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Improved Portable Steam Brick Machine.

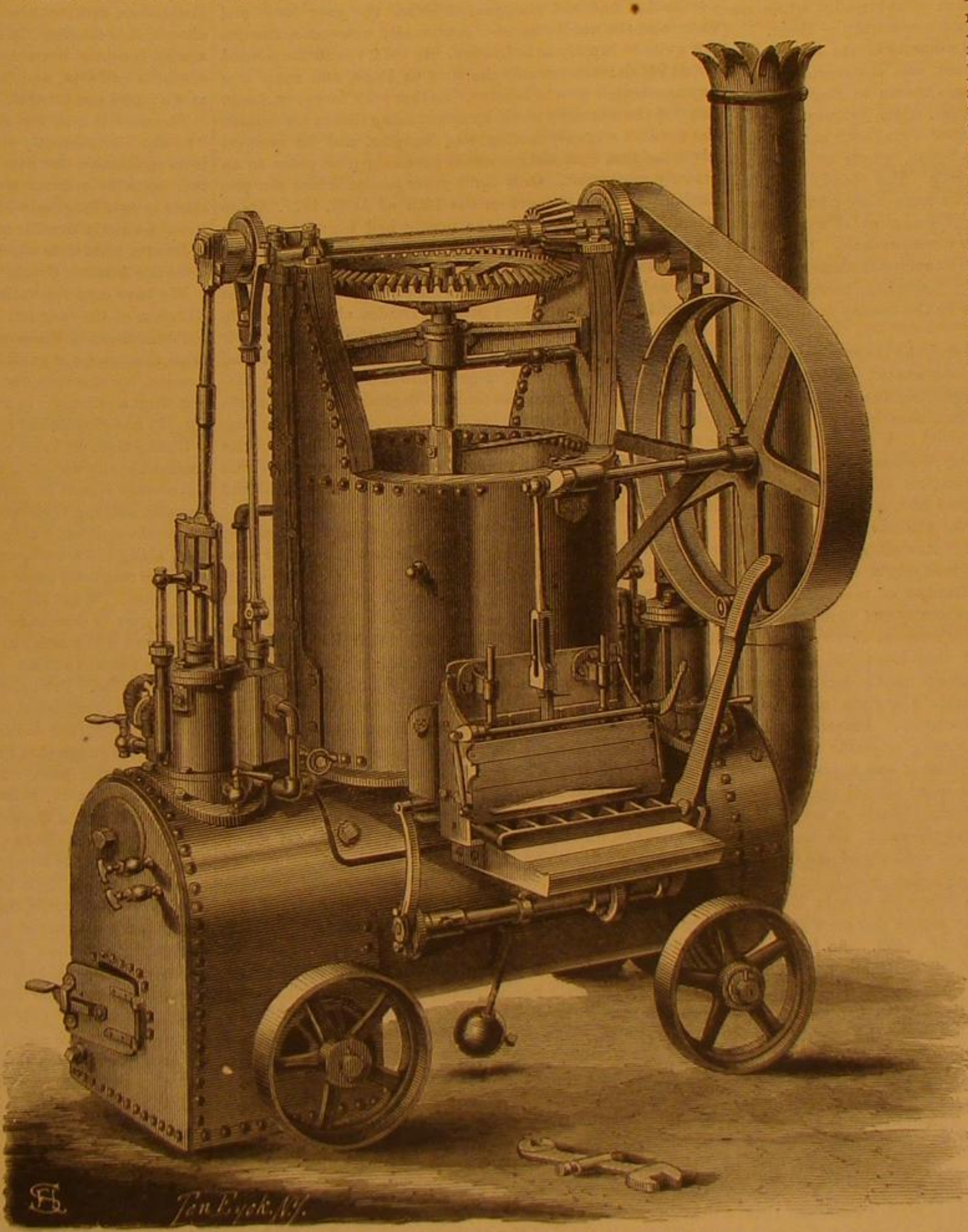
To successfully manufacture bricks, a full recognition of the chemical, as well as the mechanical character of the process, is necessary. The clays employed for this purpose vary greatly in character; not only in different beds, but in the same bed, much difference in quality is often met with at different depths. Without at this time entering into details, it is perhaps safe to say that most of the failures in methods adopted with a view to produce better and cheaper bricks than those made by the original method have arisen from subordinating the chemical principles involved to the mechanical part of production.

To produce a smooth, even, and regular surface, to turn out bricks rapidly, to avoid the necessity of hacking, and to give the bricks sharp and clear-cut angles, amount simply to nothing, if the other essentials of good bricks are wanting. The principal essentials of good bricks are that they should, in addition to the qualities above enumerated, not crack or fall in the kiln, not be liable to break and crumble in handling or in transportation, that they should be uniform in quality, not only throughout the body of individual bricks, but approximately so throughout all those made from the same material, that they should not be difficult to cut with the trowel, nor liable to disintegration from the action of the weather.

It needs no argument to prove that a machine, no matter how perfect and beautiful it delivers the bricks, is—if in its operation it so influences the subsequent process of drying and burning that these can only be done imperfectly—worse than useless. Such, unfortunately, has been the effect of many costly machines, which have had their day.

The fact, however, that so many worthless devices have been tried, and that, while there have been many failures and few successes, brick makers are still anxious to try new devices in the hope of getting the right thing at last, shows the importance of a machine that answers all the conditions required.

Such a machine it is claimed is the one which we this week present to the consideration of our readers, and which is illustrated in our engraving.



WINN'S PORTABLE STEAM BRICK MACHINE.

The machine is a steam-boiler, engine, and brick machine combined, the whole made portable by being constructed upon wheels, and can be easily moved upon a track. The machine is constructed entirely of iron, and in the most substantial and durable manner. The clay mill, to which is attached the pressing or molding arrangement, is placed upon the boiler, and at each side of it are two engines or steam cylinders, of 8-in. bore by 14-in. stroke, running 40 revolutions per minute.

The capacity of the boiler is 20-horse power. The clay mill, in which the clay is ground and tempered, is built of heavy boiler-plate iron, of the same quality as the boiler, and is of cylindrical form, constructed with two shells or walls, with an annular chamber between the two shells of two and three fourths inches space. This space contains a coiled pipe, through which steam circulates and heats the water which occupies the annular chamber, and used in supplying the boiler as well as in tempering clay. By this arrangement the boiler is supplied with hot feed water, and the clay is regularly and evenly tempered, the water for the purpose being taken from the annular chamber above the clay, inside the mill, by means of a perforated horizontal pipe extending over it, and the supply regulated by a cock which is adjusted by the pit shovelers.

There is also an arrangement for tempering the clay by steam direct from the boiler, by which it is claimed most clays may be thoroughly tempered without previously soaking in a pit.

Two perforated pipes, passing through the clay mill direct from the boiler, admit high-pressure steam. This steam is condensed by the colder clay which absorbs the water produced by condensation and the latent heat of the steam given off while condensing, so that the clay becomes thoroughly wetted as well as uniformly heated. The bricks are delivered from the molds hot. Of course they dry much more rapidly than could be the case with cold-molded bricks; 50 per cent being the saving in this respect claimed over any other process, attained without the expense of fuel and fixtures required in other artificial methods of drying.

Besides being advantageous in working tenacious clays, the use of steam is particularly beneficial in winter. It is claimed that by its use the manufacture may progress as profitably in winter as in summer, provided a market for the bricks can be secured. The steam extracts all the frost from the clay, and the bricks are laid on the floor at a higher temperature than can be attained by the expensive method of arches and flues with superimposed floors; the bricks in cooling becoming so dry that they are no longer liable to injury from frost.

In good weather, when the yard is in good drying condition, there is no particular advantage in tempering with steam, and the cock may be closed; but in cloudy, misty weather, when the yard is damp, or from any other cause the drying of the bricks is too slow, the steam is turned on and the water partially shut off, and the clay is heated as much or as little as desired. Or, if the clay is tough and tenacious and does not properly temper, the steam is used. For making brick during the winter season, the use of the steam is indispensable, and the bricks may be delivered from the molds or machine at any temperature desired up to 212 degrees.

The advantages claimed for this machine may be summed up as follows:

It is combined with its own motive power. It is portable, and requires no foundation other than two sticks of timber, which serve as a simple temporary track for the wheels. It can be set in operation in twenty minutes. It is both powerful and durable, made of the best iron and in the most workmanlike manner. Each part and movement is adjustable, and the pressure may be instantly regulated and changed without stopping any of its moving parts. It cannot be broken by any stones or sticks, whether they are in the clay by accident or design. It is extremely rapid in its work. It may be used for motive power applied to other purposes when not used for making bricks. It is further claimed to be the cheapest machine of any now used in the United States, and driven by steam power, both as regards original cost and the maintenance of repairs.

Patented, through the Scientific American Patent Agency, June 2, 1868, by C. A. Winn, whom address for further information, at Lock Haven, Pa.

Work for Women.

We learn that a novel institution for women is to be opened in the neighborhood of Boston, as soon as the requisite funds are obtained. It is to be a horticultural school, and is designed not as a charitable institution, but a high-class school where thorough instruction in horticulture will be given to young women for such compensation as will, in the end, make it self-supporting, or nearly so.

The working plan of the school comprises a farm, to be procured in the vicinity of Boston, containing about twenty acres, five acres to be used for the cultivation of small fruits, flowers, salads, and such vegetables as are suitable for culture by female labor, the rest to be devoted to mowing and pasturage; a good plain dwelling house capable of accommodating about thirty inmates; a barn large enough for the farm stock, and an experimental plant house for growing flowers and early vegetables, and the forwarding of plants for field crops. The control of the institution is to be vested in a president, secretary, treasurer, and twenty-four managers—one half of whom will be ladies—who will be aided by a competent instructor, an experienced farmer, and the necessary assistants. The pupils will be instructed in plain sewing, the use of the sewing machine, and in all kinds of housework, as well as in horticulture; and lecturers and teachers in kindred branches of labor and service will be employed from time to time.

It is intended to receive pupils to the numbe r of twenty-five, who are from the age of sixteen upward, of good character, fair education, and able to work as may be required. The course of instruction will extend through two years. The estimated cost of procuring the farm and outbuildings and maintaining the school for three years, is $30,000.

No more Shearing of Plates.—By means of their patent "Universal Mill" the Union Iron Mills, of Pittsburgh (branch office 19 Broad Street, New York,) are enabled to furnish plates, with the edges formed, by the action of vertical rolls, remarkably straight, solid and uniform throughout, so that no re-shearing is necessary, even when great exactness is required. Workers in iron will do well to give this improvement a trial, as the prices are said to be as low as for plates manufactured in the ordinary manner.

TERRESTRIAL MAGNETISM.

From Chambers' Journal.

One of those periods is now approaching when the earth is thrilled through her whole frame by magnetic throes of unusual intensity. Physicists will be able to trace in the silent indications of the suspended magnet the action of the most remarkable of all the forces to which the earth is subjected. In telegraphic offices, the occurrence of these disturbance will be made apparent by the interruption of communication for longer or shorter intervals of time. And the self-recording instruments at Kew and other such observatories will indicate by unusual movements the progress of those mysterious electric convulsions known as magnetic storms. But except for such indications as these, and one or two others which have only of late years been referred to the agency of terrestrial magnetism, the inhabitants of this earth will not be made sensibly aware that anything unusual is in progress. For ages these magnetic disturbances have thrilled through the earth's framework without being recognized; and even now it seems almost by an accident that our physicists have been led to understand the significance of one of the most remarkable of all terrestrial phenomena.

The facts which have been ascertained respecting terrestrial magnetism are so interesting and so little known, that we may confidently claim the attention of the reader while we state some of the most striking and noteworthy of them.

The most generally recognized property of the magnet, its power of indicating the north point, was discovered by the Chinese many ages before it became known to European observers. We learn that the Chinese, when journeying over the great plains of Central Asia, used a magnetic car, in front of which a floating needle bore a figure, whose outstretched arm pointed continually southwards. The Greeks and Romans were aware that iron could be magnetized: but it never happened that a suitably balanced fragment of magnetized iron exhibited to them the earth's directive force. Humboldt remarks that "on this accidental circumstance alone the great discovery depended." It must be remarked, however, that such accidents have been common in the history of discovery and invention.

Had the western nations discovered the magnet's principal property so early as the Chinese, we should probably have gained valuable information respecting the next property which has to be considered—the fact, namely, that the magnet does not commonly point due north. It is not likely that the Chinese discovered this property, because over the whole of Eastern Asia the magnetic compass points very nearly towards the north. But even if they had, it is not so much the divergence of the compass from the north point which would have rendered the discovery interesting to us, as the knowledge which ancient observations might have given us respecting the laws on which the *changes* of that divergence depend. In Europe, as we shall presently see, these changes are very conspicuous.

It was in the thirteenth century that European observers first detected the fact that the magnetic needle does not point due north. It may be well to notice a certain peculiarity about the nomenclature of this deviation. Seamen always call it the needle's *variation;* but among scientific men it is called the *declination.* For a long time it was supposed that the direction of the needle was the same for all places; but during the first voyage of Christopher Columbus across the Atlantic it was found that this is not the case. He had traveled six hundred miles from the most westerly of the Canary Islands, when he noticed that the compass, which had been pointing towards the east of north when he was in Europe, was now pointing due north. The actual day on which the discovery was made was September 13, 1492. As he sailed further west he found that the westerly declination gradually increased.

But here we have at once to call attention to another peculiarity of the magnetic compass, otherwise the reader would form a mistaken notion of the present nature of the needle's declination. We have spoken of the needle as pointing to the east of north in 1492. This is no longer a true description of the declination in Europe. The needle now points far to the west of north. It is a peculiarity of the science of terrestrial magnetism that variations are thus mixed up with variations, until it has become a matter of exceeding difficulty to present all the facts of the science in such a sequence that the student shall not be in any risk of being led astray. Properly speaking, the change of the needle's declination from time to time should be kept wholly separate from the changes which are noticed as the needle is changed from place to place. Yet, if this were done in describing the original discovery of the latter change, erroneous impressions would be given respecting the present state of the needle's declination in various countries.

At present, the terrestrial globe may be looked upon as divided into two vast but unequal portions, which may be called the region of westerly magnets and the region of easterly magnets. In the former must be included all Europe, except the extreme north-easterly parts of Russia, the whole of Africa, Turkey, Arabia, the greater part of the Indian Ocean, and the western parts of Australia. Returning westwards, we must add to the region of westerly magnets the greater part of the Atlantic Ocean, the north-eastern parts of Brazil, the eastern parts of Canada, and the whole of Greenland. All the rest of the world belongs to the region of easterly magnets except an oval space, which is situated in the very middle of the region, yet has a contrary character. This space includes the eastern part of China, Manchooria, and the islands of Japan.

Such is the present arrangement of the two divisions; but fifty years ago, the description would have been incorrect, and fifty years hence it will again be so; for over the whole world the declination is steadily changing—here in one direction; there in the contrary; quickly at some places, almost imperceptibly at others. And we may mention in passing, that, as a general rule, where the declination is least either westward or eastward, there it is changing most rapidly; and where it is greatest, it is hardly changing at all. But there appear to be some places where the range of change is so small, that, though the declination is never large, it does not change rapidly—as in other places of small declination. As yet, however, much remains to be learned respecting the progress of these strange changes in countries where magnetic observations have been only commenced in recent times.

Some idea of the complexity of the question will be suggested by comparing the changes which have occurred in two places so near to each other as London and Paris. We shall see that not only are the declinations different in these cities, but their range of variation is different, both as to extent and as to the period in which a complete oscillation of the needle is effected.

The easterly declination of the needle in London was observed to disappear in about the year 1657. From that epoch, the needle continually traveled westwards, until it began to be thought that it would move ever in that direction, and so come at length to point southwards. In Paris, the easterly declination had not disappeared before the year 1663, and there also the needle traveled continually westwards, though not quite so rapidly as in London. In 1814, the needle pointed about 22¼ degrees towards the west in Paris, and some two degrees further west in London. In that year, however, Arago startled the scientific world by announcing that in his opinion the needle's westerly motion was flagging, and he asserted his belief that that motion would presently give place to an easterly movement. Only three years passed before the prediction was fulfilled; and on the 10th of April, 1817, Arago was able to announce that the needle had begun to return towards the north. But observers in London pronounced against this view. The London needles were still traveling westward, though with a slowly diminishing motion. It was not until the spring of 1819 that the London observers admitted that the needles had really reached the limit of their westerly oscillation. And whereas in Paris the needles had not traveled more than 22¼ degrees towards the west, in London they had passed no less than 25 degrees from the north point. Corresponding to this circumstance, we see also that the duration of the half-oscillation (for the needles had not been watched from their greatest easterly declinations) was a hundred and sixty-two years in London, and a hundred and fifty-four years in Paris.

It gives a grand idea of the nature of those ever-acting forces to which terrestrial magnetism is due, to consider that the sway of the magnetic needle from limit to limit of its range should occupy so long an interval as three centuries in both these instances. Conceive the scale on which a pendulum should be constructed in order that its oscillations might have a period of as many seconds!

It was while they were engaged in tracking the progress of this long oscillation, that physicists detected minute oscillations superposed, so to speak, upon the main one, and even more singular in their character. The case is somewhat as though, to the bob of a long pendulum there were attached a short one, and that it was to the motions of this short pendulum (beating with its own rapid swing, while carried slowly backward and forward by the main movement) that attention was primarily directed.

Each day the magnetic needle sways backward and forward *twice* across its mean position. Shortly before midnight, it begins to travel from west to east, reaching the limit of that motion soon after eight in the morning. Then it sweeps westward to its greatest westerly limit, which it reaches soon after one. Then back again towards the east, until half-past eight, and so to its original position at about eleven o'clock.

It must be understood that these motions are so minute in comparison with the great secular oscillation, that they never affect the general direction of the magnet to any noteworthy extent. For instance, we have just spoken of the two easterly limits of the daily swing, but throughout the day the magnet always points far to the west of north. The mean declination, in fact, is (roughly) about 20 degrees, whereas the daily swing never ranges over more than the fifth part of a degree.

It will be noticed that the oscillations above described correspond closely with the diurnal motions of the sun. They are such, in fact, as the needle would exhibit on the supposition that it tries to follow the sun during his complete apparent revolution round the celestial sphere. It is believed that the daily motions of flowers, and in particular that class of motion which has given the sun-flower its distinctive appellation, are due to the same magnetic properties which cause the diurnal swing of the suspended needle.

But besides the daily sway of the magnetic needle, there is an annual oscillation of a somewhar different character. In fact, properly speaking, the annual change is not oscillatory, though it has a regularly recurrent character. The daily swing is variable. Now this variability would be somewhat confusing, on account of its general irregularity; therefore, physicists consider the mean of several days, and thus get rid of what for the present we may term accidental variations. When this has been done, it is found that the average daily swing of the needle is subject to a slow progressive increase, followed by an equally slow diminution; and the period of these slow changes is a year.

The peculiarity of this annual change is that its progress is the same for both hemispheres. It might have been expected that it would attain its maximum in summer, when the solar influence is strongest; but this is not the case. It attains its maximum in January, which is indeed near midsummer for the southern hemisphere, but nearly the least sunny of our northern months. The secret of this peculiarity lies in the fact that the sun is nearest to the earth in January. The peculiarity is a very meaning one, as showing that the magnetic influence is not a local matter, however variable the magnetic declination may be as we shift from place to place. The real fact pointed to by this, as by many other phenomena, is, that the earth must be looked upon as a single gigantic magnet, gaining or losing power throughout its whole frame simultaneously.

The consideration of the *power* of the great earth-magnet must be for a moment laid on one side, while we deal with a form of deviation as remarkable as the declination. We refer to the *dip* of the needle. The ordinary compass is, we know, suspended horizontally, and, for anything which appears to the contrary when we examine such an instrument, that might be the needle's position of rest. But when a needle is so suspended by a silken thread as to be free to assume an inclined position, it is found that the northern end dips perceptibly. We are assuming, of course, that in its non-magnetized state the needle would rest horizontally. In our latitudes, the dip or inclination is so great that the needle is inclined only about 22 degrees to the vertical. When we travel northwards, the dip increases; when southwards, it diminishes, until we reach a place near the equator (traveling always, it is assumed, in the longitude of London) where the needle becomes horizontal. After passing that point, the southern end dips, and the inclination continues to increase as we travel southwards.

The same is true for other longitudes, only the place of "no dip" is differently situated. The line along which there is no inclination lies near the equator, crossing that circle at two opposite points, one in west longitude 3 degrees, the other in east longitude 177 degrees. The magnetic equator is not a strictly circular curve, however; it is noteworthy that it departs most from the figure of a true circle where it traverses the Atlantic Ocean.

We have seen the variations which are exhibited in the declination of the magnet, not only at different places, but at different times in the same place. Changes of precisely the same character are exhibited in the dip of the magnet; in London, for example, the dip has diminished four degrees in less than a century; in Paris, during the last two centuries, the dip has diminished about seven degrees.

Seeing this, we must accept with some little question the locales usually assigned to the magnetic poles; because we have every reason for supposing that these poles must be continually shifting their position. In fact, the motion of the magnetic equator, which is continually sweeping from east to west along the true equator, suffices of itself to demonstrate that the magnetic poles are continually traveling around the true poles. What the laws of this motion may be, it would not be easy to determine in the present state of our knowledge; but it is worthy of notice that the same motion would serve to account at once for the change of dip and the change of declination. For example, in 1663 the magnetic pole may be reasonably supposed to have been due north of Paris. In the latter year, the inclination was 75 degrees in Paris, so that we can judge that the magnetic pole was on the nearer side of the true pole. As the magnetic pole passed away from this position, traveling westward, there would naturally result both a westerly declination and a gradual diminution of dip. And the fact that when Sir J. C. Ross determined the position of the northern pole in 1837, it was found to be somewhat more than 90 degrees west of the longitude of Paris—in other words, the fact that it had traversed somewhat more than a quarter of a complete revolution soon after the westerly declination at Paris had attained its maximum value—seems strikingly confirmatory of this view. If this theory is correct, the inclination will continue to diminish until the magnetic pole has completed half a revolution, so as to be again due north of Paris, but on the further side of the true pole. Then the declination will be nothing, and it will afterwards become easterly.

It must be admitted, however, that there is much more complexity in the laws according to which the declination varies, than the above view, taken alone would imply. Doubtless, the peculiarities of the earth's structure, the arrangement of land and water, mountain-ranges, table-lands, and valleys, have much to do with the matter.

The variations of the intensity of magnetic action, either from time to time, or as we proceed from place to place, are among the most interesting of all the phenomena of terrestrial magnetism. The latter class of change is associated so obviously with the changes of declination and dip, that we need not enter on its consideration. The former, however, points to problems of extreme interest in connection with the probable character and source of the whole range of forces included under the subject we are dealing with.

We have seen already that from hour to hour, and from day to day, there are changes in the extent of the minute oscillations of the suspended magnet, and that these changes indicate variations in the intensity of the magnetic force under diurnal and annual solar influences. When we add to these variations a change which has a period corresponding to the motions of the moon, it becomes evident that it is to an influence as subtile and as pervading in its character as gravitation itself, that the terrestrial magnet owes its powers.

But there are other variations still more significant.

A long series of researches had convinced Colonel Sabine, one of our leading authorities on the subject of terrestrial magnetism, that the intensity of the magnetic action is subject to a process of change having a period of somewhat more than ten years. Scarcely had this law been established, when the results of a long and elaborate series of solar observations

exhibited to the world the strange fact, that the spots which stain the sun's face vary in frequency according to a precisely similar relation. It was found that the changes of solar spottiness, and of magnetic intensity of action, are not merely characterized by an equality of period, but that the maximum effect under one period is absolutely coincident with the maximum effect under the other.

We might have looked upon this as merely a very singular coincidence, had we not independent evidence of an association between the sun's action and the intensity of terrestrial magnetism. Part of this evidence has been already referred to. But the evidence founded on the exact coincidence of magnetic storms, thrilling in a moment through the whole frame of the earth, with solar disturbances actually witnessed by astronomical observers, is even more striking. Thus, no room is left to question the dependence of terrestrial magnetism on solar action, and the relation between the sun's spots and the vibrations of the needle—a relation which, when first propounded, was received even by eminent physicists with ridicule—has been accepted as one of the most well established of all the circumstances known respecting terrestrial magnetism. Of the meaning of this singular relation, we have not at present space to speak; indeed, we should be led into a variety of considerations, which would be out of place in such a paper as the present. The appearance presented by the solar spots, the processes by which they are formed, the laws on which their changes depend—all these, and many other questions of the sort would have to be dealt with, to say nothing of the planetary movements on which, according to modern researches, the habitudes of the solar atmosphere are dependent. We may note, in conclusion, that the solar face has recently presented all the signs which we have learned to associate with the intenser phases of terrestrial magnetic action. Enormous spots and clusters of spots have broken out during the past few months; and probably the spots which will shortly make their appearance will be yet larger, since the epoch of maximum disturbance has not yet been fully reached.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Combustion of Pyrites Compared with that of Sulphur.—It is found, in making sulphuric acid from pyrites, that larger chambers are required, and a larger quantity of niter in proportion to the sulphur burnt, than when sulphur is used. This arises from the higher temperature of the vapor from the pyrites, and from the greater quantity of inert gas that circulates through the apparatus. Too much attention cannot be given to diminishing the temperature of the gases, but in most works it is neglected; some, however, pass the gases through a kind of tubular boiler of lead surrounded by water, and thus cool down the vapors before they enter the chamber. Another precaution to be observed is, not to let the lump pyrites exceed the size of an egg, and to free it from fine matter that would clog the openings. There is very convenient machinery devised that will answer this purpose very well.

The little loss by the augmentation of inert gas in the chamber where pyrites is used may be diminished by determining, by frequent analyses, the proportion of sulphurous acid introduced into the chamber, a method now slowly growing into use; tests being made with a solution, *titrée*, of iodine, colored by starch. The gas is drawn from the chamber by means of an aspirator, and the water flowing from the aspirator is measured in a graduated vessel, which gives the bulk of the inert gases mixed with the sulphurous acid. This last is absorbed and calculated from the iodine solution through which the gases are made to pass. The mean of these analyses gives nine per cent of sulphurous acid, which, according to the composition of the air and pyrites, ought to be mixed with 79 of nitrogen and 8½ of oxygen. This method of testing is well adapted to chambers where nitric acid is used or having nitrification furnaces constructed at the base of the chambers; but this testing can be used for all chambers at the exit, where the gases commonly contain six per cent of oxygen. It would be well to diminish this quantity, taking care, however, that the oxygen does not disappear entirely, as this is a guarantee against the loss of binoxide of nitrogen, which is not absorbable by the cascade of sulphuric acid of Gay Lussac, when the proprietors of works are prudent enough to use his method of preventing loss of nitrous vapors.

Proper manipulation of the pyrites method depends on the nature of the combustion of the pyrites and the regulation of the draft of air. When the furnaces are well constructed with this in view, there can be obtained 126 parts of sulphuric acid for 100 parts of pyrites of 45 per cent of sulphur, thereby utilizing as much as 42 per cent of the sulphur. There is no greater drawback to this method of making sulphuric acid than the admission of too much air.

Oxidation of Sulphurous Acid by Nitrous Acid Vapors.—The compounds of nitrogen and oxygen are used as agents to complete the oxidation of the sulphurous acid by a reaction familiar to chemists. The introduction of the nitrous vapors into the lead chambers is carried on in several ways in Kuhlmann's large works at Lille, and in other factories in France a small stream of nitric acid is allowed to flow into the nitrification chamber, the size of the stream being regulated so as to furnish the proper proportion where it reacts on the sulphurous acid at a comparatively low temperature. It is a good process, and may be regarded as a more natural process than any other in supplying the nitrous vapors. The acid is allowed to enter into the first chamber in a small stream; it is made to strike on glass gutters, or a stone-ware vessel, in such a manner that the liquid acid is divided into spray. As this falls into the chamber, and comes in contact with the sulphurous acid, it only furnishes the useful nitrous products, there being no formation of protoxide of nitrogen, or nitrogen, as sometimes happens from a rapid action on the niter pans, as when they are carelessly heated red-hot. The operation is very regular, and the economy in nitric acid more than compensates for the expense of first forming the nitric acid.

The more common process is by the action of sulphuric acid on nitrate of soda, and passing the vapors thus produced into the lead chambers. The method usually employed in England is the best for carrying out this decomposition, it being carried on in one instead of several vessels, and placing the vessel very near the entrance into the lead chambers. The quatitity of nitrate of soda used by the several manufacturers for every 100 parts of sulphur, as stated by C. R. Wright, is

For pyrites containing 45 to 50 per cent sulphur..............	8·5 per cent.
For pyrites containing 30 to 50 per cent sulphur..............	12·0 per cent.
For pyrites containing 35 average per cent sulphur..........	12·5 per cent.
For pure sulphur..	10·0 per cent.

Efforts to Produce Sulphuric Acid without the Agency of Nitric Acid or Nitrous Vapor.—Several methods have been proposed, but no one of them has proved successful. Tennant Dunlap has approximated to success by a method which is in use, whereby, having once produced the requisite supply of nitrous vapors no more are required except to make up the unavoidable loss. As this process is not familiar to most of our manufacturers, it will here be described, although it has been in successful operation for several years in the gigantic chemical works of C. Tennant & Co. Instead of treating nitrate of soda with sulphuric acid, and employing the nitric thus obtained, a mixture of nitrate of soda and of chloride of sodium is decomposed, which yields, together with sulphate of soda, chlorine gas and nitrous acid. These gases are separated by passing them through concentrated sulphuric acid of not less than 1·75 sp. gr., when the nitrous acid is absorbed, the chlorine being utilized for the production of chloride of lime. The sulphuric solution of nitrous acid is allowed to flow into the chambers, where, by appropriate apparatus, it is brought into contact with water, which disengages the nitrous acid. At the works of Messrs. C. Tennant & Co., where this process is in use, they employ Gay Lussac's process for absorbing the nitrous acid from the escaped gases of the chambers, and M. Dunlap's process is used to such an extent as is found needful to provide for the waste of nitrous acid which occurs, notwithstanding the use of Gay Lussac's process. It will thus be seen that the immense quantity of sulphuric acid made by the Messrs. Tennant & ..., is formed without any nitrate of soda used specially for obtaining nitrous gas to be applied to the oxidation of sulphurous acid.

Condensation of Nitrous Vapors by Gay Lussac's Process.—The condensation of the excess of nitrous vapors that escape at the exit of the furnace in sulphuric acid works, by Gay Lussac's process, is very generally employed in France, but to a very small extent in England, where eight to ten parts of nitrate of soda are employed to every 100 parts of sulphur burnt. In all well-directed establishments this apparatus should be used to save the excess of nitrous vapors, and, while its use requires skill and care, it will reduce the quantity of nitrate required to less than two thirds, and the saving will very much more than pay for the increase of expense and attention. This method has been long known, and is fully described in works on industrial chemistry, so that no detail of it need be given in this report.

Purification of Sulphuric Acid from Arsenic.—The acid is sometimes boiled with a little common salt, and the arsenic goes off as terchloride of arsenic. But probably the most efficient and practical method is that adopted by Kuhlmann in his large acid chambers. The sulphurous acid from the combustion of the pyrites passes into a small chamber of 1,500 cubic feet capacity, that communicates with the furnace by a large leaden pipe forty or fifty feet long, sustained on its inside by iron bands covered with lead. In this way the sulphurous acid is cooled before it reaches the acid chambers, and several condensible products are deposited, among them the arsenious acid.

It is also purified by means of sulphide of barium, at Chessy, as it comes from the lead chamber, or by sulphureted hydrogen; this last is successfully used at Freiberg in the following way: The apparatus used for making the sulphureted hydrogen is composed of two large leaden vessels, placed side by side, and communicating with each other at the bottom. One of the vessels is filled with sulphide of iron and the other with diluted sulphuric acid. The gas as it is produced enters a long column full of coke, while the acid from the chamber is run through the coke by a kind of receptacle that alternately fills and empties itself, thus giving an intermitting flow. As the acid has time to spread over the coke, the sulphydric acid and the arsenious acid react on each other. The flow of gas is regulated according to the quantity of arsenic present. The acid thus acted on falls into a leaden receptacle, is allowed to settle before it is concentrated in the lead pans, and, finally, in the platinum still.

The separation and purification from nitrous acid, when the sulphuric acid contains it, can be effected by adding either a little sulphate of ammonia or alcohol in the lead pans used in the first concentration.

Concentration of Sulphuric Acid.—It is well known that the acid, as it comes from the lead chambers, is first concentrated in lead pans. Little or no improvement has been made in this part of the concentration. In these pans the acid can only be brought to a degree of concentration equal to 1·70 sp. gr. Further concentration is carried on in glass or in platinum vessels

The high price of platinum, and its monopoly by the Russian Government, from which it gets into the hands of a few manufacturers, has driven many of the makers of sulphuric acid to return to the use of glass which they had once abandoned. In addition to this there has been considerable improvement in the manufacture of large lead-glass vessels, so that now about four fifths of the acid made in England and Belgium is concentrated in glass, of which the original price and breakage, etc., do not exceed half of the annual interest of the cost of platinum stills. The vessels are very large, and are heated in open fire, or in iron pots, with a thin layer of sand between them and the sides of the pots. The vessels are kept constantly at work. The acid is drawn off by a siphon, and the vessels are immediately refilled with hot acid. The temperature of the room must be kept very warm, and a proper provision should be made for carrying off the vapors. The heat and the presence of the vapors of acid are very injurious to the workmen, and they suffer more or less from them. In this way, in South Lancaster alone, 700 tuns of sulphuric acid of 1·85 sp. gr. are manufactured weekly.

In France platinum stills are almost altogether used, and the manufacturers of these vessels have exercised their ingenuity to diminish their cost, and none of them has succeeded so well in this direction as Messrs. Johnson & Matthey, of Hatton Garden, London. In 1862, in London, they exposed a still capable of concentrating from two to four tuns of acid in twenty-four hours, for not much more than twenty-five per cent of the former prices. The apparatus cost $2,300. In 1867, when I visited their establishment, they were actively engaged in the manufacture of platinum stills, making some with the neck of the still directed upward, to prevent the violent boiling of the acid from throwing over portions of concentrated acid. The platinum stills exhibited coming from the establishments of Desmontes, Chapins, and Quennessen, in Paris; Herasus, of Hanau; and Johnson and Matthey, of London, were most beautifully executed. In soldering all of these makers use gold, except the last-mentioned firm, who burn the sheets of the metal together at the seams and joints with the oxyhydrogen blowpipe, and for large vessels of platinum the last-mentioned manufacturers turn out work more to my satisfaction than any of the others.

It is not usually understood that while platinum is not virtually acted on by sulphuric acid it does experience a little and gradual loss of substance by the action of the acid, and this especially when it contains nitrous acid, but this last can be prevented by adding a little sulphate of ammonia prior to distilling. Even when this precaution is taken there is still a loss, less in new and more in old vessels, commencing with a loss of one gram and gradually increasing to two grams for every tun of acid concentrated. When the platinum contains iridium the loss is diminished 50 per cent, but the Paris manufacturers, I believe, are the only ones who have used iridium in their platinum, and they do not do it except by express order, for platinum that contains it is more difficult to work.

With this I will terminate the brief review of the present condition of the manufacture of sulphuric acid in the world, as brought out by the Exposition of 1867, and by the examination of old and well-established factories.

An Incident at the Fair of the American Institute.

One morning, says the *Tribune*, the Secretary of the Board of Managers, Mr. John W. Chambers, was having his boots blacked at the entrance of the Fair by a small boy, shoeless and stockingless. The Secretary, in his urbane manner, told this boy that if he would wash himself, and come to him the next day, he would admit him to the Exhibition. The next morning, a young lad, with his face polished by the use of soap, appeared in the office, and asked to be admitted to the Exhibition, as he had been promised.

"When did I promise you?" said the Secretary.

"Yesterday morning, when I polished your boots."

"If you are the lad, come in."

He passed him to the Exhibition. Half an hour afterward, while the Secretary was passing one of the pianos, he noticed a crowd surrounding the instrument, and, to his surprise, found the young bootblack delighting the audience by the brilliant tones he was drawing from the instrument. It is a pleasure to record the fact that this young lad has been taken into the store of the manufacturers whose piano he was then playing. These gentlemen have furnished him with a new suit of clothes, and every evening he has been heard at the Exhibition playing equally well on the piano or electric organ. The boy is an orphan. His father, a German musician, taught his infant son to play, but after the former's death his son was thrown unprotected upon the world, and, finding nothing to do, earned a precarious living by blacking boots. His names is Charles Knubel; he is now foutreen years of age, and we have no doubt but that he will honorably be heard of in the future.

CURIOSITIES OF A CITY DIRECTORY.—It is an entertaining pastime to look over the pages of a city directory and see the variety of curious names and the great number of the same name it contains. For instance, the "New York City Directory, for 1869," has the name and address of Smith recorded two thousand and fifty-nine times; one hundred and eighty-nine bearing the given name of John. The Murphys number seven hundred and sixteen; sixty two bearing the name of James, one hundred and nine John, and fifty-nine Patrick.

WE are much gratified to state that since the inauguration of President Grant, the public debt has been reduced $64,352,070·65. This fact not only demonstrates the efficiency of the present administration in the collection of revenues, but the the immense resources of the country.

The New State Capitol, Illinois.

We give a view of the New State Capitol now in the course of erection in Springfield, Ill. The ground plan is that of the Greek cross, arranged to present four fronts of similar style. The order adopted is the Corinthian. The north, east, and southern fronts of the superstructure are each to be supplied with a portico of eight detached columns in front, the outer two on each side being coupled. The western façade presents the same exterior, except that when entering the building you pass into the basement through a stylobate, the portico not projecting as far as on the opposite front. The tambour of the dome comprises two stories, the first ornamented with disengaged columns in pairs; and the second with pilasters. From the top of the latter springs the dome, surmounted by a lantern. There is a balustrade on the top of the entablature of the first story, consisting of pedestals and balusters. The hight from the ground to the top of the lantern is 254ft. The dome at its base is 83ft. in diameter, outside the walls. The building is 354ft. long by 240ft. wide; the hight is 95ft. The interior is to be finished in the same elaborate style. Messrs. Cochrane & Garnsey, of Chicago, are the architects; Mr. J. W. Ackermann (late of London), acting as draftsman. The corner-stone was laid with Masonic ceremonies on the 5th day of October, 1868. The whole structure will cost $3,000,000.

THE STATE CAPITOL OF ILLINOIS.

Refining Oil.--How it is Done.

Our readers, says the Oil City *Weekly Times*, are probably, most of them, aware that petroleum is a product found in many parts of the world, and that it has been known to man for more than two thousand years; a spring of it, on the island of Zante, one of the Ionian group, being described by Herodotus. And we read that at Agrigentum, in Sicily, petroleum was collected and burned in lamps as a substitute for oil; and in more modern times Parma and Genoa in Italy were lighted with supplies of this oil obtained in Amiano and other places. We also know large supplies of it have been obtained at Bakoo, in Georgia, on the borders of the Caspian Sea, and at Rangoon, on the Irrawaddy, in Burmah, for several centuries, and that it has been for a long time in use in Persia and India, both for its lubricating and illuminating purposes, and also for preserving timber against insects and as a medicine. It has been known and collected in this region from its earliest settlement by the whites, and was previously known and used by the aborigines. The product was used in a crude state, and though its qualities were known, no progress was made in the manner of distilling it until Reichenbach, of Moravia, undertook an investigation of its properties, the results of which were published in 1830-31. These attracted the attention of scientific men, and stimulated experiments, and, in 1834, a patent was issued to Selligue, a French chemist, for his process of refining, which, with subsequent improvements introduced and patented by him up to 1845, is the same, with a few modifications of the apparatus employed, as that now practiced. The invention was introduced into England by James Young, of Glasgow, and incidentally also into the United States. As this branch of industry just at present is occupying much attention among our people, and possesses in itself considerable interest, we give below a description of the process of refining as it is now practiced. We avoid the use of technical terms, in order that we may be easily understood by all.

In the early days of refining in this country stills of a capacity of from 15 to 200 barrels were used. Lately tank shaped stills of a capacity of 500 to 2,500 barrels have been substituted. These stills are filled with crude oil, and fire applied in the furnaces beneath them, and as the heat increases it causes vapors to arise on the surface, which are carried forward to pipes immersed in water, and the vapors flowing through these pipes are condensed into a liquid which runs out at the end of the pipe. The first product of the pipe is gasoline, a very light hydrocarbon, weighing on Baumé's hydrometer 77°. This gasoline is composed of different degrees, beginning as high as 83°B., and running as low as 75°. The temperature of the stills is necessarily increased as the distillation progresses, and the next product obtained from the pipe is called naphtha, benzine or benzole, which is taken from 75° to 63° B. This mixture of degrees will stand at about 67°. The next production of the stills is refined petroleum, called distillate, such as used in lamps. This is produced until as the distillation progresses about eight or ten per cent of the original quantity contained in the still remains, which is called residuum or tar. This is drawn from the bottom of the still and has been generally used as waste and fuel, but of late it has been re-distilled for the purpose of obtaining paraffine and lubricating oil. Paraffine is a fatty material, resembling sperm in appearance. The product, taken off of a gravity between 63°B. and the tar, called distillate, still retains a greenish color, and its disagreeable odor, and the next step in the process of refining it is the treatment with sulphuric acid. For this purpose it is placed in a tank where it is violently agitated by means of an air pump, forcing air through the oil, and while thus agitated a quantity of sulphuric acid equal to one and a half or two per cent of the oil is added, after which the agitation is continued fifteen to thirty minutes. The blast of air is then stopped and the oil allowed to settle, when the acid and impurities are drawn from the bottom. The oil is then washed, first with water, and then with caustic soda, by which means the remaining impurities are removed, and any portion of the acid remaining in the oil is neutralized. [Some parties heat the oil before treating in order to get what is called the "fire test."] The oil is then taken to shallow tanks, called bleaching tanks, where it is exposed to light and air, and allowed to settle; it is then heated by means of a coil of steam pipe running through it, to generate all gaseous vapors which will ignite at a temperature below 110° Fahrenheit, and to cause their evaporation. The oil is now called a "fire test" oil and is ready to be barreled and sent to market.

Ornamenting Glass.

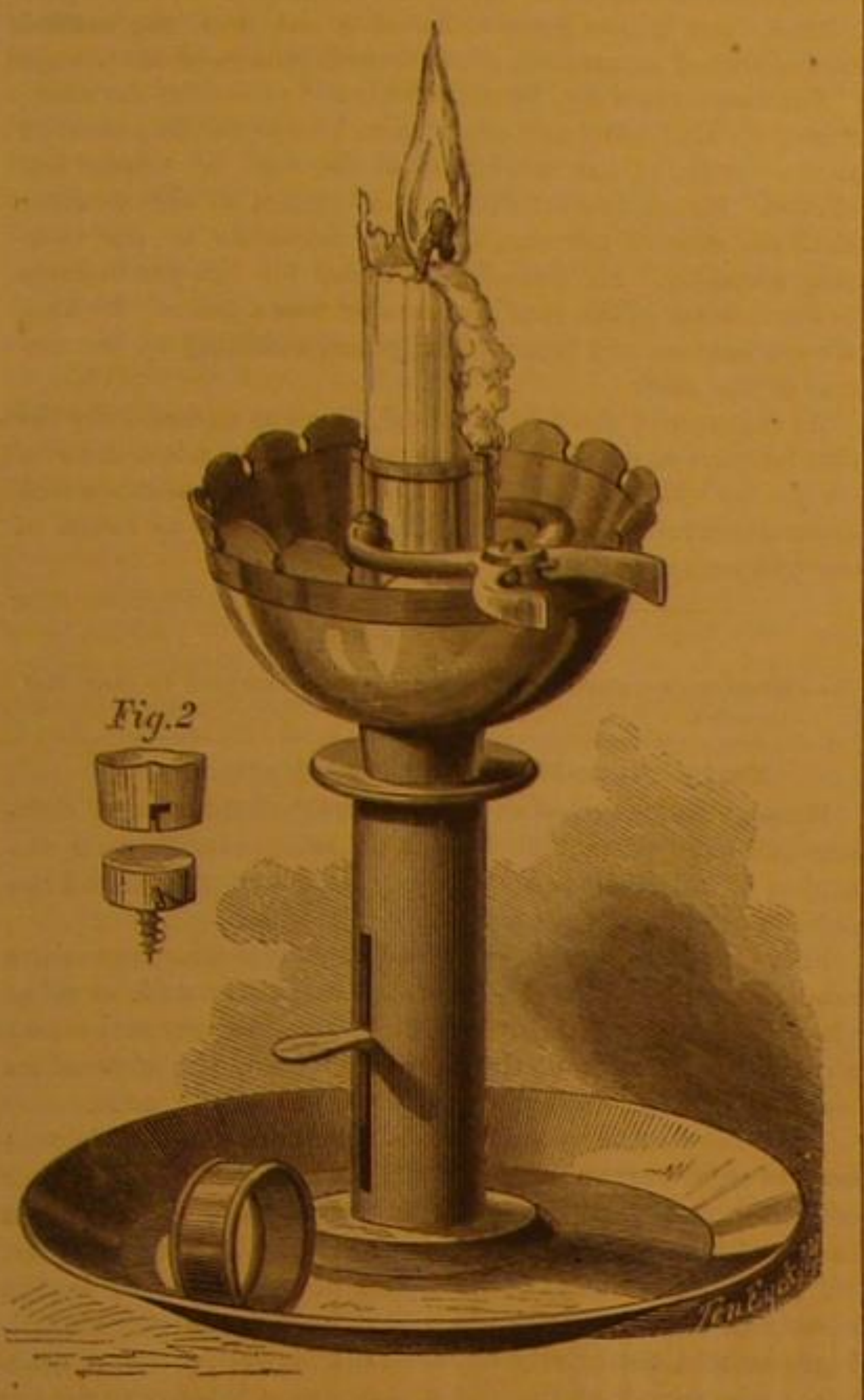
The *Mechanics' Magazine* states that Mr. George Rees, of Holloway, has lately patented an invention for producing ornaments or devices by vitrifying pounded glass upon glass and glazed ware, or by cementing together fragments of colored glass or glazed ware by vitrifying a layer of pounded glass on to the fragments. The glass, after it is pounded, is sifted through sieves, the meshes of which correspond to the sizes of the particles of glass to be used on the surface of the glass or glazed ware. The new process is as follows: Take a sheet of glass and prepare the surface by brushing a gummy or other adhesive liquid thereon. Then sprinkle pounded glass over the gum, which adheres to it. The glass thus prepared is placed in a furnace, or under heat in any suitable manner, in order to vitrify the pounded glass upon the surface of the sheet glass. The pounded glass may be of one or a mixture of colors, or the sheet glass may be of a white or other color. When it is required to form a pattern on the surface of the sheet of glass, cover the intended part with gum, and then sprinkle the required colored pounded glass on it. The other portions of the pattern are likewise similarly prepared, and pounded glass of a different color is sprinkled on those. These operations are repeated until the required number of colors are sprinkled on. The sheet of glass is then heated to the required degree to reduce the pounded glass to almost a liquid state; when the glass is removed from the furnace the pounded glass is found to have fixed itself into or on to the surface, and forms a rough face. If the sprinkled sheet of glass be left under heat for a longer time the pounded glass runs and intermixes itself in the surface, and thus produces a smoother face.

In carrying out the second of the above described methods of this process the inventor takes broken or shaped fragments of colored or plain glass, or glazed ware or metal, and arranges them in any desired pattern, placing them in a metal mold. He then spreads over them a layer of pounded glass or other vitreous substance in such a manner that the powder shall enter the interstices between the fragments forming the pattern, and shall cover the entire back surface of the pattern to such a depth as may be convenient. He then removes the whole to a furnace and vitrifies the mass, thus cementing together with a thorough vitrified cement the colored device and giving it a solid back.

AULT'S IMPROVED CANDLE HOLDER AND GREASE CUP.

Of all the arrangements trying to the souls of good house-keepers, the dropping of grease is, perhaps, the worst. Dwellers in cities, who, for the most part, use gas lights, do not, perhaps, appreciate the advantages possessed by them over those in rural districts, where, even people who employ kerosene lamps, are obliged to resort, more or less, to candles.

It is to obviate the dropping of grease, and to also furnish a means of holding, firmly and vertically, candles of different sizes, that the simple device, illustrated in our engraving, has been perfected.



It consists in the application of a cup to the ordinary candle stick, with hollow stem, to hold the candle, and which, also, is inserted into the candlestick, in the manner shown in the engraving, together with a spring clasp attached to the edge of the cup, which grasps the candle and holds it in a perfectly upright position. Each arm of the clasp is provided with a concave piece of metal, at the inner end, which closes upon the candle, and the outer end is formed into a thumb-piece. The pressing of the thumb-pieces together releases the candle.

To adapt the improvement to use on Christmas trees, etc., the lower end of the hollow stem which supports the grease cup is slotted as shown in the detail at the left of the engraving. A small cylinder of wood with pins projecting radially, fastened by a screw to the limbs of the tree or place where it is desirable to fix the cup, forms a convenient attachment. The slots in the lower part of the hollow stem engage with the pins in the wooden support in such a manner that they are locked together.

The attachment of the clasp or candle holder is made to a ring at the top of the grease cup which may be unscrewed for convenience in cleaning. Its application to chandeliers where wax candles are used will also suggest itself.

This invention is the conception of E. G. Ault, of Dundas, Rice Co., Minnesota, who may be addressed for the entire right, or for rights to manufacture on royalty.

WINKELHOUSE'S IMPROVED BIT HOLDER.

Of the many devices intended to hold bits in the stock, we have seen none that seems better adapted to serve the purpose than that illustrated in the accompanying engravings. It is simple, durable, and perfectly reliable, holding the bit so firmly that its shank would probably break in an attempt to draw it by main force from the stock.

Fig. 1

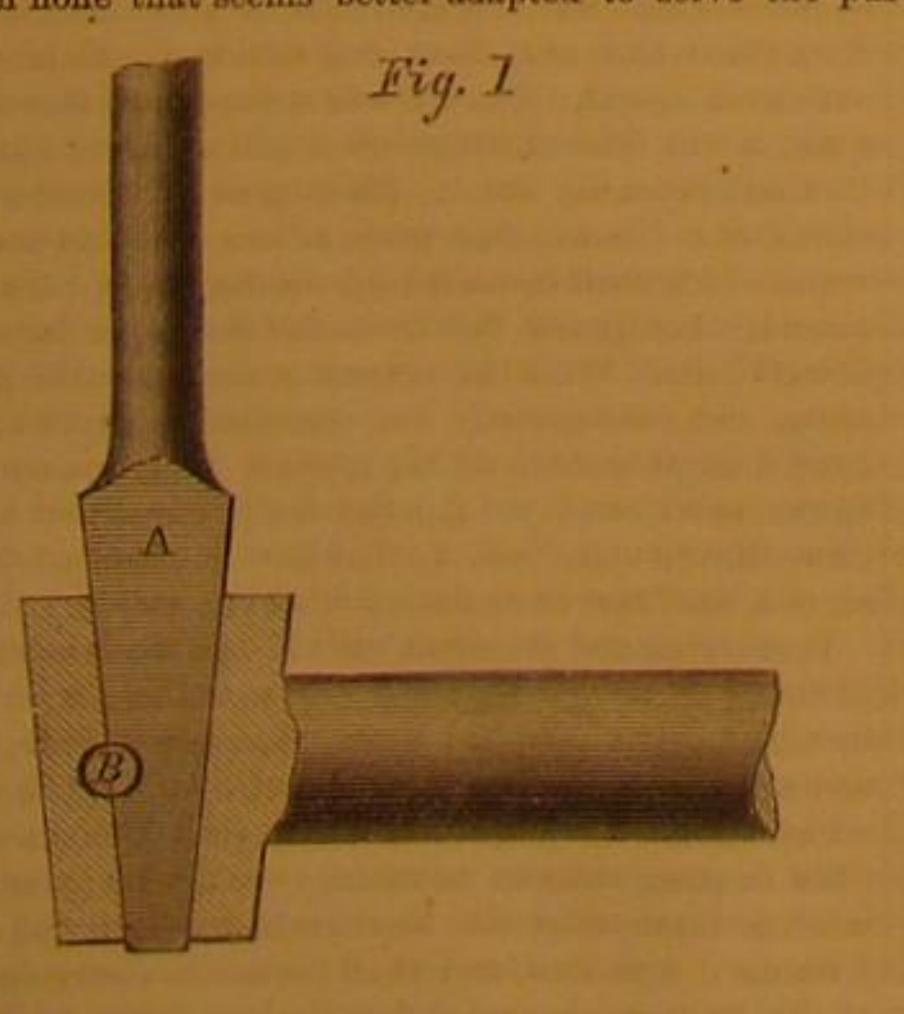
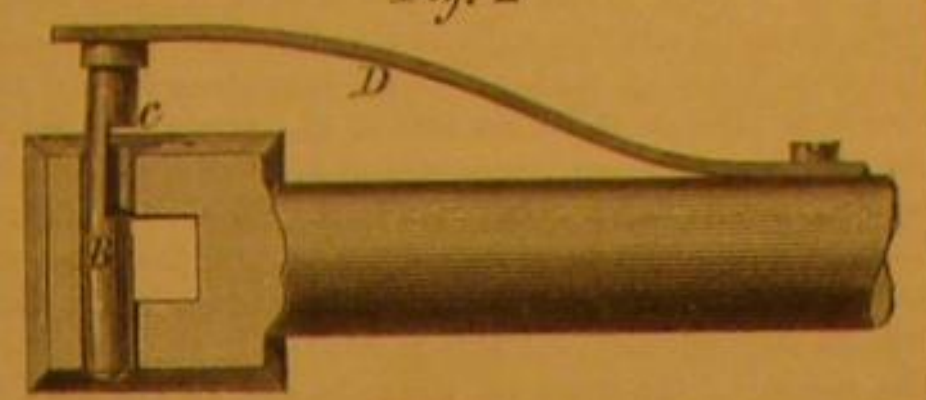


Fig. 1 is a section of the holder with a bit in the socket, and Fig. 2 is a section showing the form of the pin which locks the bit in the socket, and the manner in which it is held by the spring.

A, Fig. 1, is the portion of the bit filling the socket of the bit holder. A semi-cylindrical concavity is cut in the holder, and another to correspond in the bit. These two concavities form, when the bit is entered, a hole in which plays the key-pin, B. This key-pin is attached to a spring, D, its normal position being that shown in Fig. 2.

Fig. 2



A portion of the key-pin is cut away at C forming a recess in the side of the pin, the length of which corresponds to the width of the socket.

When the pin is pressed inward this recess is brought to coincide with the socket, and a bit may either be withdrawn or inserted.

When the pressure is removed from the head of the pin the spring withdraws it, so that its unrecessed portion fits both the concave recess in the socket and that in the bit, and the bit is firmly secured.

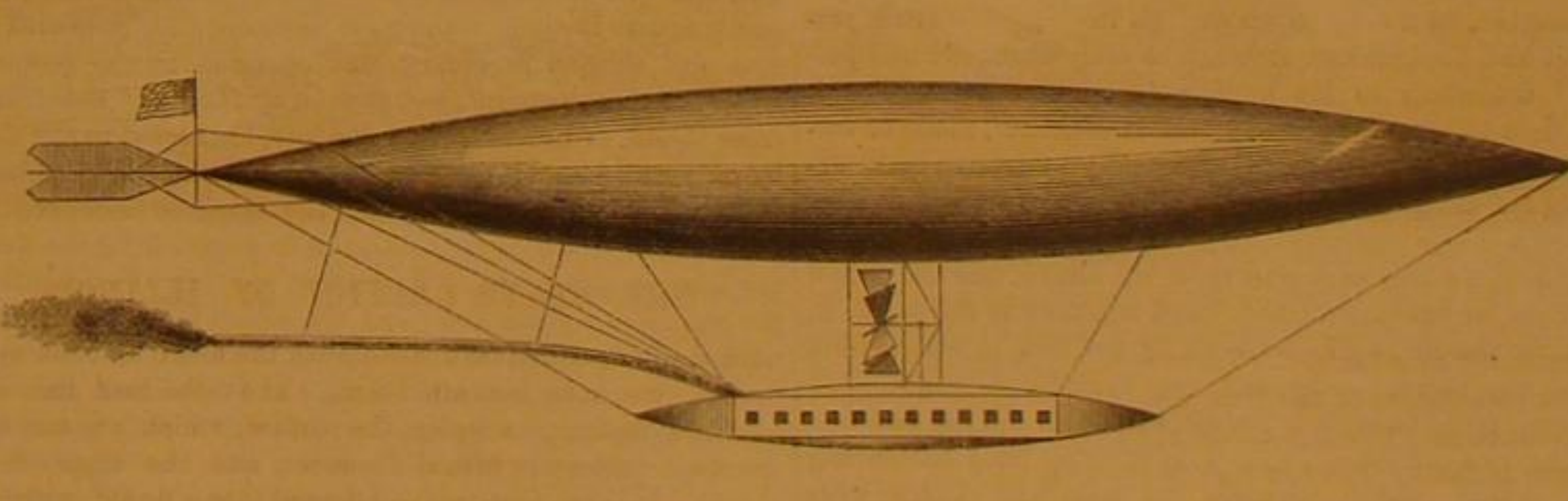
A shoulder in the pin next the spring prevents it from being pressed in too far.

Patented through the Scientific American Patent Agency, September 21, 1869, by Jacob Winkelhouse, who may be addressed, care of Dr. Hudson, 696 Broadway, New York city, for further information.

AERIAL NAVIGATION.

NUMBER TWO.

The grand obstacle in the way of operating artificial wings, for the purpose of flying, by steam power, has been the unavoidable weight of the steam boiler. To obviate this, engines have been invented to work without boilers, being furnished with small generators which are heated to redness, and having small quantities of water injected into them, for the purpose of producing steam instantaneously, at a high pressure. This plan appeared feasible to most scientific men until the experiment was made and the theory tested, when it was discovered that red hot iron would not immediately convert water into steam. Engines were also projected—being suggested by the steam engine—to be operated by the gases produced, or liberated, by the combustion of gunpowder, or its constituent materials; and there is yet room for further experiment on this subject; but the heating of the machinery, and the adherence of the residuum to the cylinders employed, have thus far defeated these efforts.



RUFUS PORTER'S AEROPORT

Various plans have been projected for propelling and guiding the common spherical balloon. In 1845 an Italian gentleman, under the euphonious cognomen of Tuzzio Muzzi, gave a lecture with an illustrative exhibition, in one of the most popular halls in this city; and, being a foreigner, he raised curiosity and expectation so high as to fill the house with a fashionable audience desirous to learn the art of aerial navigation. His lecture was brief, because he had not much to say, and not much occasion for saying it. After descanting on the prevalent desire for aerial locomotion, he brought out a miniature balloon, three or four feet in diameter, and furnished with a pair of horizontal, inclinable planes, so often employed before by other inventors, for the purpose of producing a forward movement, by their alternate inclinations, according as the balloon is made to ascend or descend by the ordinary means. But the idea was new to a New York audience, and all appeared satisfied that a balloon might be propelled at least half a mile per hour, in a still atmosphere.

Some time after a Mr. Taggart, of Massachusetts, gave out word that on a certain day he would sail from Lowell to Andover, and return to Lowell; a distance of ten miles. At the time appointed, he did succeed in reaching Wilmington, a few miles to the right of Andover, but could not return. This aerial machine, having an out-rig in front of the car, which was furnished with a propelling device, to be operated by a man within the car, and having a long rudder in the opposite direction, might evidently have been propelled moderately, in any direction, in a perfectly calm atmosphere; but could not stem the least breeze of wind, and, of course, could not be made available for navigation.

But in nearly all the experiments on this subject, the projectors have overlooked the immense atmospheric resistance which a balloon must encounter, if propelled with any considerable velocity through a calm atmosphere. Take, for instance, a balloon capable of lifting 1,000 lbs., including its own weight; the diameter of the balloon, even if filled with pure hydrogen gas, must be 31 feet, and its area 750 square feet, which is equal to a plane surface of 600 square feet, placed at right angles with the direction of the motion. To propel this surface with a velocity of twenty miles an hour, would require a continuous force of 1,200 lbs.;—equal to 650-horse power.

Several persons during the present century, have been shrewd enough to discover that an oblate spheroid, or a parabolic spindle, would encounter less atmospheric resistance, in passing through the air, than a ball or globe.

Among those who projected plans for the employment of parabolic spindle balloons, was a Mr. Pennington, of Baltimore, who proposed to suspend a cubical box, at some distance below the center of the balloon, or aerial float, to serve as a cabin, and contain a steam engine; the power of which was to be applied to some device for propelling it. But our diagram of the machine having been mis-laid, we cannot give a full description; nor is it essential at present, since the plan has been abandoned without a trial of its merits.

Prior to this Mr. Ira Smith, of Massachusetts, invented an aerial or flying apparatus in which a parabolic spindle was to have been employed; but as he did not put it in operation, or publish any description of it, we cannot describe his mechanism, nor his intended mode of management. In 1853, Mr. Edward D. Tippet applied to Congress for an appropriation to bring into practical use, what he styled his "Magnificent Aerostatic Machine," which he declined to explain; and the mode of propulsion of which, he "profoundly keeps to himself," as it is "the only plan which will ever answer the purpose." But not having at command sufficient funds to build his machine himself, he, of course, could not afford to buy or procure a sufficient amount of lobby influence, to work up the case in Congress to any favorable result.

It is not our purpose to advocate any man's theory any further than it has been supported by practical demonstration. But the practicability of ascending into the atmosphere, sailing among the clouds, and moving in different directions by means of different currents at different altitudes, has been established by Professors Wise, Pauline, Low, and others. But all this is far from being satisfactory. Men want to travel through the air, not only in any required direction, but with any required velocity, or, at least, with a speed exceeding that of ordinary gales of wind, and independently of atmospheric currents. Can this be done? The few who admit the possibility are forced to confess that they cannot see *how* it can be done. And among the most skeptical on this subject, are those who have the most experience in balloon traveling. Still there are some who not only persist in their confidence, but offer arguments and demonstrations, not easily refuted; and one at least, who challenges the world to meet him in public discussion on that subject; he taking the affirmative. That man is Mr. Rufus Porter, of this city, who has probably devoted as much time and expense to study and experiment on this subject as any other man in this country. Mr. Porter claims to have invented the main features of his aerial ship, or (as he terms it) aeroport, as early as 1820, but constructed his first model at Bristol, Conn., in 1833. In 1847 he procured the construction of an operating model, which was publicly exhibited in this city; and while that was being exhibited by his friends here, he constructed a larger and improved model, and exhibited the same at Temple Hall, in Boston. These models were propelled through the air by propelling wheels operated by springs; but the inventor proceeded to Washington, and there constructed and exhibited a model twenty-two feet long, by four feet in diameter, and propelled by a regular steam engine, operating a pair of propelling wheels, and guided by a four-leaved rudder. This model consisted of a the form known as the revoloidal spindle, made of fine oiled silk, supported internally by twelve rods three eigthths of an inch in diameter and extending from point to point. Three feet below the float was suspended a saloon, seven feet long and ten inches in diameter, of the same form as the float only that its cross section was square instead of being round. This saloon was furnished with a row of open windows on each side, and the representation of many happy looking passengers looking out at, or sitting opposite the windows. When adjusted above the stage of Carusi's large hall—furnished with flags, and gaily painted—and standing still without contact with anything, there was considerable sensation, and many rose to their feet; but in a moment the steam valve was opened and the miniature aeroport started forward, and with rapid speed sailed round the circumference of the hall and returned promptly to the position whence it started.

As it is a matter of some importance to the public that

these facts should be established as precedents, we copy the following notices of these exhibitions, from papers published at that time.

"The Aerial Steamer Model was again tried at the Merchant's Exchange yesterday afternoon, and with brilliant success. It described the circle of the rotunda eleven times in succession, following its rudder like a thing instinct with life. With its description of each circle, burst after burst of applause arose from the excited throng, and followed it throughout its journey. At the close of the performance, three loud cheers were given for the steamer, and the auditors quitted the rotunda with every manifestation of pleasure and delight."—*New York True Sun.*

"The Model Aerial Steamer was exhibited again in the Merchant's Exchange yesterday, and satisfied some of its greatest opponents that it could navigate the air."—*New York Sun.*

"Mr. Porter's flying machine did all that it promised on Wednesday evening. It rose above the audience, and went round the hall, exactly as he said it would, and the spectators gave three cheers for the successful experiment."—*Boston Bee.*

"The flying machine did fly last evening, though rather low. At the second and third attempts, the apparatus went round the hall, just over the heads ot the auditory, very satisfactorily, and elicited three hearty cheers from the spectators. Mr. Porter may be considered as having fairly demonstrated the theory of aerial navigation; but it is only in the open air that the practicability of the theory can be demonstrated."—*Boston Mail.*

"Aerial Navigation.—Mr. Porter has made several successful exhibitions of his model aeroport, or flying ship, at Carusi's saloon, on which occasion the assembled spectators manifested much excitement, admiration, and gratification, as the steamer with its gay saloon and flying colors, sailed about the hall, floating in air, and with the semblance of several passengers looking out at the windows of the floating saloon. On Friday afternoon the pupils of several schools assembled, and witnessed with manifest pleasure, the phenomenon of a steam vessel sailing through the air, propelled by an operating steam engine."—*National Intelligencer.*

"The Flying Ship.—The performance at Carusi's saloon last evening, was highly satisfactory, and elicited frequent applause from the excited audience. A mode of traveling rapidly and safely through the air, in any required direction, has been desired by man in all ages of the world. But never prior to the introduction of Mr. Porter's model aeroport, has anything appeared upon which creeping humanity could base a rational anticipation of the long desired art; and even with the reality of a bona fide aerial steamer, men are inclined to imagine that what they see is but an optical illusion, or some peculiar affection of the imagination. But there is the tangible fact before them—a real, mechanically-constructed steam ship, with its wheels, engine, and cargo, floating in air, and occasionally shooting forward in directions or circles, according to the dictates of its engine and helm."—*Washington Evening Star.*

After having tested the main principles of his invention on a small scale, Mr. Porter made arrangements, procured materials, and commenced the construction of an aeroport at Washington, on a scale large enough to do good service, provided it had been carried through to completion, and had performed according to his anticipation. He constructed an aerial float 160 feet long, by 16 feet in diameter, made of varnished linen cloth, supported internally by twelve rods extending the entire length. Suspended about sixteen feet below was a saloon sixty feet long and eight feet in diameter, tapering on a curve each way from the center, and furnished with seats for passengers, and glass windows in the sides. In the center was an engine room, six by five feet, in which were a four-horse power boiler, and two cylinder engines. The float was furnished with a rudder with four leaves, two vertical, and two horizontal, with four steering lines descending to the saloon cabin. Between the float and saloon, were mounted a pair of six-fan propelling wheels, ten feet in diameter, connected to the engines by endless-chain belts. The buoyant power of the aeroport over all the weight of float, saloon, engine, etc., would have been 700 lbs. All parts of the apparatus were finished, ready for operation, and the inflating boxes arranged, with a full supply of acid and zinc for inflation, when it was discovered that the varnish, which had been used for preparing the float, had so weakened the linen that it would support but little more than its own weight; and while the workmen were engaged in repairing and strengthening it—the float having been partly inflated with air for that purpose—a sudden and severe storm, with a violent gale, rent the float so extensively, that, winter coming on at the same time, the work had to be abandoned. Mr. Porter has since discovered a varnish that will not injure the fiber of linen, and intends to construct an aeroport to carry sixty passengers as soon as he can command the requisite funds for that purpose.

The fact has now been satisfactorily established, that hydrogen gas may be so confined in a bag, balloon, or other light casing, as to lift ponderous substances from the earth, and hold them suspended in atmospheric air; that a long revoloidal spindle may be propelled through the air with less application of force, than a globe of equal buoyant capacity; that an inflated revoloidal spindle may be propelled rapidly through the air by the rapid rotation of oblique fans, or blades of fan wheels; that men and light steam engines may be supported in air by the buoyant power of hydrogen, and that a revoloidal-spindle float may be steered by a rudder, while moving through the air by the application of the force of springs, or of steam power. Yet another fact remains unremoved, namely, that successful aerial navigation, for common traveling, and business purposes, has not yet been established; and that a large portion of intelligent scientific and business men are still skeptical on the subject of its practicability. It is interesting to observe the various arguments presented against it by men of reputed intelligence. The *Philadelphia Bulletin*, in noticing Mr. Porter's exhibitions, remarked as follows:

"Though every man of sense is, or ought to be, aware of the impossibility of steering a balloon, or any other aerial machine, yet it seems there has been found, in New York, a fellow who was knave or fool enough to advertise, for exhibition, a Flying Machine, at the Tabernacle; and that there were found Dogberrys sufficient to fill that huge building. We have heard of nothing more ridiculous since a theater was once filled, on the other side of the Atlantic, to see a man get into a pewter pot. It would seem as if the gullibility of human nature kept even pace with the wit of knaves, and that nothing could be proposed for an exhibition, too preposterous to find believers. In this very case, the thing proposed was an impossibility. A ship is steered in the water because the action of the wind on the sails, and of the hull in the water, can be brought to counteract with each other by means of the rudder. Now, a flying machine is but in one element, and hence can never be steered. Yet, as in the analogous instance of perpetual motion, there will be found dolts to believe in it, we suppose, to the end of time. Alas, poor humanity."

A well-known gentleman in Washington, who is regarded as a very scientific man, contends that a long revoloidal spindle would encounter more frictional resistance in passing through the air, than the amount of atmospheric resistance, obviated by its revoloidal form; as compared with that of a globe. Another gentleman volunteered to aver, in the presence of a large audience, in this city, that when a long revoloidal float should be running at right angles with the direction of a fresh breeze of wind, the force of the wind against its side would be so great, that even heavy iron plates would not be strong enough to resist it. A very popular balloonist of this city declared, publicly, that no other form of balloon than the spherical could be made to float in air. And there are many who can not see the possibility of any effectual action of the propelling wheels upon the air, when the wind is ahead, and, consequently, passing rapidly away from the fans of the wheels; and that experienced aeronaut, Professor Wise, is apprehensive of difficulties in encountering vertical, and, sometimes, whirling currents in the air. Whether Mr. Porter has discovered reliable means of obviating all the apprehended difficulties, readers may judge, after an examination of his theory, which has been published in pamphlet form, and from which we shall extract such portions as appear to be the most illustrative of the main subject.

On the practicability of aerial navigation, Mr. Porter thus argues and describes his plan of construction:

"One hundred years of research and experiment, since Montgolfier commenced making his miniature paper balloons, has sufficiently established the fact, that the only possible way by which any useful and controllable mode of navigating the atmosphere, can be established, is by the use of aerial floats of the form of the revoloidal spindle, inflated with hydrogen gas, and with saloons suspended below, of similar form, only being square in their transverse sections, and propelled by means of oblique revolving fans, operated by the power of steam, or its equivalent, and steered by means of four-leaved, cross-plated, or hollow-square rudders, connected to the floats by universal joints; the said float being made susceptible of enlargement or contraction, and the machine (aeroport) furnished with facilities for enlarging or diminishing the size of the float, or either end of it, without varying the quantity of the gas therein contained; and the saloon must be furnished with ready facilities for ascertaining the altitude, velocity, or course, even in time of mist or fog; and furnished, also, with a self-regulating gas replenisher, that will supply gas to keep the float uniformly full, without any attention from the engineer. It must, also, be furnished with means for producing power to propel the aeroport with sufficient speed to stem any gale of wind, or to keep a regular course when running at right angles with the direction of a gale.

"In order to iilustrate the feasibility of accomplishing all these points, it will be needful to give a description, in detail, of the proper construction, furniture, and management of a regular, medium-sized aeroport, for actual service."

The details will be given in our next issue.

Nicholas W. Darrell, and the First American Locomotive.

Few among the thousands, says the *Rural Carolinian*, who are constantly passing up and down the South Carolina Railroad are aware what an ancient institution our pet road is, and most of our readers will be somewhat astonished, we have no doubt, on being told that the gentleman, a sketch of whose life, is herewith presented, ran on this road the first locomotive built in America, and that its first trip was made nearly forty years ago. What imagination could then have conceived anything like our present system of railways, covering a continent with a network of iron, and stretching out its many-jointed arms from the Atlantic to the Pacific? Here, right in our midst, was the small beginning, and here is the man who helped to give the initial impulse to the wheels of progress; living among us, beloved and respected by his friends and acquaintances, but unknown to the public. He shall be no longer unknown.

The following facts concerning him were kindly furnished by Mr. James M. Eason, himself an engineer, and a builder of engines, and familiar with the history of the S. C. R. R., from the beginning:

N. W. Darrell, the subject of this sketch, was born on the 12th day of November, 1807. At an early age he became an apprentice to the late Thomas Dotterer, to learn the "engineer's trade."

In the year 1830, the first American locomotive arrived in Charleston, and was named the "Best Friend." It was made at the West Point Foundery, New York, under contract with Mr. E. L. Miller, for the South Carolina Canal and Railroad Company (now represented by the S. C. R. R. Company).

Mr. Darrell, with others, was set to work putting the locomotive together, and he was the man who first opened the throttle valve of an American built locomotive. He was appointed to the responsible position of engineer of the "Best Friend," and in that position he continued until the arrival of the second locomotive, when he took charge of that.

For many years Mr. Darrell continued to run on the road; when, for his fidelity and experience, he was finally promoted to the charge of the machinery of the road as master machinist. He continued fulfilling the duties of this position until the close of the war, and still continues in the Company's employ. Mr. Darrell was noted for his devotedness to the interest of the road, and no day was a holiday for him, always anxious and feeling a large responsibility for the success of the road.

As engineer of the "Best Friend," he was undoubtedly the first locomotive engineer in America, and is a noted man in connection with the introduction of the era of railroads and locomotives into the United States, upon which so much of our prosperity, as a nation, depends.

Correspondence.

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

Early Manufacture of Sulphuric Acid.

Messrs. Editors:—In the Scientific American, of October 16th, on page 246, I find an article treating on the subject of sulphuric acid, showing its great utility and the manner of its production.

I here take the liberty to place before your readers, some facts relative to the first manufacture of sulphuric acid, or oil of vitriol, in America, and give (as well as my memory serves me) a correct description of the apparatus used, the mode of its manufacture, by whom manufactured, and where made.

Previously to the year 1810, but little of the article was used in this country; and that little was imported from other countries, and until that time, its manufacture was unknown in America as an article of commerce. In the year 1810, Mr. H. Baldwin, a native of the town of Woodbridge, in the county of New Haven, Connecticut, a graduate of Yale College (assisted financially by Mr. Lott Newell, a fellow graduate), who conceived the idea of erecting a laboratory for the purpose of making experiments in chemistry, and for the further purpose of manufacturing sulphuric acid, or oil of vitriol, for the market. He procured for that purpose a building which belonged to my father, situated on the post road leading from New Haven to Humphreysville, it being seven miles from New Haven, and three from Humphreysville. In this building he established his laboratory which was arranged in two rooms, each 9 by 18 feet, one of which was elevated about six feet above the other and lined with heavy sheet lead, and having a door about three feet square in each end, which closed perfectly air tight. In the middle of this room upon a large stone was a kettle that would hold from fifteen to twenty gallons. The kettle was filled with brimstone and a small quantity of saltpeter, which he had previously ground together in an old fashioned wooden ring and wheel mill made for grinding apples for cider. The floor of this room was covered about four inches deep with water. The brimstone in the kettle was set on fire by means of a stone or bit of iron which was heated sufficiently hot to ignite it when thrown into it. The doors were then closed and remained shut twenty-four hours, at which time they were opened, the kettle refilled, and again set on fire. This operation was repeated for six days in succession, during which time the water had become as sour as ordinary vinegar by the nitrous substance deposited from the smoke. This water was then drawn off and boiled down in glass retorts (buried in a sand bath), until its weight indicated it to be of sufficient strength.

The furnace was in the other room situated on the ground and was constructed with two parallel walls of brick about two and one half feet high, and about eight feet in length, with a grate and ash pit at one end, and a chimney rising from the other end. The top was a corrugated sheet of metal on which was sand of sufficient depth to cover the retorts, which contained the water. Each retort contained about two gallons, and the number used at one time did not exceed twelve. In several instances his retorts were burnt and he came near losing his life from the fumes produced by the boiling vitriol. With this apparatus he continued his experiments, and subsequently manufactured it for two years, retailing a large portion of his product to the country cloth dressers, at 83 cents per lb.; the residue was sent to market in New Haven and New York, where it attracted the attention of a business firm, one of whom (a Mr. Morrison) came to Woodbridge and arranged with Mr. Baldwin to remove his laboratory to New York, and there, with the aid of proffered capital, to erect a chemical factory on a larger scale. Accordingly his leaden room was stripped of its lining, the sheet of lead being rolled in large rolls, which, with such other portion of his equipage as was movable, were taken by ox teams to Derby, and from thence to New York, where it was again put up for use. The location was in the north-western suburbs of the city, near the banks of the Hudson river. I think the place was called Greenwich at that time. Mr. Baldwin continued to superintend the manufacture of this establishment for several years, until his health became so impaired that he

was obliged to retire, when he returned to the home of his childhood where he remained until his death.

In the above, I have given a brief description of the origin of the chemical factory in New York, and the mode by which the oil of vitriol was first manufactured in this country.

Skaneateles, N. Y. JOEL G NORTHRUP.

The Discovery of Oersted Contested.

MESSRS. EDITORS:—In one of the latest numbers of an industrial journal of this city, appears the following passage: "The real discoverer of the fundamental principle which lies at the base of all the present different systems of telegraphs in use, was Oersted, of Copenhagen. For more than a century a relation had been known to exist between electricity and magnetism, but the nature of this relation remained a profound secret until, in 1819, Oersted discovered what has been called, after him, the law of Oersted, namely, that the magnetic polarity lies at right angles around the electric current, and *vice versa*; the direct result is that any compass needle will place itself across the electric current, and the experiment illustrating this is called the experiment of Oersted. If ever a discovery was important in its far-reaching results it was this, and in the whole field of human progress there is scarcely another instance in which one single and simple principle bore such rich fruits, not only in regard to useful, practical application, but also in divulging to us some of the hidden mysteries of forces which appear to lie at the foundation of our very existence as living beings." I should have refrained from quoting these sentences, if they did not truly express the belief of the authors of our text-books on physics and kindred sciences. But, this being the case, I cannot but call attention to the fact that the Russian *savant*, M. Hamel (*vide* the *Bulletin de l'Academie de St. Petersburg*, vol. ii. p. 116), nine years ago, proved that the discovery so unanimously ascribed to Oersted, had been made seventeen years earlier—in May, 1802—by the Italian physicist Romagnosi; it having first been published in the *Gazette* of Trent.

Undoubtedly, political, hole-and-corner journals are not the proper depositories for scientific discoveries, and it would rather be surprising if Oersted had searched for anything of this kind in such papers. However, an account of the experiments of Romagnosi was also inserted in *Izarn's Manuel du Galvanismè*, and in *Aldini's Essai théorique experimental sur le Galvanisme*, both of which were published in Paris in 1804. The discovery of Romagnosi must therefore have been known in scientific circles; besides, Oersted was in Paris in 1802, 1803, and 1813. He even maintained a lively correspondence with the author of the last-named work. It can hardly be possible, therefore, that the Danish *savant* was not acquainted with the facts in question. Of these the first-mentioned treatise states that "Romagnosi, a physicist of Trent, has discovered that the magnetic needle is deflected by the galvanic current." And in the latter, "according to the observations of Romagnosi, a physicist of Trent, the magnetic needle suffers a deflectien when exposed to the electric current."

This, neither more nor less, constitutes Oersted's often-praised discovery.

With all due respect to this investigator, one cannot but confess that, in relating his own experiments, it would have conferred more praise upon him if he had also mentioned the labors of others. And it is characteristic that the discovery of the Italian scientist is still not recognized, although Cantu, in a pamphlet published in Milan, in 1835, again called attention to it. We learn from this that the exact sciences have also their dogmas to which they adhere, no matter whether they have been disproved or not; and, further, we learn that it is not sufficient to *make* discoveries, but that one must also understand how to present them to the world.

New York city. ADOLPH OTT.

[We publish in another column an account of the discovery above alluded to, and which has been generally attributed to Oersted.—EDS.

ON THE NATURE OF THE AURORA BOREALIS.

BY PROF. VANDER WEYDE.

The observation of Mr. D. K. Winder, of Toronto, communicated on page 230, current volume, SCIENTIFIC AMERICAN concerning the spectrum lines of the aurora borealis, correspond almost perfectly with those made by J. A. Angström communicated to the *London and Edinburgh Philosophical Magazine* for September, 1869. The first found a distinct bright line in the yellow, and one faint in the green; the last found "a single bright line to the left of the lines belonging to the calcium group," wave length 556·7; and "traces of three faint bands nearly as far as F." As the wave length of the sodium line D, in the yellow, is 588·8, the line of M. Angström is near to it; and as the line F is in the limit of green and blue, his three faint lines appear to correspond also with the faint line of Mr. Winder in the green.

These observations are meritorious and their publication valuable; however, the conclusions these two gentlemen draw from them are open to criticism. The first named comes to the conclusion that polar light is incandescent oxygen gas; this I most emphatically deny, as the spectrum lines of oxygen are entirely different. Its brightest line is not in the yellow near D, but in the red; and after Mr. Winder's own statement," the dim line in the green," he could "not identify as belonging to any known substance." How then he can conclude that it is oxygen gas, I must confess not to comprehend. The lines of oxygen are nine in number, the brightest has a wave length of 615, the next 532, then 513, and 436 millionth of a millimeter; of the remaining five faint lines none corresponds exactly with the lines observed in the aurora, which exact correspondence is an absolute requisite to draw conclusions. Besides this, the hypothesis of the existence of such gas in excess, by decomposition of water, is rather far-fetched, principally when we consider that the auroral display sometimes reaches a hight of some 400 miles—far above our clouds or atmosphere—most likely never reached by watery vapor.

At the close of the article Mr. Winder attributes the fact that the solar spectrum lines are black to "absorption by passing through a deep luminous stratum of the earth's atmosphere." This is utterly erroneous; the common well-known explanation why these luminous lines are dark in the solar spectrum being that the solar atmosphere, consisting as it does of the vapors of sodium, lime, iron, etc., also incandescent in the body of the sun, act by interference, as the absorbing medium. The effect of our terrestrial atmosphere on the solar spectrum, and on that of the stars and nebulæ, is of an entirely different nature.

M. Angström comes to the conclusion that the northern light is not an electric luminosity, such as is produced in the electric egg or rarefied air, "because the lines he observed in the aurora do not agree with those produced by our experiments with electricity in rarefied air. Very interesting is his statement that he observed these same lines for a whole week in the zodiacal light, and I must confess that I felt at first disappointed that the whole of our electric theory concerning the aurora borealis, and our beautiful lecture-room experiments imitating it in large tubes and egg-shaped glass vessels, partially exhausted from air, were set all at naught by this single observation with the spectroscope.

Very soon, however, it became evident to me that this conclusion arrived at by Angström was false, remembering that Masson maintains that the lines of the luminous spectrum, as seen in the spectroscope, depend only partially on the chemical nature of the molecules of the medium which radiates the light and partially on the primitive source originating it. Foucault and Kirchhoff proved, indeed, that the double line seen in luminous sodium vapor, for instance, was not changed in position if the vapor was illuminated by solar, electric, or any other kind of light.

It is thus evident that the position of the lines observed in the aurora, zodiacal, or any other luminous phenomenon, prove nothing in regard to its electric or non-electric origin, but are a criterion for the chemical nature of the illuminated transparent matter, the super-atmospheric medium. They are also a criterion proving that the polar light is not derived from the sun, because in all substances illuminated from this latter source, traces of the lines of the solar spectrum are always visible; this is the case with the reflected light of moon, planets, clouds, etc. The spectrum of the polar light, on the contrary, shows no trace of the lines belonging to the solar spectrum.

Paper from the Reed Cane.

We learn from a Norfolk, Va., journal, that a company has been formed near that city for the manufacture of pasteboard, etc., from the fiber of the reed cane.

The process by which the fiber is disintegrated, though not new is interesting, and may not be known to many of our readers:

"The cane, just as it comes from the cane brakes, is put into a cylinder, about 25 feet long and 12 or 15 inches in diameter—steam at 200 pounds pressure is let into the gun from a boiler close by. After a few minutes the valve at the mouth of the gun is opened by a trigger arrangement, and the steam blows the contents of the gun into the open air. The cane is thereby thoroughly disintegrated; and the effect of the great heat of the steam at 200 pounds pressure is such that the resin and gums in the fiber are soluble in water without the use of chemicals, and the fiber can be beaten up in a paper-maker's rag engine and run off into coarse paper suitable for paper for board without any further treatment. A large part of the intercellular tissue is washed out by the process, so that the cellulose will fall on the machine.

"A bundle of cane four feet by eight feet by the length of the cane (averaging ten feet) yields a tun of steam blown fiber; the weight of that bundle of cane before it is blown from the steam cylinders, is about two tuns, about one half of the weight being water. The fiber on being blown from the cylinders, or guns, becomes quite dry in a minute or two, and is ready for baling. It is somewhat like oakum in appearance.

"The resinous and gummy matter, acid and coloring matter, to the extent of thirty-three per cent of the weight of the steam blown cane fiber, can be washed out by immersing it in water and then squeezing out the liquid.

"A battery of ten guns of the ordinary size (12 inches diameter) will yield fifty tuns of fiber per day.

"It has been found at Wilmington that the cost of a quantity of cane sufficient to make a tun of fiber, as disintegrated by the explosive force of steam (Lyman's process) is under four dollars a tun, including all expenses and the delivery of the cane at the works. This will be about the expense at Norfolk and Mobile, or at Memphis, Baton Rouge, etc., varying, however, somewhat in each locality.

"The expense of reducing the cane to fiber, by a puff of steam is very slight. If coal be used it will take one tun of coal for five tuns of the fiber; but in most cases sufficient refuse timber for fuel can be got from the cane region, and being transported to the works by the same means which are used for the transportation of the cane, the cost of wood for fuel is less than that of coal.

"Notwithstanding the great utility of the cane, the cane lands can never become of much value, because they are so vast and inexhaustible. Indeed, except on a few choice spots they will remain of no salable value, even when thousands of tuns of the steam blown fiber shall be used daily in the United States for paper and building materials and other purposes, and other thousands of tuns shall be exported daily to Europe.

"When it is understood that it costs five cents per pound to reduce wood to paper pulp by the ordinary chemical processes now in use, and four cents per pound by Voelter's mechanical process, now used extensively in France and in some parts of the United States, the vast importance of the process of disintegration by steam will be at once recognized. It costs less than one fifth of one cent per pound to reduce the cane to fiber by that process, ready for the paper-maker's beating machine. Moreover, the cane is much cheaper than wood.

"For common, coarse articles, such as paper box-board and pasteboard, plain and bituminized, for building purposes, it is impossible to get anything so cheap as the steam-blown cane fiber, and consequently very large quantities of those articles will be worked up by the water power near Norfolk, especially at Richmond and Fredericksburg. Moreover, large quantities the cane fiber will be exported to the Eastern States, and to England and France."

New Mode of Fettling or Lining Puddling Furnaces.

An invention patented in England consists in lining puddling furnaces with crude or prepared oxide of manganese or manganese ore either as the chief ingredient of the fettling or as an addition to the oxide of iron or other material which is employed. In using crude or native oxide of manganese, or manganese ore without admixture with other solid, an ore is used, which, when pulverized and moistened, will form a plastic and pasty mass, and which when heated will harden and adhere firmly to the sides and bottom of the puddling furnace. For this purpose the cheap oxides containing a considerable proportion of iron are best suited, provided they do not also contain other impurities, such as sulphur and phosphorus, which would injure the iron in the furnace. When an ore or prepared oxide is used which does not harden sufficiently, after being rendered plastic by water alone, it is mixed with a sufficient quantity of finely powdered and moistened hematite, or other suitable material to give it the property of hardening and adhering when heated in the furnace.

The proportions in which oxide of manganese and oxide of iron should be mixed, in order to make the fettling according to this invention, vary with the nature of the cast or pig iron to be puddled. With pig iron of ordinary quality, about half a hundredweight of oxide of manganese mixed with the requisite quantity of oxide of iron for the fettling of the furnace is sufficient for a charge of four to five hundredweight of pig iron. When the pig iron itself is rich in manganese a less proportion is necessary in the fettling. When the pig iron contains a large quantity of silicon and little manganese, more oxide of manganese is required in the fettling than is required with pig iron containing much oxide of manganese and little silicon. Where practicable the inventor prefers to introduce the pig iron into the puddling furnace in a melted state; when this is done, and the fettling containing oxide of manganese is laid on the bottom and lower part of the sides of the furnace, the charge gets the full benefit of the evolution of oxygen, which takes place when the oxide of manganese is heated. By the use of oxide of manganese, as described, the puddling process is expedited, and the quality of the iron or steel produced is improved. The heated iron or steel during the puddling process decomposes the oxide of manganese, causing an evolution of oxygen, which, rising through the molten iron or steel, rapidly oxidizes the oxidizable materials contained in the metal. A portion of the reduced manganese enters into alloy with the iron or steel and effects the improvement in the quality of the metal which is well known to result from the use of manganese in the manufacture of iron or steel.

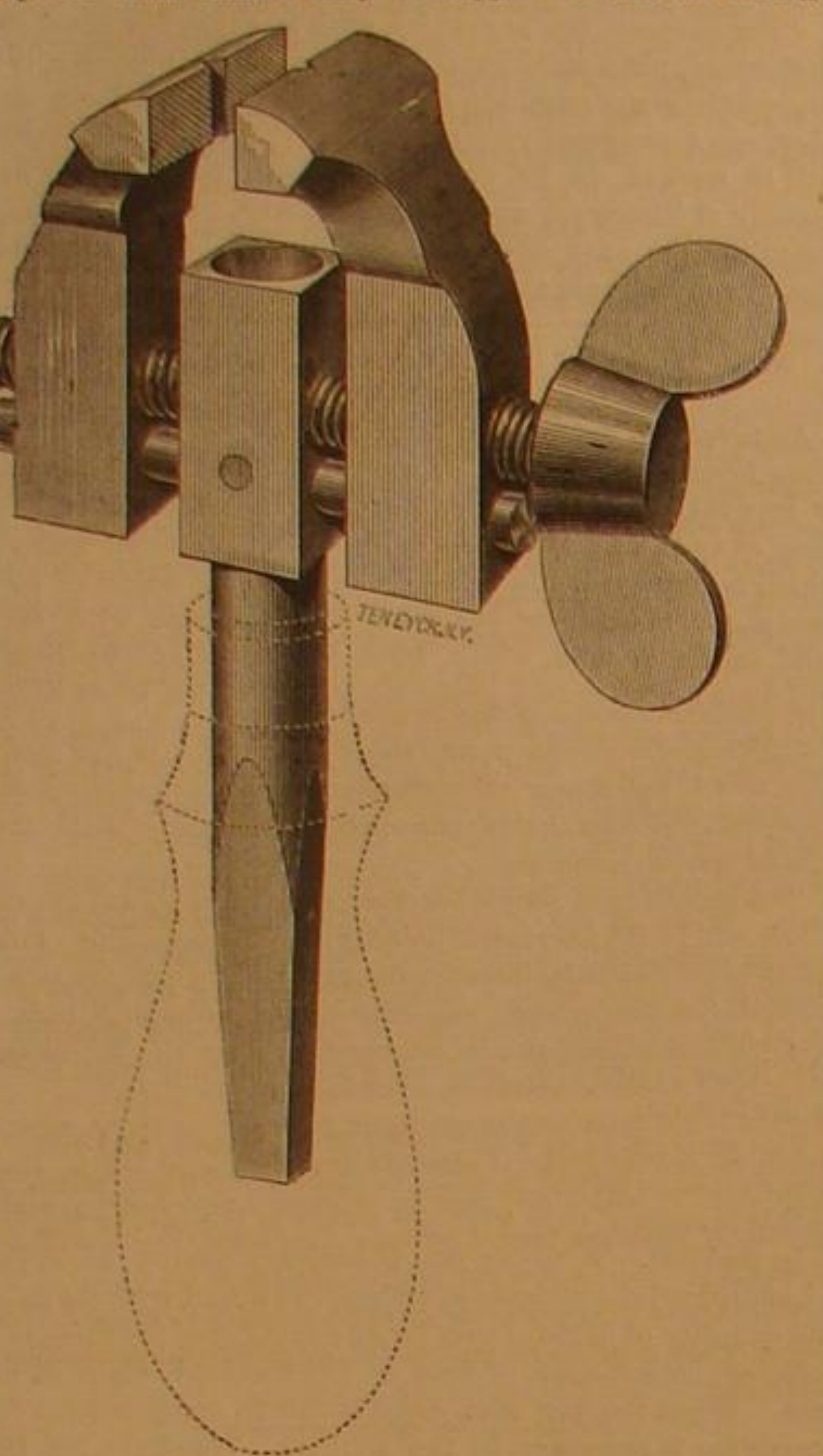
When oxide of manganese is mixed directly with the charge for fluxing, as has been proposed, a portion is liable to become mechanically distributed through the mass of iron or steel in the state of an infusible powder, consisting of manganese in a low state of oxidation, and injures the mechanical properties of the metal. But when oxide of manganese is used in the fettling of the puddling furnace according to this invention, it is gradually decomposed as the carbon and silicon of the pig iron or steel are presented to it by the stirring of the puddler, and the manganese enters the charge in a fused state either as reduced metal or as silicate.

Very little of the manganese which enters the iron or steel during the puddling process remains in the finished metal, most of the manganese separating during the finishing of the metal in the form of silicate of manganese, carrying with it other impurities, such as phosphorus and sulphur. The silicate of manganese separates from the metal more readily than silicate of iron, and is found in considerable quantity in the cinder and hammer slag. The cinder and hammer slag are, therefore, more valuable than ordinary cinder or hammer slag for the making of cinder iron, in consequence of their richness in manganese. Although the fluxing property of oxide of manganese, either alone or mixed with oxide of iron, renders the addition of any other material to the fettling unnecessary when pig iron or steel of the ordinary qualities are puddled, yet when pig iron or steel of such quality as renders the use of alkaline fluxes desirable is about to be puddled, common salt, or carbonate or nitrate of soda may be added to the oxide of manganese. A quantity of the soda salt, equal to about one fourth of the weight of the oxide of manganese, is generally sufficient.—*Mechanics' Magazine.*

MR. LOWE, the English Chancellor of the Exchequer, is an accomplished velocipedist, although he began practice at the age of fifty-eight.

STEVENS' PATENT HAND VISE.

The vise is a tool of such universal application that no mechanic can do without it. The improvement shown in our engraving is intended to serve better in general work than the old hand vise, and has some special adaptations impossible to the old one. Having parallel-faced jaws, it takes a good hold of the work and gripes it securely with but little strain on the thumbscrew. But the main feature of peculiarity is its shank, around which a dotted line in the engraving shows the form of a wooden handle very convenient in filing a roll, ing piece. This handle may be slipped off and the shank



inserted in a half-inch hole in the bench, when it becomes a neat permanent vise for light work. This shank is turned round, with parallel sides to fit lathe chucks, and is also tapered at the end to fit the bit stock. In the upper end of the shank is a deep countersink, and central with it is a vertical groove in the face of the jaws, by which arrangement twist drills, and all tools with regular shaped shanks, are held firmly and perfectly coincident with the axis of revolution as the jaws are moved by a right-and-left thread so that they move equally to and from the center.

So this tool has not only the many uses of a perfect hand vise, and light bench vise, but serves all the purposes of a drill chuck, at one third its cost. It supplies a great need long felt by mechanics and amateurs, by serving to hold, either in lathe or bit stock, all sizes and shapes of shanks, from three-quarter inch down to the smallest shanks employed.

We have often called the attention of those wishing to engage in manufacturing, to the large profit derived from the production and sale of light staple articles, the parts of which may be duplicated by machinery. From its many uses and perfect adaptation, we think the vise herein described and illustrated cannot fail to recommend itself.

Further information to any one wishing to purchase the entire right of the United States may be had by addressing the inventor, W. X. Stevens, of East Brookfield, Mass., to whom a patent was granted Sept. 28, 1869.

Making Foundations in Marshes.

A new process of making foundations for bridges in marshy soils has, according to the *Railway Times*, been recently used on a branch line of the Charentes Railway Company, in France. This line crosses a peat valley to the junction of two small rivers; the thickness of peat was so great that any attempt to reach the solid ground would have been very expensive. In order to obtain cheaply a good support for the bridge, two large masses of ballast, accurately rammed, were made on each bank of the river, and a third one on the peninsula between the two. The slopes of these heaps were pitched with dry stones, for preventing the sand from being washed away by the rain or by the floods in the rivers. Over the ballast a timber platform is laid; this platform carries the girders of the bridge, which has two spans of about 60 feet each. When some sinking down takes place, the girders are easily kept to the proper level by packing the ballast under the timber platform; this packing is made by the plate layers with their ordinary tools. This simple and cheap process has succeeded quite well.

The same difficulty was overcome by a different plan on an ordinary road near Algiers. This road crosses a peaty plain nearly one mile broad; the floods and elasticity of the ground prevented the formation of an embankment. The road was to be carried over a viaduct across the valley, but the foundations of this viaduct presented serious difficulties; the thickness of peat or of compressible ground being nearly 80 feet. It was quite possible to reach the solid ground with cast iron tubes sunk with compressed air, or with any other system, but neither the implements nor the suitable workmen were available in the colony, and it was a great expense to bring them, and especially the workmen, from France. The use of timber piling was of course out of the question, as timber is very expensive in Algiers, and quickly becomes rotten; but there was a set of boring implements with the men used to work it. The engineers began boring holes 10 in. in diameter down to the solid ground. These holes, lined with thin plate iron pipes, were afterward filled with concrete up to the level of the ground. Each of these concrete columns bear a cast iron column; these columns are properly braced together and support the girders of the viaduct, which is divided into spans of about 20 feet, and is 20 feet high over the ground. This system has succeeded very well, and is to be extended to another large valley.

MASSEY'S PATENT LOW WATER DETECTOR AND GAGE COCK COMBINED, AND HIGH AND LOW WATER DETECTOR.

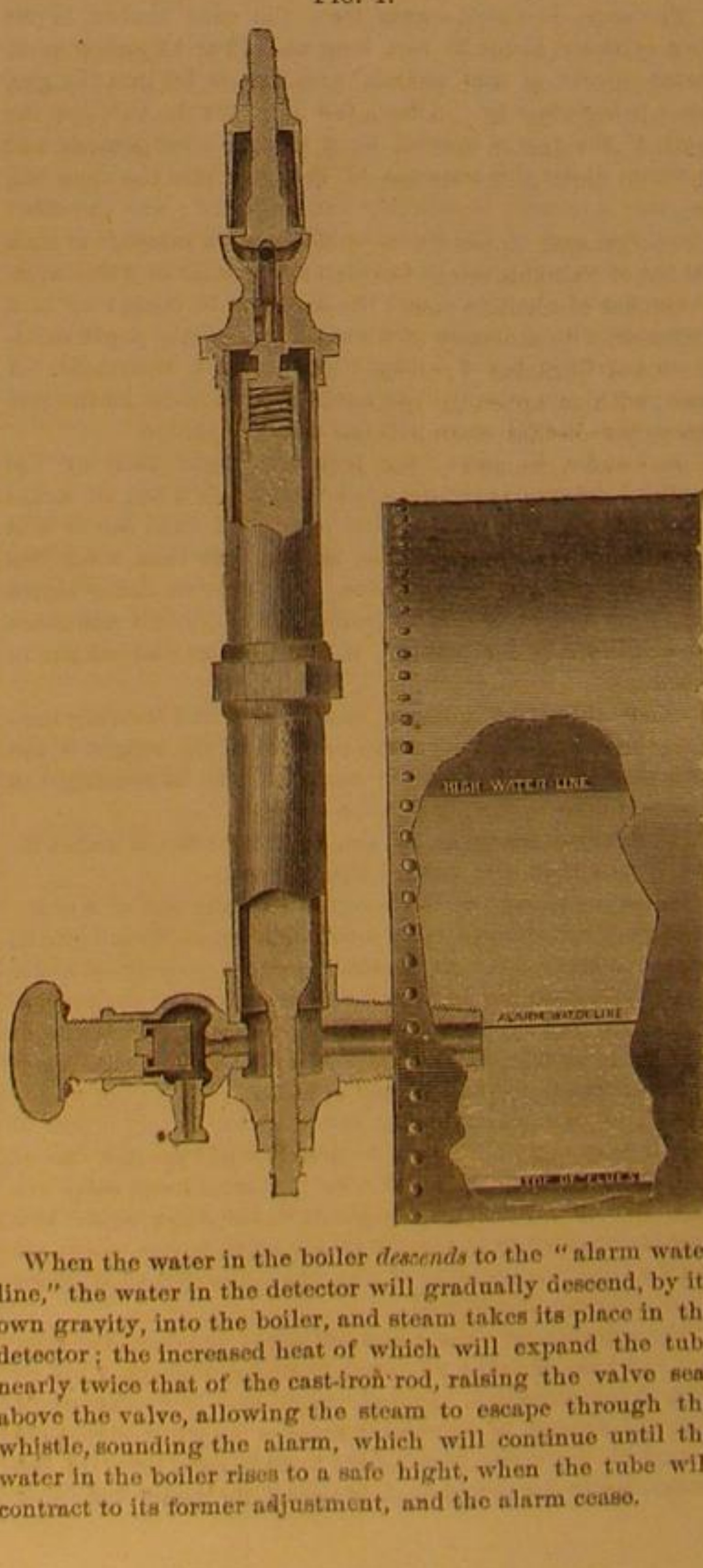
The attention of owners of steam boilers is yearly becoming more attracted to the utility of high and low water detectors, the latter more especially. We have latterly illustrated and described a number of safety devices of this class, and we this week present to our readers two other inventions of a like character, which have, although recently introduced, acquired considerable reputation as safe and efficient instruments.

Fig. 1 is an engraving of a low water detector, and gage cock combined. The instrument is made of seamless brass tubing, one and a fourth inches in diameter, and twenty inches in length; with suitable brass fittings, with gage cock at the lower end, arranged to screw in the boiler in place of the lower gage cock; and a brass fitting, with steam whistle at the top end. In the center of the tube is a cast iron rod, galvanized to prevent rusting, the upper end holding the whistle valve, and the lower end passing down through the lower casting, which is threaded and arranged for adjusting with a wrench, as may be fully understood by reference to the accompanying engraving. The spiral spring shown in the upper end of the iron rod, is to admit of further contraction of the tube as it cools below 212°—the point of adjustment.

The operation of this instrument is based upon the different amount of expansion in iron and brass at the same temperature, brass expanding nearly twice as much as iron. The difference in temperature of steam at atmospheric pressure, or fifteen pounds, and at one hundred pounds, is 126°. This indicator being carefully adjusted at 212°, or boiling water, must be still further expanded when subjected to an increased degree of heat; and repeated tests have fully proven that twenty pounds of steam is amply sufficient to insure the prompt sounding of the alarm whistle.

When the water in the boiler is at the "high water line," or above the "alarm water line," the communication with the detector is submerged, and consequently, the pressure of steam will force water in the detector, the temperature of which cannot exceed 212° Fahrenheit. At this temperature the detector is adjusted.

FIG. 1.



When the water in the boiler *descends* to the "alarm water line," the water in the detector will gradually descend, by its own gravity, into the boiler, and steam takes its place in the detector; the increased heat of which will expand the tube nearly twice that of the cast-iron rod, raising the valve seat above the valve, allowing the steam to escape through the whistle, sounding the alarm, which will continue until the water in the boiler rises to a safe hight, when the tube will contract to its former adjustment, and the alarm cease.

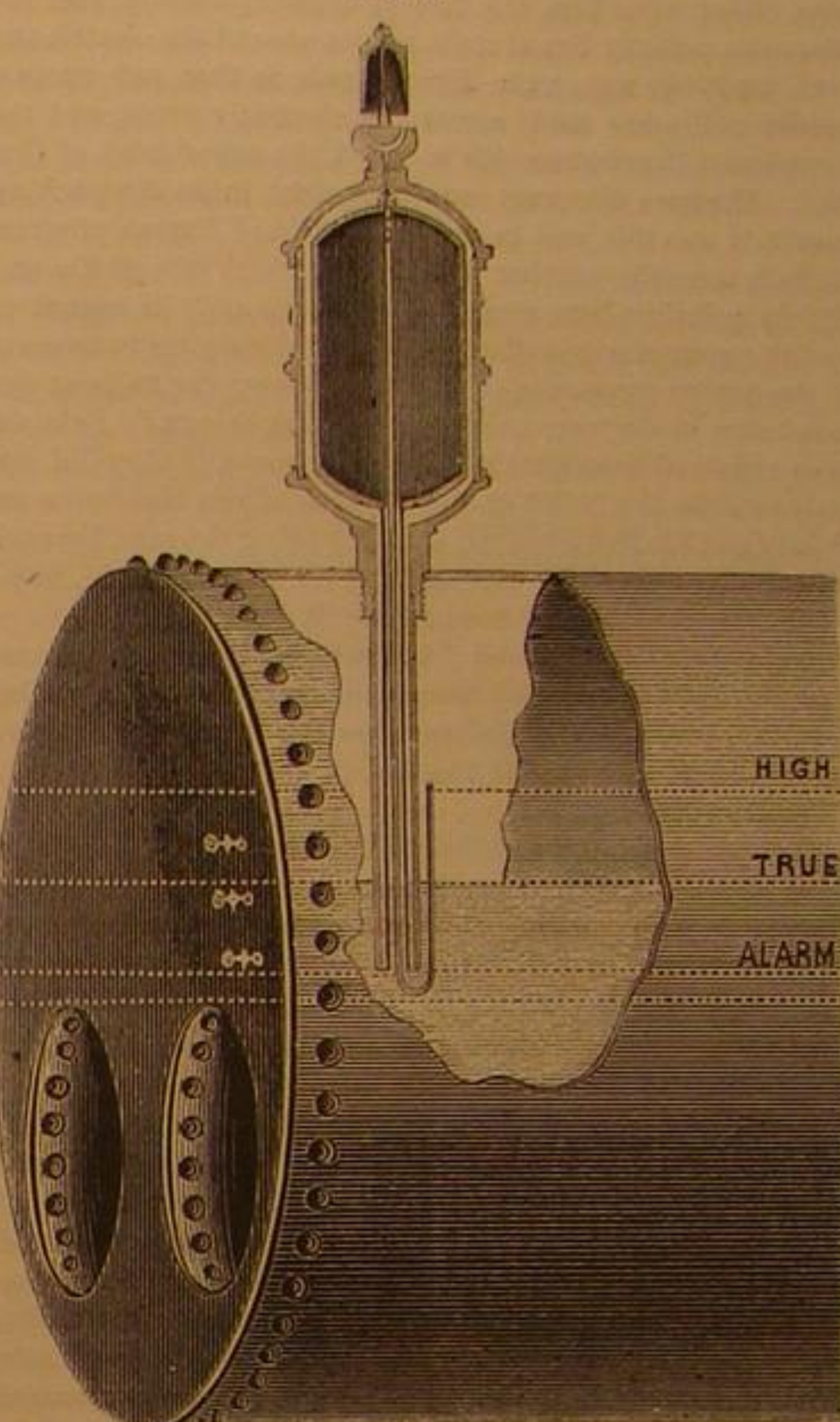
The extreme simplicity of this device and the sound principles upon which it is based, will be obvious to engineers without further description on our part.

A cap not shown in the engraving, screws into the lower part of the instrument, which secures it against being tampered with.

Fig. 2 is an illustration of a high and low water detector combined. It is made either of galvanized cast iron or brass, as the purchaser may desire; both being equally effective, but those of cast iron being of course cheaper.

In the construction of this detector a steam-tight chamber is made, about five inches in diameter by eight or ten inches in hight, with steam whistle at the top, and threaded at the lower end to screw in through a one and a half inch hole on the top of the boiler; to the lower end of this chamber is at-

FIG. 2.



tached a light one-inch brass pipe, extending down to the "alarm water line," or say one or two inches above the flues. Inside of this chamber is a metal float, about four and a half inches in diameter, and seven to nine inches in length, with the whistle valve attached to its top end. To the lower end of this float a light brass pipe, a half inch in diameter, is attached, and extended down even with the outer pipe, or to the "alarm water line." Through this half inch pipe a fourth inch pipe is passed to the top of the float, and perforated so as to allow steam to pass out in the interior of the float; the lower end of this small pipe being curved up on a level with the "high water line," as shown in the engraving.

When the water in the boiler is at the "true water line," the pressure of steam will force water up in the chamber through the larger pipe until the float rises and closes the valve. The float, having both steam and water connections with the boiler, when the water is below the "high water line," must be filled with steam which will equalize the pressure and prevent collapsing.

Now, it is obvious that when the water in the boiler falls below the "alarm water line," and below the end of the pipe communicating with the chamber, that the water in the chamber will, by its own gravity, descend into the boiler, and its former space be occupied by steam, and that the float, now becoming a weight, falls to the bottom of the chamber, opening the valve and sounding the alarm. In case the water in the boiler rises above the "high water line," both communications with the float being submerged, it will soon fill with water and fall to the bottom of the chamber, opening the valve, allowing water to escape through the whistle, which must soon attract the attention of the engineer and prevent damage. When steam goes down in the boiler, air will pass in through the whistle, which at once becomes a perfect and certain vacuum valve.

This indicator, being automatic, will adjust itself immediately after the water in the boiler falls below the "high water line," or rises above the alarm water line, ten seconds of time only elapsing before it announces low water, and one minute for high water. This instrument is, we believe, the only one yet patented which has pressure equalized on outside and inside of the float, thus insuring it against collapsing or sinking.

The first prize, a bronze medal, has just been awarded this instrument, at the recent Massachusetts State Fair, held at Boston.

Patents were obtained through the Scientific American Patent Agency for these instruments as follows, by G. B. Massey, of New York: On the first described instrument, Feb. 23, 1869; on the second Sept. 28, 1869; and patents on the same have been secured in France and England. Address, for further particulars, J. W. Blake & Co., 56 John Street, General Agents for the Massey Low Water Detector Company.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE PROTECTION OF PROPERTY.

It is an old proverb that "God helps those who help themselves." It might be said also that even at this late day the administration of justice remains so imperfect that the law helps only those who help themselves, so far as the protection of property is concerned. Even in countries where police duty is confessedly performed in the most efficient manner, and where a thief caught, is as a rule a thief condemned and punished, citizens feel it necessary to supplement the arm of the law by all the means in their power.

No departments of mechanical art have given birth to more numerous devices, or combined in a greater degree ingenuity and constructive skill than those whose products are designed for the protection of property against thieves and fire, these being the principal enemies which are to be combated on land.

In the invention of locks there has been displayed a vast amount of study, thought, and ingenuity. All departments of science have been drawn upon to prevent thieves from withdrawing bolts that have been shot; and one of the latest and most ingenious of these applications is that of magnetism, the subtile influence of which has enabled the combination lock, hitherto not inaccessible, to defy the most expert pick-locks.

The ingenuity of honest men has been taxed to the utmost to circumvent the opposing ingenuity of rogues; for it is nearly always the case that when some improvement stops these gentry for a time, they learn to surmount it, and the minds of inventors are again taxed to create new obstacles.

A great deal of skill and talent has also been expended in the attempt to render walls as well as locks burglar proof; and as it was found practically impossible to do this on a large scale at a price within the means of ordinary persons, the practice of building burglar-proof boxes or safes, was introduced at a very early period in the history of the world. Constant improvement has been requisite in the construction of these safes, as the resources of burglars have nearly kept pace with those of the safe builders. They have, however, at least, been partially brought to bay before chrome iron, chilled iron, and steel; how long they will remain so remains to be demonstrated.

In fire proof safes the problem is how to combat a fierce, but blind, unreasoning force, limited in its operation, and the effects of which are well known and understood. Much success has been reached in the construction of safes which will resist the action of fire for a long time. Of these the most successful have been those which do not depend merely upon the non-conductivity of some substance to protect the contents from the action of external heat, but upon the power of steam to absorb and rapidly convey away heat. The water is generally inclosed between the external and internal walls of safes in the form of "water of crystallization" in some salt, alum being by far the best for this purpose, as it contains a very large percentage of water.

When the crystals of this salt become heated they give off the "water of crystallization" gradually, and it is converted into steam at 212°. So long as this steam is generated the contents of the safe cannot be injured as the temperature therein can not rise higher than 212°, no matter how great the external heat may be. Water has also been inclosed in tubes with plugs fusible at a low temperature, which, melting as the heat rises, allow steam to fill the safe.

A vast number of inventions based on the above principle or upon others less reliable, have been made and patented, many of which have had their day, but some of which remain deservedly popular.

How immense the distance also from the old fire syringes and buckets of medieval times to the superb and powerful steam fire engines of the present. How the "devouring element" must have laughed at those insignificant squirt-guns, in their impotent efforts to subdue it.

The last ten years have given birth to two important additional means of security, namely, the Burglar Alarm Telegraph, and Safe Deposit Companies.

Our readers are well informed in regard to the ingenious application of electro-magnetism, to the giving warning against the entrance of burglars through doors and windows. The principle is capable of extension, so that if, through neglect in setting the instrument, or by the superior art of the burglar, entrance should be effected, he could not pass about a building without giving notice of his presence.

The Safe Deposit Companies afford facilities to people about to absent themselves from their residences, for the security of valuables while they are absent, and also for the safe keeping of valuables at any time. They were called into existence by a necessity, which, as it must in the nature of things be permanent, will afford them a permanent support.

The time is probably far distant when any or all the means employed for the protection of property from robbers will avail to give perfect immunity from their encroachments; still, with those now employed their profession would be rendered a most hazardous one, were the administration of justice as perfect as the mechanical devices intended to protect property from such marauders.

REPORT OF THE REGENTS OF THE SMITHSONIAN INSTITUTE.

The report of the Secretary, Professor Henry, states that at the last session of the board it was resolved to memorialize Congress, asking that the usual appropriation of $4,000 for the maintenance of the National Museum might be increased to $10,000, and also that $25,000 might be appropriated towards fitting up the large room, in the second story of the building, for the better exhibition of the Government collections. The request was refused and only the usual appropriation was made.

In view of the facts that $4,000 was the sum appropriated when the museum was under the charge of the Patent Office, that since its removal to the Institution its size has been trebled, that the currency is greatly depreciated, and that the amount expended since the fire of 1865, is over $140,000, the greater part of which was for the accommodation of the National Museum, it is hard to see why, if the sustaining of this museum is considered necessary, the moderate request of the Regents should not have been granted.

The fact that $20,000 of the $140,000 expended since 1865, were paid out of the last annual income, renders the results attained during the year particularly praise-worthy.

The funds of the institution are reported in better condition than they were at the time of the preceding report by $18,000. The total capital of the Institution after payment of all liabilities is $697,000, a gain upon the original bequest of Mr. Smithson of over $155,000.

The fifteenth volume of the "Smithsonian Contributions to Knowledge" has been published and distributed to institutions of learning in this country and in Europe. A large number of valuable and interesting papers are in hand, and will form parts of the sixteenth volume of the same publication.

The general appendix to this report contains a large amount of valuable scientific matter, together with biographic sketches of scientific men. These latter comprise a memoir of Cuvier, with a history of his works; a memoir of Oersted; a notice of Christian Frederic Schoenbein, the discoverer of ozone, with an appendix giving an account of the principal discoveries of that distinguished investigator; a memoir of Encke; and a memoir of Eaton Hodgkinson, the celebrated English engineer, with reviews of many of his inquiries and demonstrations.

These are followed by a translation of a very important paper on "Recent Progress in relation to the Theory of Heat," by A. Cazin, and another one from the pen of Dr. Joh. Müller on the "Principles of the Mechanical Theory of Heat," with a large number of illustrations, the execution of which fully entitles their perpetrator himself to execution. The subject matter, however, of this paper, and the thoroughness and perspicuity with which it is treated, render it one of the most valuable works upon heat ever published in English.

The next contribution in order is a short but valuable paper on the "Continuous Vibratory Movement of all Matter, Ponderable and Imponderable," by L. Magrini, of the Museum of Florence. In this paper the attempt is made to prove that *movement is a fundamental property of matter* in whatsoever state it exists, that the movement always has existed, and, though the author does not draw this inevitable and logical conclusion from his argument, *always will exist* so long as matter exists. We may at some future period review this paper at length

We are next given a lecture by Dr. John Tyndall before the University of Cambridge, May 16, 1865, on the subject of Radiation, of which, having given the author's name, it is unnecessary for us to say it is a comprehensive and exhaustive discussion, exhibiting in a marked degree the peculiarly felicitous style characteristic of Mr. Tyndall's efforts.

The remainder of the volume is filled with records of scientific experiments, reports of learned societies in various parts of the world, archæological discoveries, etc., etc.; the whole making a volume which the Secretary might justly hope "would show the results attained to have been little inferior in value or extent to those of any preceding year."

THE RATIONAL CONSTRUCTION OF HOSPITALS.

We have been greatly interested in a correspondence which has been going on in the columns of the *Scotsman*, in reference to building the new Royal Infirmary at Edinburgh.

The parties to this discussion are Professor Syme, and Sir James Y. Simpson.

Mr. Syme is in favor of a large building, placing the utmost reliance in disinfectants for preventing the spread of disease, and those evils to which all such institutions are occasionally liable. The disinfectant upon which he chiefly relies is carbolic acid; but Sir James Y. Simpson denies its efficacy. The latter states that during the two years in which it has been employed the mortality from amputation has increased from forty to fifty-three per cent.

Instead of the large buildings hitherto employed as hospitals, with their numerous wards, bedrooms, etc., he advocates a central building for the administrative part of such an institution, and the erecting upon the ground around about this central building a series of village hospitals or wards, furnished with the latest and best sanitary improvements.

He claims that in the construction of such buildings the great disinfectants and antiseptics that we should alone depend on are abundance of space, abundance of light, and above all, abundance of fresh, pure, and ever-changing air to every patient in every ward. He is right. During the recent war we saw an admirable test of the correctness of his views. It was our privilege to contrast daily for a long period, the sanitary condition of patients crowded together in a large hospital, and others distributed in smaller buildings at considerable distance from the main hospital, used to supplement the accommodations of the larger building.

The increased comfort, and the improvement in the condition of the patients in these smaller wards were so marked as to attract the attention of, and elicit considerable remark from the surgeons in charge.

The huddling of people together, even when all are healthy, is attended with increased liability to disease. How much must such liabilities become exaggerated when the air is loaded with foul effluvia and exhalations, sickening even to healthy attendants, and which together form an odor characteristic of every hospital we ever entered.

Best of all restoratives are light, pure air, and rest, such as never can be secured to patients crowded together in large wards and forced oftentimes to witness involuntarily sights which, to those not inured by long familiarity with suffering and disease, are harrowing in the extreme.

We believe that were the suggestions of Sir James Y. Simpson adopted, a great benefit would be conferred upon suffering humanity.

SOLAR SPOTS.

If any of our readers had provided themselves with a piece of smoked glass during any of the bright days which were so plentiful during the middle of last April, they might have seen through it a group of remarkable spots on the sun's disk. These spots have been observable more or less during the entire summer. On the fourth of September five of these spots reappeared, after a short period during which the sun was almost wholly free from spots. Two of these spots were of very great size, the entire surface covered by these and other smaller spots being more than one fifth the sun's diameter.

These spots are of frequent occurrence, and although they cannot always be detected by the naked eye, there are few intervals when they cannot be detected with a telescope. We should not have felt called upon to say much about these spots at this time were it not for the fact that we are approaching a period when they are to be expected in greater numbers than at ordinary times. Mr. W. T. Lynn, of the Royal Observatory at Greenwich, England, says all things indicate that we are rapidly approaching a period of maximum of abundance and frequency of the solar spots. He estimates the most probable length of the interval between two consecutive maxima, as one ninth of a century, or eleven years and one month; this would bring us to another maximum in the course of the year after next, 1871, probably about the middle or towards the end of it.

As the period of the sun's rotation on its axis is 25·34 days, and its apparent revolution is 27·3 days in consequence of the change in the position of the earth during a rotation of the sun, the time for the reappearance of spots after having passed behind the western limit of the sun, unless they should be dispersed before his semi-rotation is completed, may be readily computed.

The April spots, or rather the spot, as although there were five distinct nuclei observed they were included in one penumbra, were estimated on the 13th of that month as being 55,000 miles in length, and 30,000 in breadth, covering an area of about 150,000 square miles.

Recent observations seem to put beyond all question that there is an intimate connection between disturbances in the sun's photosphere (light-sphere) and meteorological conditions of the earth's atmosphere. Some of these observations have found a record in the late volumes of this journal, and our readers will recollect them perfectly, particularly an article entitled "Storms in the Sun," published on page 139, current volume.

It is no wonder then that all solar phenomena should at the present time be of the most absorbing interest. We are probably on the eve of remarkable discoveries. The spectroscope is, in the hands of able investigators, throwing light on much that has been hitherto mysterious, and opening new avenues of research, the future of which it is impossible to predict.

Two hypotheses have hitherto been entertained in regard to the nature of the solar spots. The first is, that the vaporous

envelope is deeper and of greater density where the spots are seen, thus partially intercepting the light from the photosphere; and the second is that the photosphere is broken up where the spots appear. The latter has been supposed by some to be caused by an upward rush of vapor from beneath; but we need not say that all this speculation has been of no real value to science in the absence of any facts tending to support them.

Mr. J. Norman Lockyer, F. R. A. S., a young English astronomer, who has achieved an enviable reputation as a sagacious and careful investigator, undertook, in 1866, to demonstrate if possible which of the two hypotheses, if either, was correct.

We cannot, in the limits of this article, follow Mr. Lockyer through the extended labors he brought to bear upon this subject. Suffice it to say he has by his perseverance developed a mass of facts in regard to the constitution of the photosphere which alone would render his name famous in the scientific world. The instrument upon which he chiefly relied was the spectroscope, and the conclusion at which he arrives is that neither of the hypotheses above stated is correct, but that the spots are produced by the sudden and downward rush of portions of the sun's atmosphere. It must be confessed, however, that Mr. Lockyer has yet to demonstrate the hypothesis—for hypothesis it must yet be called—which he seeks to substitute for the ones he has discarded.

Whatever these spots may be they must indeed be obstinate spots if they refuse to surrender to the "artillery of science" now leveled against them.

THE CRACK OF DOOM.

Shall we confess it? We have been badly frightened. Mr. D. T. Taylor, of Rouse's Point, is the man who has done it. The means employed is a small pamphlet, entitled the "Coming Earthquake and its Approach."

This pamphlet quotes from the following sources: the Bible, the SCIENTIFIC AMERICAN, Mungo Ponton's "History of Earthquakes," Herodotus, Mallet, Ansted, M. Alexis Percy, Professor Merriam, Humboldt, "The American Naturalist," the New York *Tribune*, the *Sun*, Dr. Burnet, *Harpers' Magazine*, *Chambers' Journal*, "Pollock's Course of Time," Darwin, "Wells' Geology," the hymns of Thomas of Celano, Luther, Wesley, and many others. Nearly all the religious periodicals and papers of the day are also quoted with some dozens of "eye witnesses" of earthquakes in different parts of the world. In so small a pamphlet these quotations leave little room for much original remark; but we gather that the writer expects the world to be brought to judgment very shortly, and that the day of judgment is to be ushered in by an earthquake of rather unprecedented extent and power.

We did not feel at all terrified while penning the numerous passages quoted from our pages by Mr. Taylor, but we confess that their reperusal has caused us much trepidation.

It does not detract from this fear, that the world has been so near its end many times before, and has always failed, as yet, to "come to time." If no quotation had been made from our own writings, we should have remained unperturbed; but it seems we have committed ourselves to the "coming earthquake," and we cannot "go back" on our own statements. We are bound to be scared, and we are scared accordingly.

The "coming man" is debarred from putting in an appearance. The coming earthquake will get here before him, and Parton will turn out a false prophet.

How this announcement will affect the price of gold we cannot predict, but those not in the ring had better stand from under.

ON EXPERIMENTS WITH DYNAMITE.

Under the direction of M. von Arx, experiments with dynamite have been lately undertaken in Switzerland, with the view especially to investigate what degree of danger is offered by it in transportation. Already the first blasting experiments gave proof of the extraordinary power of this explosive. The explosion took place in from two to four minutes. Two and a half cartridges detached a mass of six and a half cubic meters of hard rock in a bore hole of 1·11 meters depth and three centimeters diameter; and in another experiment, three and a half cartridges, when exploded in a hole of 1·32 meters depth, loosened a mass of seventy-one cubic meters.

Similar results were obtained in cast and wrought iron, and in water. A cartridge that was allowed to explode in the river Aare, threw a large volume of water to a considerable hight. In order to investigate the danger of spontaneous explosion, the dynamite was first subjected to chemical analysis. In treating it with alcohol, 76·6 per cent of nitro-glycerin were extracted, while a solid residuum of a reddish white color was left, that consisted chiefly of silica, and small admixtures of lime, oxide of iron, and alumina. The priming of the copper fusee was found to consist of fulminate of mercury. The effective portion of dynamite is consequently the nitro-glycerin, while the other substances serve merely to diminish the danger of spontaneous decomposition.

A blasting material of this kind may explode by great variations of temperature, by intense solar rays, shocks, electricity, and spontaneous decomposition. This last mentioned possibility must yet be referred to experimental investigation. However, the experiments have furnished very satisfactory results in regard to the other influences. Dynamite was not acted upon by steam, and when not inclosed was consumed slowly in the fire, but when inclosed, it exploded with considerable force. The effect of light was experimented upon by a mirror, the dynamite burning in its focus with light puffings, without explosion, and when exposed to a less concentrated light, no effect was found to take place. The experiments which were undertaken in order to examine the effect of concussion proved that explosion will only take place when the material is placed between two very hard surfaces, and when the shock is very powerful. However, if concussion takes place between iron and stone, explosion is rarely produced, and never so between iron and wood. Inclosed dynamite explodes easier, but the intensity of the shock must in all cases be great.

It was also thought of importance to examine whether the dynamite would explode by lightning. It was for this reason exposed to the discharge sparks of a large Leyden jar, and those of a powerful induction apparatus. As, however, explosion ensued in no instance, from the experiments the experts drew the conclusion that the transportation of dynamite is not attended with any danger. Changes of temperature, strong heat, even fire, and intensely concentrated solar rays do not produce explosion, so long as the material itself is not inclosed in vessels possessing great powers of resistance. And, while it will decompose by shocks, these will scarcely ever be intense enough to offer real danger. As regards spontaneous decomposition, there is nothing known about the new blasting material; however, it is evident that the earthy admixture must prevent a rapid decomposition, and only allow a gradual and slow one. Taken all in all, the dynamite offers considerably less danger than nitroglycerin, and, since it is nearly equal to it in explosive power, there is no reason why the latter composition should not soon be replaced by the former.

THE EXTENSION OF PATENTS.

It is much more difficult to obtain the extension of a patent which is about to expire, than to procure a patent for a new invention. In the former case the law presupposes that the patentee has received a proper reward for his invention; in the latter the patent is granted to assist him in obtaining a reward.

The applicant for an extension must show to the Commissioner of Patents that the invention is of value; that he has faithfully endeavored to introduce it to the public; and that without any neglect on his part, he had failed to receive an adequate remuneration for the time, labor, and ingenuity expended. The rules of the Patent Office require that carefully-prepared statements, with proofs on these points, shall be presented to the Commissioner, who takes nothing for granted.

An example of the failures to observe the rules, sometimes made by applicants for extensions, resulting in the loss of their cases, is seen in the following official decision:

PAPER-CUTTING MACHINES (extension).—M. Riehl, August 27, 1869.—The applicant has fallen into a fatal error in making up his accounts, which renders it useless to consider the merits of his case on other points.

He first brings down his account to 1867. Previous to that time he had disbursed $87,500 on account of his invention, and had received the same amount in money, besides $25,000 in old machines received in exchange for his own. Upon these machines he expended $7,000, and sold them afterward for $40,000. Deducting from the latter sum the estimated value of the old machines, and the expenditures upon them, $32,000 in all, he credits the invention with the balance, $8,000. He also credits it with $840, being the profits made on new machines since 1867, besides $2,000, old iron on hand. The whole amount of the three latter sums, $10,840, is all, therefore, that he admits himself to have ever received on account of his invention. By a very moderate estimate he shows it to have been worth to the public $40,000, and relies upon this showing as entitling him to an extension.

It seems not to have occurred to him that the old machines he received previous to 1867 were also clear gain, and that the invention should be charged with the sum for which he sold them, $40,000, deducting the $7,000 he expended upon them. He should, in fact, have allowed their estimated value, $25,000, in addition to the sum he credited, $10,840, making $35,840 which he has received over and above all expenditures. This approaches so near to the supposed value of the invention as to destroy his claim to a further monopoly.

There is reason to believe that the applicant might with propriety have made a far more favorable exhibit of his case had he not fallen into a delusion by his manner of presenting his accounts. An opportunity was offered him, accordingly, to explain and correct them. Unfortunately, he was so situated as to be unable to prepare them anew. It is out of the Commissioner's power to remedy the mistake, and he is left without any ground for finding that the petitioner has not been pretty nearly remunerated for his ingenuity, time, and expense.

The patent cannot be extended.

S. H. HODGES, Acting Commissioner.

THE NOTTINGHAM KNITTING MACHINE, AND GADD & MOORE'S IMPROVED ONE SHAFT LOOM.

We have been much interested in the inspection of some English knitting machines, now on exhibition at Room 13, Harlem Depot, in this city.

The principal of these is what is known as the Nottingham Machine, invented by the Nottingham Manufacturing Co., Nottingham, England. This company is represented by Mr. John Kent, 324 Broadway, New York, who is pleased to exhibit and explain the operation of the machines to all who feel interested in their examination. This gentleman has also applications for patents in important improvements in knitting machines now pending through the Scientific American Patent Agency.

The machines exhibited produce full-fashioned stockings, drawers, shirts, etc. The stocking frame is arranged to make eight legs at once with clear welts and narrowed down to the heel. Mr. Kent inform us that a 24-gage frame will make thirty dozen legs per week; or with two frames for legs, and one frame for footing, employing the labor of one man and two girls, from sixty to seventy dozen of finished stockings can be made per week, which is a more rapid production than any machine with which we are acquainted with is capable of performing.

The frames for drawers and shirts are arranged with four sections for knitting four sides of drawers, or four complete shirt sleeves, full-fashioned. When making drawers the frame widens the leg to the gusset, and then narrows up the back. In the widening process one needle has to be cleared of its loops which leaves an eyelet hole in the texture. This is filled up by a very simple device which operates while the widening course is forming, thus perfecting the fabric on the frame, and obviating hand labor for this purpose. We believe no other frame is capable of doing this on widened fashioned knitted goods.

A comparison of the goods with those of ordinary American make shows a great superiority in their finish. There is great want of uniformity in American goods of this class. In purchasing by number a good fit is very uncertain, large bodies with short sleeves, and sleeves of different lengths on the same body, bands of different sizes, and similar defects, often perplex the wearer of these articles.

Goods made on these machines are free from all the above defects, the widening and narrowing being uniformly done as required.

The machines are in successful operation in the manufactories of the proprietors, and J. R. Morley & Co., also of Nottingham. Other English manufacturers have been refused licenses.

The Dudley Hosiery Company purchased, two years since, the right of this machine for the United States, and recent important improvements have been transferred to them. Other American firms desiring to compete with English goods of this class are either employing these machines or negotiating for them.

We were also shown a small machine for making rib tops with perfect selvedges, stiff welts—slack course, and splicing thread put in. This machine produces a first-class rib top for half hose, cuffs for shirts, bands for drawers' bottoms, etc. It can be adapted to make 2x1 rib stockings with fancy stripes. It works forty courses per minute. This machine has been ordered by a large number of leading manufacturers; and we trust it will work a reform in the character of the rib tops now put on American shirts, drawers, and half-hose. If our hosiery knitting manufacturers expect ever to compete in quality with English goods, they must pay greater attention to finishing details.

We are now taking out a patent for Mr. Kent on an improvement in circular knitting machines, which produces an imitation seam in circular knitted goods for half-hose stockings, shirt-bodies, etc. It makes a very handsome seam indeed, much more regular than can be done by hand-work. Ribs may also be run on and cleared, when required for half-hose legs. To change the frame so as to adapt it to making the plain circular web, or the imitation seam, is the work of only a few moments.

These improvements would probably have never been introduced into this country but for the protective policy now adopted by our Government. This is additional proof of the wisdom of that policy, which not only sustains such industries as we now have, but draws into the country valuable improvements and even new industries.

The Gadd and Moore's patent loom is also shown in connection with the knitting machines. This is probably as cheap a power loom as was ever built. It is a one-shaft loom of the most simple construction, working equally well with the over-pick and under-pick, and with very little consumption of power. As a calico loom, for which work it is specially designed, its merits must be admitted in this country as they have been in England. The motions are all positive except the shuttle motion.

Mr. Kent stated to us that he would be happy to see and give information to those not directly interested in the manufacture of such goods in this country, but who feel in any way desirous to promote the advance of American industry.

Carbon Pointed Tool for Dressing Emery Wheels, etc

In a recent visit to the office of Mr. John Dickinson, No. 64 Nassau street, New York, we were shown the operation of his new patent Shaped Carbon Tool for turning and dressing emery wheels, grindstones, etc., which is extremely effective.

This is the only tool for this purpose in which the application of *shaped* carbon is made. The points of these tools have five distinct cutting edges, which may be substituted one for another, according to the kind of edge required for special kinds of work, the time required to make the change not being more than five minutes.

People not accustomed to this kind of tool are often disappointed when they first get one, in regard to the edges. They should bear in mind that the action of the carbon points is that of grinding rather than cutting; a sharp edge like that on a steel tool is therefore not desirable, although to do good work the general form must approximate to that of steel points employed for similar purposes.

The Raid Against Vaccination.

A long article recently appeared in the New York *Times*, taking the strongest ground against vaccination, urging that it propagated disease, while as a prevention of mortality from small-pox, it was utterly inefficient. This article represented views now entertained by many upon this subject. The London *Lancet* in an article in favor of vaccination, makes the following remarks:

"The fact is, that the only people injured by the Compulsory Vaccination Act are medical men. And they are seriously injured by it, as we can easily show. There is no disease which pays medical men better than small-pox. A good attack of it makes a man, or child either, a patient for a solid

month. Then the chances are that the patient is left very weak, and with a very eruptive tendency impressed upon him for another month at least. Styes, or abscesses, or eruptions are frequent results of small-pox. It puts vaccination in the shade for after consequences, which inconvenience the patient but greatly swell his medical bill. We saw a boy lately with an ulcer of the arm several inches long, which had been left by small-pox five years ago. Cullen well said, 'Though the small-pox be not immediately fatal, the more violent kinds are often followed by a morbid state of the body of various kind and event.' It will, then, be readily understood that when the law compels vaccination, it does a great injury to medical men, and aims a most serious blow at a disease which has occasioned many a good doctor's bill. Of course Mr. Gibbs, the itinerant lecturer against vaccination, says, and will continue to say—for it is impossible for him not to talk nonsense—that the present law is upheld by the medical press in the interest of the profession. We do not write with such a utopian object as that of convincing Mr. Gibbs. But the above simple statement will satisfy common and candid people that the Compulsory Vaccination Act involves a dead loss to the medical profession; and that if medical men and journals advocate vaccination, and even the compulsory enforcement of it, it is in direct opposition to their own interests. We are quite prepared for the abolition of the Vaccination Act. Medical men can and do, by vaccination, or rather by revaccination, protect themselves from small-pox, so that they go in and out among patients afflicted with this loathsome disease with perfect security. We have everything to gain pecuniarily by a return to the small pox *regime* of our forefathers, or the milder form of it which obtained before the present act was passed, and applied with such creditable firmness by the magistrates. Meantime, we shall continue our disinterested support of an act, which indeed is one of the wisest and most humane which ever adorned our statute book."

REPORT OF THE COOPER UNION FOR THE ADVANCEMENT OF SCIENCE AND ART.

We are in receipt of the tenth annual report of the above institution, which shows it to be in full and successful operation.

The report discusses the history of the institution from its origin in the liberality of its founder to the present time, during which it has conferred inestimable benefits upon the young mechanics and others through its system of free night classes, its schools of art and telegraphy for women, its musical department, its reading room and library, and its popular lectures upon scientific subjects.

The trustees state that "Far better and larger results would have been produced if the pupils who have been admitted to the institution had been better trained in the ordinary rudiments of a common-school education, namely, reading, writing, and arithmetic, a good knowledge of which is essential for any higher progress. By far the larger number of applicants have been ignorant of arithmetic beyond its simplest elements, showing that the existing night schools maintained by the public authorities, valuable as they unquestionably are for the primary education of the foreign element in our midst, are not so organized and conducted as to give a thorough knowledge of arithmetic, without which it is vain to attempt a mathematical course or to make any scientific progress. The trustees have therefore considered the propriety of establishing a training or prepatatory school for the young men, over sixteen years of age, who must necessarily be refused admission to our classes in consequence of their ignorance of arithmetic. Such a school is required, but it is surely the duty of the Board of Education to establish it, and the trustees have decided to make a formal representation of the facts to the new Board of Education, in the hope that such a school for adults will be opened in October next for the reception of the pupils who must be refused admission to our classes in consequence of want of preparation. The necessity for such a school is made apparent by the fact that during the last ten years not more than one third of the pupils admitted to the mathematical department have remained until the close of the term, and that the progress of those who were qualified has been seriously interfered with by the sifting out of those who could not go on.

"The trustees are the more earnest in calling attention to this lack of elementary preparation, because it has been found to be the most serious obstacle to the scientific and technical education of a very large proportion of the young men of New York engaged in mechanical pursuits.

"A brief statement of the results of the free night classes of the year just closed will confirm these observations:

The total number admitted in Mathematics is	482
" " remaining at the end of the term is	109
" " admitted in Natural Philosophy	276
" " remaining at the end of the term	58
" " admitted in Elementary Chemistry	97
" " remaining at the end of the term	22
" " admitted in Applied Chemistry	35
" " remaining at the end of the term	21
" " admitted in Free-Hand Drawing	582
" " remaining at the end of the term	332
" " admitted in Architectural Drawing	126
" " remaining at the end of the term	53
" " admitted in Mechanical Drawing	160
" " remaining at the end of the term	83

"Whence it appears that in the night schools of Science and Art 1,757 pupils in all were admitted during the term which has just closed, of which only 678 remained at the close. Of course some of this falling off is due to the migratory nature of the working classes, but it will be observed that the loss is greatest in those branches which require good mathematical preparation, and the experience of teachers in their intercourse with the pupils all goes to show that the chief obstacle to progress and a far larger measure of success in imparting a technical education is the total want of preparation in the ordinary rules of arithmetic."

We will add, in this connection, that Wm. G. Plympton has been appointed Professor of Natural Philosophy and Mechanism to this Institution, and delivered his inaugural address on the 30th October. These lectures will be continued in the Mechanical Lecture Room every evening of the week except Saturday and Sunday, at 7½ P. M. Free to all.

THE HIGHEST PRIZE AWARDED AT THE AMERICAN INSTITUTE.

This prize, a gold medal of honor specially struck for the occasion, has been awarded to Mr. James Lyall, the inventor and exhibitor of the Positive Motion Loom at the recent National Exhibition of the American Institute. It is the first of this kind ever awarded. It can only be given in accordance with the following by-laws:

The highest prize at any exhibition shall be the large Medal of Honor, which shall be given only for a new and useful invention, or for a new and highly valuable product of the soil never before exhibited. This prize shall be awarded only to the originator of such invention or product.

The large Medal of Honor designating the highest prize shall not be awarded by the managers for any article, unless its practical value shall exceed that of any similar one in use known to the managers, or intended to accomplish the same purpose.

It will be seen that to obtain this medal any invention must compete with all existing inventions designed to accomplish the same end, and that the prize awarded to this loom is one of no ordinary character. We are glad to see this invention fulfilling the predictions we made for it in our descriptive article in No. 2, current volume. It is doubtless desired to become historical among American inventions.

OBITUARY.—GEORGE PEABODY.

The death of George Peabody, which occurred on the evening of November 4th, at his residence in London, will be lamented in both hemispheres. Our readers are perfectly familiar with the princely benefactions this benevolent man has made to the poor of London and for educational purposes in his native land. He was born at Danvers, Mass, Feb. 18, 1795. He visited the United States for the last time in June of the present year, during which visit he made an additional gift to the cause of education in the South. A single line of the American poet, Holmes, expresses not only the character of this great hearted man, but the affectionate esteem with which he was universally regarded,

"The friend of all his race; God bless him!"

An excellent portrait of Mr. Peabody was published on page 181, Vol. XVI., of this journal.

Oersted's Discovery of Electro-magnetism.

Our readers having read a communication from Dr. Adolph Ott, denying the claims of Oersted to this discovery, will be interested in the perusal of the following account of it given in the last volume of the "Report of the Smithsonian Institute," which is as follows:

"What at the present day is of most import to the memory of Oersted in relation to this work, is perhaps the palpable proof found therein of his ceaseless preoccupation with the subject of electrical phenomena. He had conferred great improvements on the pile; he was one among the most practiced experimenters in employing it; he had formally indicated magnetism as one of the phenomena of which it would some day furnish the explanation, and no one was better prepared than himself to advance to the practical realization of this new conquest.

"Yet all the attempts thus far made had remained unfruitful. The expedient had been tried of placing the two poles of a battery as highly charged as possible in a parallel line with the poles of a strongly magnetized needle; no effect, however, had been produced. Nevertheless, the conviction still prevailed, especially with Oersted, that a relation must exist between galvanism and electricity. The route to the discovery was unknown, though hazard might open it unexpectedly.

"Fortune, it might be said, ceased to be blind at the moment when to Oersted was allotted the privilege of first divining that it was not electricity in repose accumulated at the two poles of a charged battery, but electricity in movement along the conductor by which one of the poles is discharged into the other, which would exert an action on the magnetized needle. While thinking of this—it was during the animation of a lecture before the assembled pupils—Oersted announces to them what he is about to try; he takes a magnetic needle, places it near the electric battery, waits till the needle has arrived at a state of rest; then seizing the conjunctive wire traversed by the current of the battery, he places it above the magnetic needle, carefully avoiding any manner of collision. The needle—every one plainly sees it—the needle is at once in motion. The question is resolved. Oersted has crowned, by a great discovery, the labors of his whole previous life.

"It was on the 21st July, 1820, that Oersted communicated to learned Europe the important fact with which his genius had just enriched science. He consigned it to a small tract written in Latin, of only four pages in 4to, which, notwithstanding its conciseness, presented with perfect clearness, the results of more than fifty experiments, and left scarcely anything to be added on the subject. This composition, entitled *Experimenta circa effectum*, etc.—(Experiments on the effect of the electrical conflict upon the magnetic needle)—was addressed the same day by post to all the societies in Europe which occupy themselves with the natural sciences. A French translation of it appeared in the number of the *Annales de chimie et de physique* for August, 1820, from which I transcribe a few expressions employed by Oersted on this occasion.

"The first experiments on the subject I undertake to explain were made in the lectures which I gave last winter on electricity and magnetism. They evinced in general, that the magnetic needle changed its direction through the influence of the voltaic apparatus, and that this effect took place when the circuit was formed, and not when it was interrupted; a process which had been attempted in vain by celebrated physicists, some years before. But, as my experiments had been made with an apparatus of small energy, the effect of which was not so striking as was called for by the importance of the fact to be established, I invited my friend Esmarch, judicial councillor to his Majesty, to unite with me in repeating them with a more powerful apparatus. We had also for associates and witnesses, the Chevalier de Vlengel, MM. Hauch and Reinart, professors of natural history; Jacobson, a very skillful physician and chemist, and Zeise, professor of philosophy. I made other experiments when alone, and if these taught me anything new, I took the precaution of repeating them in the presence of these eminent men of science. * * * In order to make the experiment, we put in communication the opposite poles of the voltaic apparatus by a metallic wire, which we will call, for brevity, the *conducting* or *conjunctive wire*; and we will designate the effect, which is manifested in this conductor and around it during the voltaic action by the term *electric conflict*.

"Let us suppose now that the rectilinear part of this wire is horizontal, and placed above and parallel to a magnetic needle freely suspended * * * the latter will move in such a manner that, under the part of the conjunctive wire which is nearest to the negative pole of the apparatus, it will deviate towards the west. * * * If the conjunctive wire is arranged horizontally *under* the needle, the effects are of the same nature with those which take place when the wire is above the needle; but they act in an inverse direction—that is to say, the pole of the needle, under which is the part of the conjunctive wire that receives the negative electricity of the apparatus, inclines towards the east. * * * It appears, from the facts stated, that the electric conflict is not inclosed in the conducting wire, but that it has around it quite an extensive sphere of activity. We may conclude from the observations that this conflict acts by a vortical or whirling movement."

WOOD-PAPER MANUFACTURING CASE.

UNITED STATES SUPREME COURT. APPEAL FROM THE CIRCUIT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA. OCT. 30, 1869.

The American Wood-Paper Company, Appellant, vs. Jacob D. Heff, S. A. Rudolph, and John W. Dixon.—The American Wood-Paper Company, incorporated by the Legislature of Rhode Island, is the assignee of the English and French improvements for the manufacture of paper from wood (by boiling in caustic alkali until reduced to pulp), and of an American improvement in boilers for that use, under patents taken out in this country, which it is claimed the appellees have infringed, by manufacturing and selling paper and paper pulp manufactured by the descriptions set forth, and by means of processes and machinery described in the specifications annexed to the letters patent. The bill sought to restrain the appellees, a Philadelphia firm, from the manufacture of such paper and pulp, and prayed that all infringing paper or pulp in their possession be destroyed or delivered up to the appellant.

In the Circuit Court, Mr. Justice Grier held that so far as the alleged improvements in boilers were new and patentable, they had not been infringed; that the reissued patents for the English improvements were illegal and void, having been obtained on the false pretence of seeking a correction on the specification, when the real intention was to change the invention; that the French improvement was not infringed, because the process used by the appellees did not require the minimum pressure to the square inch employed by the patent.

Mr. Justice Cadwalader concurred with Mr. Justice Grier, in respect of the two former patents, but thought there had been an infringement of the latter. This difference of opinion, however, did not save the case of the appellant, and the case was dismissed in order to enable the Company to appeal.

Harrison B. Mead, of Fort Edward, Washington county, N. Y., now intervenes, and moves that the appeal be dismissed, alleging that it now presents only a feigned issue, the controversy having been composed between the parties to it since the decree of the Circuit Court. It is averred that the appellees have no further interest in the matter, having been indemnified by the appellant, and that the suit is now carried on for the purpose of obtaining a judgment in this court on which to found an application for an injunction against a large number of persons in the manufacture of paper by a similar process for alleged infringements of one or more of the improvements whose validity is at issue in this cause, one of whom is the intervenor, and against whom this Company has brought suit by a complaint precisely like the bill at bar.

Proof to sustain the motion having been taken, it was now argued.

Gen. B. F. Butler for the motion; T. A. Jenkes, opposed.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The Mechanics' Institute Exhibition of San Francisco closed on the evening of October 30. The receipts were over $61,000.

A company has been organized in Kalamazoo, Michigan, with a capital stock of $100,000, for the manufacture of railroad cars.

A Russian engineer has run a railway train successfully from Charff to Kutschigan, a distance of 53·6 miles, the only fuel applied being raw commercial naphtha.

The Hartford and New Haven Railroad Company have commenced to erect their new freight building on Belle dock, New Haven. It is to be 300 feet long by 40 broad.

The Association for the Promotion of the Industry of Prussia offers a premium of $225 for the preparation of an enamel on cast iron, of variegated colors, unaffected by exposure to air, which has proved effectual for at least a year.

It is stated that by melting copper in plumbago crucibles previously lined inside with pipe-clay and dried, non-porous castings may be obtained. As soon as copper, while in a molten state, is in contact with coal, or carbonaceous matter, it yields a porous and spongy casting.

From the report of the amount of trade between the United States and foreign countries it appears that England figures for the enormous total of $190,436,700 of our exports. The British Empire, in all, receives our exports to the amount of $230,000 000. Spain and all her possessions get $32,500,000, of which Cuba has $12,600,000. Liberia has the least, viz., about $70,000. Of all that we send out, $275,753,000 are shipped in foreign, and but $138,201,636 in American vessels.

The directors of the *Services Maritimes des Messageries Impériales* have announced that the steamship Godavery will be dispatched from Marseilles on the 10th of November, to Port Said where she is expected to arrive on the eve of the inauguration of the Suez canal. After the opening ceremony she will pass through the canal on her voyage direct to Calcutta. The length of the Godavery is 305 feet, her burden 1,380 tuns, and her draft with full cargo 17 feet 9 inches.

Between May 10, 1865, and May 9 of the succeeding year, a passenger on the road of the Hudson River Railroad Company, between the New York station and Spuyten Duyvil, had to pay, on five hundred and twenty-six occasions, a few cents above the fare legally due to the company. Each time he protested against the overcharge, and thus reserved to himself the privilege of prosecuting. On May 9, 1866, he brought an action against the railroad company, and a decision has recently been given by the Hon. Chas P. Kirkland, the referee in the case, awarding damages covering the sum illegally collected, and fifty dollars each time an overcharge was paid amounting in all to about $29,319.

U. S. Patent Office.

How to Obtain Letters Patent

FOR

NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upwards of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination. MUNN & CO. ask Special Attention to their

SYSTEM OF DOING BUSINESS.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire to consult with us are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us an HONEST OPINION. For such consultations, opinion, and advice, WE MAKE NO CHARGE. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

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 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.

PRELIMINARY EXAMINATION

Is made into the novelty of an invention by personal search at the Patent Office, which embraces all patented inventions. For this special search and report, in writing, a fee of $5 is charged. This search is made by a corps of examiners of long experience.

MUNN & CO. wish it distinctly understood, that inventors who employ them are not required to incur the cost of a preliminary examination. This examination is only advised in more doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fees paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually with **No Extra Charge to the Applicant.**

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those when appeals are taken from the decision of the Examiner after a second rejection; and MUNN & Co. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & Co. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners; and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared. The Government fee on filing a Caveat is $10, and MUNN & Co.'s charge for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send us a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & Co. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & Co. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & Co. have prepared and taken a larger number of European Patents than any other American agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free. Address MUNN & CO., 37 Park Row, New York.

Recent American and Foreign Patents.

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

CLOTHES MANGLE.—Hamilton E. Smith, New York city.—This invention relates to a new clothes mangle, which is so arranged that a suitable degree of pressure can be brought to bear on the clothes or other articles that are wound upon a roller, and so that no pressure or power is uselessly expended on the roller that carries the clothes, and to obtain continuous action in one direction.

MILK AND LIQUID COOLER.—A. P. Bussey, Westernville, N.Y.—This invention relates to a new apparatus for cooling milk and other liquids, and is more particularly adapted to the use of dairymen for cooling the milk in the cans in which it is transferred, and for keeping it cool while being conveyed.

MACHINERY FOR PROPELLING SMALL BOATS.—Virgil Dresser, Leavenworth, Kansas.—This invention relates to a new device for rotating by muscular-power paddle wheels that are hung on flat boats or other small vessels, and consists in the application of an oscillating lever which has a double set of pawls pivoted to it, to engage into ratchet wheels mounted on the paddle-wheel shaft.

NOZZLE AND SCREW CAP.—Alexander N. Lapierre, New York city.—This invention relates to a new method of constructing the nozzles and caps of cans for returning oil and other liquid matter, and has for its object cheapness of arrangement and convenience of operation. The invention consists in providing a vent for the discharge and entry of atmospheric air, and in the arrangement of a washer, which is secured to the cap, and closes the vent and nozzle.

HORSE-POWER FIRE ENGINE.—John C. McCarthy, New York city.—This invention relates to a new manner of constructing fire engines with a view of facilitating their operation where man or steam power cannot be readily obtained. The invention consists in the application of an endless apron, or other horse power, to a fire engine, so that horses on the engine or near it may operate its pump work for extinguishing fires.

APPARATUS FOR DRYING LUMBER.—F. I. Norton, Fremont, Ohio.—The object of this invention is to construct a kiln for drying lumber by means of steam and dry heat produced by steam. The invention consists chiefly in arranging a series of doors within the kiln, which doors when let down will close one or more chambers, into which the steam is discharged, while they will, when swung up, open said chambes, so that the steam may freely enter the kiln.

FREEZER.—Paul Schumacher, New York city.—This invention relates to a new apparatus which can be used for freezing ice cream and other suitable substances. The object of the inventon is to obtain a proportionately large cooling surface to the quantity of the material to be cooled.

SKIN AND OTHER GARMENTS OF CLOSE TEXTURE.—H. E. Smith, New York city.—This invention consists in providing such garments with perforations to permit the escape of the insensible perspirations and other emanations of the body, to maintain a more healthy condition thereof than can be done when these garments are worn in the common way.

SURGICAL INSTRUMENT.—P. J. Frank, Ashford, N. Y.—The object of this invention is to provide a simple and efficient instrument for depositing medicine under the skin for the treatment of "hernia."

COMPOUND WHEEL AND AXLE.—B. F. Leet, Dayton, Nevada.—This invention relates to new and useful improvements in wheels and axles for railroad cars, whereby it is designed to provide a simple and strong arrangement of independently revolving wheels, calculated also to utilize the wheels and axles now in use by removing one of the fixed wheels and substituting a loose wheel according to the improvement, which consists in the application to the common railroad car axle, having a solid collar shrunk on at the center of wheels having hollow stems projecting from the inner faces to the said collars, and held in place by loose sleeves made in two parts, having interval flanges which engage behind shoulders of projecting rims on the inner ends of the stems and hold them against the ends of the collars shrunk on the axles.

WATER-WHEEL GOVERNOR.—J. A. Whitman, Auburn, Me.—This invention consists of a combination with the driving mechanism for the governor, the gate operating devices and the governor of a double-acting vibrating pawl, under an arrangement whereby it is changed to work the rachet connected with the gate operating devices either way, the said pawl being worked by the direct action of the governor-drawing mechanism, thereby relieving the governor of all labor except the changing of the pawl. The invention also comprises an improved construction of the governor where by the resistance of the air upon a pair of pendant-hinged revolving wings is made use of mainly for working a vertically sliding hub on a revolving spindle, to obtain the required reciprocating motion.

FIRKINS AND TUBS FOR BUTTER AND OTHER SUBSTANCES.—D. M. Lockridge, Atto, N.Y.—The object of this invention is to provide firkins, tubs, and other vessels for packing butter, lard, and other like matters, by which access may be had to the contents for inspection without the labor of loosening the hoops and removing the head, which allows the brine to run out, greatly to the disadvantage of the butter as to preservation.

COMBINED SHOW CASE AND SAMPLE CARD FOR SPOOLED SILK, ETC.—Wm. G. Kelly, Oneida Community, Oneida, N. Y.—This invention has for its object to furnish an improved show case, which shall be so constructed and arranged as to hold the spools securely in place during transportation, exhibit them to good advantage to display the variety of colors, and at the same time allow the spools to be conveniently taken out.

RAILROAD.—David Harrison, Fayette, Miss.—This invention has for its object to enable the cars to be run with safety at great speed, to give sure warning of their approach to a station, and to readily ascend steep grades, and which shall effect these objects in an easy, simple, and effective manner.

COPY HOLDER.—John S. Butler, Silver City, Idaho Ter.—This invention has for its object to furnish a simple and convenient copy holder, designed more particularly for compositors' use, which shall be so constructed and arranged that it may be placed between the upper and lower type cases, occupying little space and without covering up any of the type boxes.

MECHANICAL MOVEMENT.—D'Alembert T. Gale, Poughkeepsie, N. Y.—This invention has for its object to furnish an improved mechanical movement for operating a churn, or driving light machiney, which shall be simple in construction, effective in operation, and convenient in use.

CAR COUPLING.—Manuel Van Slyke and D. W. Wood, Rome, N. Y.—This invention has for its object to furnish a simple, convenient, safe, and reliable car coupling, which shall be so constructed and arranged that it will be self-coupling, and may be uncoupled from the side or top of the car without its being necessary to go between the cars for that purpose.

TRUSS.—G. Mayer, Sullivan, Ill.—This invention relates to improvements in trusses, and has for its object to provide a simple, cheap, and efficient construction, and an adjustable arrangement for the pads, to be either worn singly or double, and adapted for males or females.

UNIVERSAL SHAFT COUPLING.—Wilfred P. Dugdale, Goshen, Ind.—This invention relates to improvements in shaft couplings, such as are used for coupling shafts when required to run out of a right line, and has for its object to provide a coupling of simple and cheap construction, which may be readily connected or disconnected, and having no projecting parts such as screw bolts, liable to catch into the clothing of attendants, and gather straws, etc., and designed more especially to be used with thrashing machines and applicable to other uses.

SAP FEEDER.—Geo. D. Chandler, West Concord, Vt.—This invention consists in a float, having a stem hinged to the faucet, and so arranged that when the surface of the sap in the kettles, whereon the float rides, falls, it will open a passage from the faucet allowing the sap to flow until it rises sufficiently to press the said stem, which is provided with cork, or other suitable packing, against the mouth of the orifice with sufficient force to close the passage.

LEATHER PUNCHES.—John Lyle, Newark, N. J.—This invention relates to improvements in hand-spring leather punches, having a number of punches of various sizes arranged on an adjustable hub, connected to one end of one of the jaws; and the invention consists in an improved arrangement of the hub, for connection with the said jaw, whereby it is held more securely in position against the tendency to turn when punching.

CUT-OFF FOR PIPES.—James H. Perkins, Omaha, Neb.—This invention consists in the application to the conductors, where two sections are joined by an oblique connection, the one sliding into the other and arranged to have an opening at one side of a hinged spout, so shaped and arranged that where the water is required to pass down to the cistern it may be folded up against the side closing the lateral orifice, and when it is required to shut the water off and spout it through the lateral opening it may be readily turned down and arranged to cut off the direct passage below, and chute the water into other conductors, the same hook holding it in either position.

PACKING AND TRANSPORTING BUTTER.—J. Thayer, Palmyra, Wis.—This invention relates to a new and improved method of packing and transporting butter for sale and use.

SPRING BED BOTTOM.—F. F. Lahm, Chicago, Ill.—This invention relates to a new and useful improvement in spring bottoms for beds and sleeping couches, and consists in the springs, and in the construction and arrangement of parts.

CULTIVATOR.—W. T. Baker, Lancaster, Texas.—This invention relates to a new and useful improvement in machines for cultivating the ground, and it consists in the manner of hanging and regulating the cultivator plows.

SPECTACLES.—Louis Black, Detroit, Mich.—This invention relates to a new and useful improvement in spectacles whereby the glasses, or either of them, may be readily removed and other glasses inserted.

HOOP MACHINE.—William Lawyer, Macomb, N. Y.—This invention relates to a new and useful improvement in machines for facilitating the manufacture of hoops, having particular reference to the process called "racking."

DRAFT REGULATOR.—J. J. Smith and Samuel Wood, Cleveland, Ohio.—This invention consists in the use of a column of mercury in an open tube which is subject to both steam and atmospheric pressure, in combination with suitable mechanism for operating upon draft dampers and also for acting upon the safety valve.

HAY MAKING, LOADING, AND STACKING MACHINE.—B. J. Moore, Dresbach, Minn.—The object of this invention is to provide a simple, cheap, and effective machine which may be used for spreading hay, or raking, loading, or stacking it, and it consists in an improved arrangement of the truck for supporting and moving the several parts, and imparting the motion to an elevator; also, in an arrangement for raising an endless elevator, employed for taking the hay from a rake and delivering it on a platform, when required to be out of action; also, an improved construction and arrangement of the rake, for facilitating the independent action of the teeth, and the elevation of the rake above the working position.

KNITTING MACHINE.—H. C. Work, Philadelphia, Pa.—This invention consists of an improved method of taking the loops on the needles or hooks off, for the reception of the new loops, and for discharging them over the said new loops by means of pins sliding up in grooves on the hooks just previous to the going down of the hooks with the new loops. The invention also comprises a means of operating both the hooks and the sliding pins by one cam on the cylinder, and it also consists of an improved arrangement of yarn guide in connection with the pawls for turning the cam.

REFLECTOR.—Samuel Meadows, Toronto, Canada.—The object of this invention is to provide a glass reflector having the glasses so arranged as to have greater power than those now in use, and so that portions of the reflecting parts may be adjusted to throw the light on any given point, and also so arranged in respect of the frame for the support of the glass that the same may be easily and cheaply put together and parts removed for the substitution of other glasses when broken.

PROCESS FOR RESTORING AND PRESERVING BUTTER.—Calvin Peck, Marshall, Ill.—This invention and discovery relate to a new and useful improvement in a process for purifying and preserving butter, having especial reference to arresting fermentation, and restoring and preserving rancid butter.

MACHINE FOR MAKING CHAIR SEATS.—Joseph C. McCormick, Smicksburg, Va.—The object of this invention is to provide for public use a simple, convenient, and effective machine for cutting out and molding curved seats for common wooden chairs.

PROCESS OF RESTORING DECAYED RAILROAD TIES TO THEIR ORIGINAL DURABILITY.—Wm. Dripps, Coatesville, Pa.—It is the practice on railroads when making a general repair to take up all the ties though seven eighths of them may be good, provided they could be prevented from becoming any more decayed and unserviceable, to prevent decay and restore to such worthless ties an intrinsic value, and to prevent the loss of ties only partially deteriorated is the object of this invention.

STOVES.—Asa Snyder, Richmond, Va.—This invention relates to stoves for heating or cooking purposes, having hollow-walled fire chambers, and hollow grates, and perforations in the inner walls of the fire chambers for conducting air in a heated condition to the fire.

SAFETY CAN.—M. H. Barnes, Peoria, Ill.—This invention has for its object to prevent the access of flame to the explosive vapor that always fills the empty portions of cans partially full of oil, so that the can may be safely used to supply lighted lamps, or brought into any proximity, however close, with flame, without danger of exploding.

REMOVING DUST FROM THRASHING MACHINES.—Era Rose, Vernon, Ind.—The object of this invention is to provide for use in connection with thrashing machines, a simple, cheap, and convenient apparatus which can be employed to take up and remove the dust from the thrashing apparatus, delivering it outside of the building in which the machine is used, or in any other convenient place.

CAR BRAKE.—S. R. Stinard, Paterson, N. J.—This invention relates to improvements in the mode of operating brakes for retarding or stopping railroad cars or trains of cars, having particular reference to brakes which are made to act by means of steam, or compressed air, or other elastic fluid and which are under the control of the engineer, but at the same time not interfering with the operations of the hand brake of each car; and the invention consists in applying mechanism for taking up, or compensating for the "slack," or play, between the cars of a train.

FURNACE FOR MELTING AND DECARBONIZING IRON.—Charles Peters, Trenton, N. J.—This invention relates to a new and useful improvement in melting, decarbonizing, and desulphurizing iron, and consists in melting the iron at the top of the stack, or cupola, and dropping the melted iron through a column of flame, and on to a solid cone, or bed, whereby the globules of iron are burst, and, in supplying oxygen, or atmospheric air to the iron on, or near, the cone or bed.

STEAM ENGINES.—J. M. Davidson, Napoleon, Ark.—This invention relates to a new and useful improvement in steam engines, blowing cylinders and all other machinery where cylinders and pistons are used, and it consists in so constructing the piston and piston rod, and so connecting the rod with the cylinder head, that a pitman, or connecting rod, and cross head is dispensed with.

HEATER.—H. Stickney, Cleveland, Ohio.—This invention relates to improvements in base burning heaters, having for its object to provide certain improvements in the construction and arrangement of the base and in the application of water vessels around the same; also, an improved radiating apparatus; also an improved valve arrangement in the magazine for preventing the escape of the gas therefrom, and for admitting the supply of coal; also an improved means for operating the grate to discharge the ash and cinder; and also, an arrangement for closing the draft door by the action of the feed door in opening to prevent the escape of gas when supplying the magazine.

COWLS FOR CHIMNEYS AND SHAFTS.—Edward Hewett, St. Leonard's-on-Sea, England.—This invention relates to improvements in the construction of cowls to be applied to chimneys and furnace shafts, whereby an efficient up draft is obtained and all down draft at the same time prevented.

RIBBON CASE.—George F. Woolston, Marshalltown, Iowa.—The object of this invention is to provide a safe and convenient method of keeping ribbons for retail and for measuring the same as they are sold, the arrangement being more especially designed for velvet and other expensive ribbons.

PRESERVATION OF METALS.—A patent was recently granted to John Carson and Daniel Breed, of Washington city, for manufacturing, tempering, and preserving metals in a state of insulation from earth currents of electricity, in order to prevent crystallization, and to produce and retain the metal in a superior fibrous condition. In the practical application of the invention, it is necessary to insulate the foundation of the furnace, the hammers, anvils, floors for the workmen, furnace tools, rollers, and machinery, molds, forges, and all appliances for working metals and tempering edge tools, store houses and racks where metals are kept, and every place and thing in contact or connection with the metal. Also, railroads, bridges, building, and other structures made of iron in whole or in part should be insulated. For the purpose of insulation glass tiles, balls, pillars, or any other suitable means may be employed. Upon railroads a board of gutta-percha, or other bad conductor, may be placed between the ties and rails, and also under the chairs, or under the rails, upon the chairs, thus forming an insulating, elastic cushion for the rails, and thereby preventing the usually severe concussion of the rolling stock. The invention may be applied not only to iron and steel, but also to copper, brass, and others metals and alloys where it is desirable to secure a highly fibrous condition, and prevent or retard crystallization.

HATCHWAY GUARD.—Henry H. Covert, New York city, assignor to himself and James F. Sullivan, Brooklyn, N. Y.—This invention relates to improvements in guards for hatchways in buildings, and has for its object to provide a removable safety guard, for the prevention of accidents to persons by inadvertently stepping over the edges of openings in the floors and falling through.

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.

W. M., of N. Y.—A good steam gage should indicate the exact pressure per square inch in the boiler. The amount of steam at 212 which steam at higher temperature would make, may be at once computed from the pressure and the space it occupies. For formulæ to do this we refer you to Bourne's "Catechism of the Steam Engine," page 85. What is meant by vacuum is the absence of any material thing. When two boilers are connected by a pipe of sufficient size, the pressure *per square inch* will be practically the same in each. This is what the gage indicates, not the sum of the pressures per square inch in each.

F. S., of Pa.—Formic acid was first found in the bodies of ants. It may be, however, prepared artificially. It takes its name from the Latin *Formica*, an ant. It may be made by distilling with care in a retort, ten parts of starch, by weight, with thirty-seven parts of peroxide of manganese, and oil of vitriol and water, each thirty parts. There are many other methods of producing this acid, but the method given can be employed on a small scale in a retort capable of holding ten or twelve times as much in the bulk of the mixture, as the latter is liable to froth when the heat is first applied.

E. W., of Ohio.—The electric light is an expensive one, requiring a very strong battery. The calcium light will answer your purpose better and will be much cheaper for magic lantern purposes. You will find the subject of Taxidermy treated in any good encyclopedia. You will find the smell of your stuffed pole cat so persistant as to probably spoil it for the cabinet. One of these animals ought not to be killed by violence if intended for stuffing. It is better to persuade him to contribute to science by a little arsenic adroitly secreted in an egg.

J. V. R., of N. Y.—To make soluble glass in small quantities, fuse together in a Hessian crucible, one part of clean sand or finely pulverized quartz, and two parts of dried carbonate of soda. When the fusion is perfect, pour out the mass on a stone slab to cool. Pulverize and treat with boiling water until all but the impurities are dissolved, then concentrate by evaporation in a porcelain capsule.

E. B., of Mass.—Portland cement concrete might doubtless be used to advantage in filling in the walls of frame buildings. In a building, the walls of which are already plastered, it would, however, require to be done with great care not to press off the plastering. To attempt to fill ten feet in depth at once would certainly destroy the walls. Not more than one foot could, in our opinion, be safely ventured upon.

G. L. P., of Saltillo, Mexico.—The sketch you send us of an instrument for measuring the flow of streams at different depths is simply a re-invention of an instrument devised by Pictot, and well known to hydraulic engineers in the United States and Europe. It is a good instrument, and that you should have reinvented it in the absence of any previous knowledge of it is creditable to your inventive talent.

J. Y., of N. Y.—Your request for us to furnish you with a design (for it amounts to that) for engines, screw, etc., for a boat 25 feet in length and 7 feet in width, designed to have a maximum speed of 8 miles per hour, would, if complied with, cost you about one hundred and fifty dollars. We prefer that some of the mechanical engineers whose advertisements appear in our columns should get this job.

R. D., of N. Y.—The recipe for hardening mill-picks to which you refer was as follows: Two gallons rain water, one ounce corrosive sublimate, one ounce sal ammoniac, one ounce saltpeter, one and one half pints rock salt. The picks should be heated to cherry red, hardened in the bath, and drawn to temper.

M. H. K., of Kan.—We do not know of any monograph on the subject of starch manufacture. If you could get access to "Muspratt's Chemistry" in some public library, you would find the subject very fully treated. It is also discussed at length in Dr. Ure's "Dictionary of Arts, Manufactures, and Mines.

R. A., of Pa.—We were not aware, till you informed us, that practical railroad men suppose the gravity of a train to be increased with its velocity, but we were well aware that what is called its "vis viva," increases as the square of its velocity. Is not that what you mean?

R. M. F., of Texas.—Capt. John Ericsson resides at 36 Beach street, New York. The other information you seek can be found in Appleton's Encyclopedia. Article "Oysters."

E. T. D., of Pa.—You may remove the oxide of copper from the surface of that metal by ammonia in case you do not wish to employ acids.

J. L. B., of Cal.—A patent can be obtained on your invention if it is what you state. We do not deal in patents and therefore must decline your proposition.

S. M., of Mich.—Your "new thing" in paper boxes is a good thing, and we think the claims are clearly patentable.

S. B., of Ill.—A liquid black varnish for stoves is sold in this market, and we presume you can find it in Chicago.

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.

NEW PUBLICATIONS.

AMERICAN WHEAT CULTURIST. A Practical Treatise on the Culture of Wheat, Embracing a brief History and Botanical Description of Wheat with Full Practical Details for Selecting Seed, Producing New Varieties, and Cultivating on Different Kinds of Soil. With Engravings. By Edwards Todd, Agricultural and Horticultural Editor of the New York *Times*, Author of the "Farmer's Manual," etc. New York: Taintor, Brothers & Company, 678 Broadway.

This is a book from the pen of a well-known writer on agricultural matters, and it must find favor with the large class of farmers engaged in wheat growing in this country. It is a good sign for the future that such books as this can be published with the certainty that they will be purchased and read. The age for decrying what has been contemptuously styled "book farming" has passed, and farmers are beginning to see that ignorance is neither honorable nor profitable. This work is a record of forty years of experience in wheat growing by a man who had power to observe facts and trace them to causes. The author, in his preface, modestly recommends the work to the perusal of young farmers; but we are confident there are many old farmers who might read the work with profit.

THE ELEMENTS OF TACHYGRAPHY. Illustrating the First Principles of the Art, with their Application to the Wants of Literary, Professional, and Business Men, Designed as a Text-Book for Classes, and for Private Instruction. By Phillip Lindsay. Boston: Otis Clapp, 3 Beacon street.

This is a system of short writing not intended to meet the wants of reporters, but to supply the want long felt of a very much less laborious system of writing than that now in vogue. The phonographic system, although beautiful, philosophical, and extremely rapid, requires a much longer time in acquisition than that offered in this work, and with the practice possible to most literary men cannot be made more available than Mr. Lindsay's system, while the latter is so simple that its acquisition requires only a few hours study. We have examined this work with much care, and are satisfied from our own experience in the intricacies of phonography that it offers a legible, easy, and rapid substitute for the ordinary system of writing which will avail to lighten the burdens of literary workers immensely. It is perhaps too much to hope that such a system can be speedily and generally adopted for business purposes, but its advantages to business men become obvious to all who peruse Mr. Lindsay's treatise.

THE RURAL CAROLINIAN. Walker, Evans & Cogswell, Charleston, S. C. Terms, $2 per annum.

This is one of the best agricultural monthlies that comes to this office. Every number contains some eighty pages and a number of well-executed engravings of agricultural implements, and of new varieties of fruits and flowers. Its editorial discussions on the treatment of lands for cotton and other crops, the economy of various fertilizers, the best mode of application of manures, etc., render the publication of great practical value to the farmer and planter. We commend it to the patronage of agriculturists both North and South.

AMERICAN CATTLE, their History, Breeding, and Management. By Lewis F. Allen, late President of the New York State Agricultural Society, Editor of the "American Short-Horn Hand-Book," Author of "Rural Architecture," etc.

This book is eminently practical in its character. The reputation of its author as a leading agriculturist, stock grower, and author, will recommend it at once to the favorable consideration of stock growers.

A TREATISE ON NAVAL ARCHITECTURE AND SHIP BUILDING, or an Exposition of the Elementary Principles Involved in the Science and Practice of Naval Construction. Compiled from Various Standard Authorities. By Commander Richard W. Meade, U. S. N. Philadelphia: J. B. Lippincott & Co.

This is a work intended as a text-book for the use of the students at the United States Naval Academy, but we are sure it must meet the wants of many professional as well as amateur constructors outside of naval schools. The work is elementary in character, and its matter has been collected from the highest authorities. Among these may be mentioned Scott Russell, Rankine, Murray, Knowles, Fairbairn, Fishbourne, Marrett, and Peake. The work is a large octavo, printed and illustrated in excellent style. As a work of reference it will be found a useful addition to any library of technical works.

MANUAL OF ASTRONOMY. With a familiar Explanation of Astronomical Instruments and the Best Methods of Using them. By John Drew, F.R.A.S., Doctor in Philosophy of the University of Bale, Author of "Chronological Charts Illustrative of Ancient History and Geography." Second Edition. Philadelphia: J. B. Lippincott & Co.

This little work, though simple and elementary in its character, is the work not only of a distinguished scientist, but an experienced and successful instructor. The main facts of the science are therefore not only presented, but presented in the best manner. Many of our readers who have addressed us inquiries on various astronomical subjects will find them answered in a plain and attractive manner in this work. The portion of the work devoted to the construction and use of astronomical instruments will be found of especial interest to those who are not versed in practical astronomy. It contains nothing calculated to puzzle the most ordinary reader, as the special design of the work, has been to render the rudiments of astronomical science accessible to all.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING NOV. 2, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
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In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

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A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
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The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them .... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

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Patent Solicitors, No. 37 *Park Row, New York.*

96,298.—SHOT POUCH.—A. F. Allen, Providence, R. I.
96,299.—HOISTING JACK.—Bruno Beuchel (assignor to himself and W. Rodiger), Kalamazoo, Mich.
96,300.—MODE OF MAKING THE BEDS OF BILLIARD TABLES.—W. B. Billings, Chicago, Ill. Antedated Oct. 29, 1869.
96,301.—MACHINE FOR SHAPING WOODEN TRAYS.—Henry Blake, Rindge, and A. J. Blake, Fitzwilliam, N. H.
96,302.—CHEESE BOX.—Frank Blecka, Elgin, Ill. Antedated Oct. 22, 1869.
96,304.—CENTRIFUGAL MACHINE.—J. F. Brinjes, Fieldgate street, Whitechapel, England.
96,305.—SAW.—Ira S. Brown and C. N. Brown (assignors to themselves and J. M. Gross), Providence, R. I.
96,306.—CORN SHELLER.—H. W. Cornell, Oswego, N. Y.
96,307.—PUMP.—W. N. Chamberlain, Van Buren, Mich.
96,308.—BOLT BLANK.—J. B. Clark, Plantsville, Conn.
96,309.—TEAPOT HANDLE.—L. C. Clark, Plantsville, Conn.
96,310.—THREAD HOLDER AND CUTTER.—J. Cleary, Brooklyn, N. Y. Antedated Oct. 16, 1869.
96,311.—HARVESTER.—Wm. Cogswell, Ottawa, Ill., assignor to himself and W. H. W. Cushman.
96,312.—MILLSTONE DRIVER.—Solomon Darkess, Deerfield, Ind.
96,313.—APPARATUS FOR COATING CEMENT PIPES.—Edwin Dayton, Meriden, Conn.
96,314.—STUMP EXTRACTOR.—Edwin Fales, Lancaster, Mo.
96,315.—APPARATUS FOR EXTRACTING OIL FROM FISH.—W. H. H. Gloker, Southold, N. Y.
96,316.—MECHANICAL MOVEMENT.—M. A. Hardy, Cambridge, Mass.
96,317.—CATTLE FOOD.—John T. Harris, Tyngsborough, Mass.
96,318.—AXLE AND SHAFT.—W. H. Hawley, Utica, N. Y.
96,319.—COMBINED CORN PLANTER AND CULTIVATOR.—J. C. Hazen, West Independence, Ohio.
96,320.—LOOM.—J. G. Henderson, Keokuk, Iowa.
96,321.—BLUING COMPOUND FOR THE MANUFACTURE OF PAPER.—James Hogben, Cleveland, Ohio.
96,322.—COMBINED CULTIVATOR AND SEED PLANTER.—D. E. Holt, Wilkinson county, Miss.
96,323.—CORN AND COTTON-SEED PLANTER.—D. E. Holt, Wilkinson county, Miss.
96,324.—TROCHE.—S. E. Johnson, Jr., Brooklyn, N. Y.
96,325.—SASH SUPPORTER.—Peter Keffer (assignor to himself, I. S. Hoyer, and S. A. Stout), Berks county, Pa.
96,326.—MEAT-CUTTING MACHINE.—Anton Kirn (assignor to himself and J. E. Krasselt), Buffalo, N. Y.
96,328.—HOT-AIR FURNACE.—W. H. Lee and C. M. Hardenbergh, Minneapolis, Minn.
96,329.—PUMP VALVE.—Thomas Ling, Hartford, Conn. Antedated Oct. 27, 1869.
96,330.—APPARATUS FOR PERFORATING PAPER FOR TELEGRAPHING.—George Little, Rutherford Park, N. J.
96,331.—APPARATUS FOR PERFORATING PAPER FOR TELEGRAPHING.—George Little, Rutherford Park, N. J.
96,332.—ELECTRO-MAGNETIC MOTOR.—George Little, Rutherford Park, N. J.
96,333.—AUTOMATIC TELEGRAPHIC APPARATUS.—Geo. Little, Rutherford Park, N. J.
96,334.—GANG PLOW CULTIVATOR.—H. P. McCleave, Tomales, Cal.
96,335.—HOT-AIR ENGINE.—Thos. McDonough, Newburgh, N. Y.
96,336.—REFLECTOR.—Samuel Meadows (assignor for one half to T. K. Morgan), Toronto, Canada.
96,337.—AXLE BOX.—David Metz, Washington, D. C.
96,338.—OVEN.—G. R. Moore, Philadelphia, Pa.
96,339.—SHEARS.—B. W. Nichols (assignor to Canton Malleable Iron Co.), Canton, Ohio.
96,340.—APPARATUS FOR MEASURING LIQUIDS.—P. Noyes, Lowell, Mass.

96,341.—Elevated Railway.—Augustus Olcott, Elizabeth, N. J.
96,342.—Fireplace Grate.—James Old, Pittsburgh, Pa.
96,343.—Creasing Attachment for Sewing Machines.—Charles Page, Boston, Mass.
96,344.—Cultivator.—F. L. Perry, Canandaigua, N. Y.
96,345.—Solid or Dry Extract of Bark for Tanning etc.—John Pickles, Wigan, England, assignor to James Foley, John T. Harris, and W. W. Harris, Montreal, Canada.
96,346.—Bed Bottom.—J. D. Pratt, Cleveland, Ohio.
96,347.—Seed Sower.—T. J. Price, Macomb, Ill.
96,348.—Self-Lubricating Axle Box.—S. S. Putnam, Dorchester, Mass.
96,349.—Thill Coupling.—S. S. Putnam, Neponset, Mass.
96,350.—Harvester.—Amos Rank, Salem, Ohio.
96,351.—Harvester.—Amos Rank, Salem, Ohio.
96,352.—Harvester.—Amos Rank, Salem, Ohio.
96,353.—Harvester Rake.—Amos Rank, Salem, Ohio.
96,354.—Circulating Grate for Steam Generators.—James Braden, Indianapolis, Ind., administrator of the estate of James Scanlan, deceased.
96,355.—Floor Set.—C. M. Shaw, Portland, Me. Antedated Oct. 22, 1869.
96,356.—Folding Bedstead.—Gerard Sickels, Boston, Mass.
96,357.—Column or Tube.—Frederick H. Smith, Baltimore, Md.
96,358.—Perforated Wearing Apparel.—H. E. Smith, New York city.
96,359.—Clothes Mangle.—H. E. Smith (assignor to Mary Jane Smith), New York city. Antedated Oct. 16, 1869.
96,360.—Clothes Mangle.—H. E. Smith (assignor to Mary J. Smith), New York city. Antedated Oct. 22, 1869.
96,361.—Clothes Mangle.—H. E. Smith (assignor to Mary J. Smith), New York city. Antedated Oct. 22, 1869.
96,362.—Railway Cattle Car.—J. W. Street, Marshalltown, Iowa.
96,363.—Window Screen.—J. A. Thorn, Chicago, Ill.
96,364.—Apparatus for Carbureting and Applying Air for Lighting and Heating.—Joel Tiffany, Albany, N. Y.
96,365.—Making Tanning and Dyeing Extracts.—B. C. Tilghman, Philadelphia, Pa. Antedated Oct. 30, 1869.
96,366.—Pencil Attachment to Compass.—C. L. Tyler, Ithaca, N. Y.
96,367.—Ring-Stopper Nipper.—Calvin Wardwell (assignor to himself and H. H. Coe), Painesville, Ohio.
96,368.—Steam Water Elevator.—J. D. Warner, Brooklyn, N. Y.
96,369.—Lock.—H. B. Weaver, Hartford, Conn.
96,370.—Potato Digger.—G. W. B. Yocom, R. J. Walker, and Elias Sharp, Arcata, Cal.
96,371.—Compound for the Cure of Cancer.—Mortimer Williams, Middletown, Ohio.
96,372.—Machine for Threading Bolts, etc.—J. B. Wiggenhorn, St. Louis, Mo.
96,373.—Cartridge.—Friedrich Wohlgemuth, New York city.
96,374.—Manufacture of Carbonate of Soda.—Otto Wuth, Pittsburgh, Pa.
96,375.—Railway Car Brake.—G. W. B. Yocom and Edward Cowan, Arcata, Cal.
96,376.—Combination Lock.—Moses Adams, Chilmark, Mass.
96,377.—Weather-Boarding.—J. C. Anderson, Webster, Pa.
96,378.—Machine for Grinding Seats of Valves.—W. H. Anderson, Brooklyn, N. Y.
96,379.—Cultivator.—W. T. Baker, Lancaster, Texas.
96,380.—Safety Can.—M. H. Barnes, assignor to himself and E. P. Sloan, Peoria, Ill.
96,381.—Machine for Wiring Blind Slats, etc.—Peter Barry, Newark, N. J.
96,382.—Cultivator.—E. C. Bean and F. N. Welden, Rockford, Ill.
96,383.—Fastening Plowshares to Plowstocks.—W. G. Beckwith, Lowndesborough, Ala.
96,384.—Ironing Board.—C. H. Bennett and W. A. Daggett, South Vineland, N. J.
96,385.—Apparatus for Emptying Privy Vaults.—J. G. Berger, Nuremberg, Bavaria.
96,386.—Portable Fire Wall.—J. F. Bishop, Afton, Iowa.
96,387.—Spectacle.—Louis Black, Detroit, Mich.
96,388.—Fertilizer Attachment for Plows.—J. I. Boswell, Christiansville, Va.
96,389.—Lubricator.—John Broughton, New York city.
96,390.—Milk Cooler.—A. P. Bussey, Westernville, N. Y.
96,391.—Copy Holder.—J. S. Butler, Silver City, Idaho Territory.
96,392.—Sap Feeder.—G. D. Chandler, West Concord, Vt.
96,393.—Furniture Caster.—Stephen Chandler, New York city. Antedated September 21, 1869.
96,394.—Faucet.—W. P. Clark, Medford, Mass.
96,395.—Apparatus for Transmitting Rotary Motion.—Melville Clemens, Springfield, Mass.
96,396.—Child's Carriage and Velocipede Combined.—J. C. Cline, Philadelphia, Pa.
96,397.—Washing Machine.—J. D. Conner, Bloomington, Ill.
96,398.—Hatchway Guard.—H. H. Covert, New York city.
96,399.—Plow.—M. C. Cox, Bennettsville, S. C.
96,400.—Cut-Off-Valve Gear.—William Dawes, Kingston Grove, Leeds England. Patented in England Jan. 5, 1869.
96,401.—Machine for Making Eyelets.—Adolph Delkescamp, Brooklyn, E. D., N. Y., assignor to J. D. Bacon for one third, and John North for one third.
96,402.—Grinder for Harvester-Cutters.—W. B. Deuel, Ithaca, N. Y.
96,403.—Machine for Threading Bolts.—C. E. De Valin, Baltimore, Md.
96,404.—Propelling Small Boats.—Virgil Dresser, Leavenworth, Kansas.
96,405.—Process of Restoring and Preserving Decaying Railroad Ties.—William Dripps, Coatesville, Pa.
96,406.—Shaft Coupling.—W. P. Dugdale, Goshen, Ind. Antedated Oct. 30, 1869.
96,407.—Step for Vertical Spindle.—B. F. Dunklee, Concord, N. H., assignor to A. S. Gear, New Haven, Conn.
96,408.—Lifting Jack.—J. H. Edward, Polo, Ill. Antedated Oct. 22, 1869.
96,409.—Process of Producing Carbon Pigments.—Alonzo Farrar, Boston, Mass.
96,410.—Tag.—S. B. Fay, New York city.
96,411.—Self-Supporting Fence.—Thomas Flinn, Birmingham, Mich.
96,412.—Soles of Rubber Boots and Shoes.—Francis Flynn, Woonsocket, R. I.
96,413.—Washing Machine.—L. P. Follett, Clifton Springs, N. Y.
96,414.—But-Hinge.—C. H. Foster, San Francisco, Cal.
96,415.—Instrument for Conveying Medicine to Diseased Parts.—P. J. Frank, Ashford, N. Y.
96,416.—Ax.—Joseph Franklin (assignor to himself and Joseph Whitely), Springfield, Ohio.
96,417.—Snap Hook.—R. L. Fraser, Westernville, N. Y.
96,418.—Snap Hook.—R. L. Fraser, Westernville, N. Y.
96,419.—Mechanical Movement.—D'Alembert T. Gale, Poughkeepsie, N. Y.
96,420.—Base Burning Cooking Range.—J. B. Gardner, New York city.
96,421.—Tobacco Prize.—C. T. Gilmor, Baltimore, Md.
96,422.—Tobacco Press.—C. T. Gilmor, Baltimore, Md.
96,423.—Rendering Animal Fat.—H. E. Gotleb, New York city, assignor to Henry Winslow.
96,424.—Metallic Frame for Music Stand.—William M. Greenwood and Benoit Roux (assignors to M. Greenwood & Co.), Cincinnati, Ohio.
96,425.—Horse Hay Rake.—P. M. Gundlack, Belleville, Ill.
96,426.—Tool Post.—Fayette Hardenbergh, Providence, R. I.
96,427.—Oil Cup for Movable Bearings.—Dennis Harrigan, Somerville, assignor to John W. Wiggins, Boston, Mass.
96,428.—Railway Supply Apparatus.—David Harrison, Fayette, Miss.
96,429.—Cooking Stove.—Charles W. Hermance, Schuylerville N. Y.
96,430.—Chimney Cowl.—Edward Hewett, St. Leonard's-on-sea, England.
96,431.—Metal Sleigh Runner.—Daniel Holdiman, Waterloo, Iowa.
96,432.—Turbine Water Wheel.—D. O. Holman, Adams, N. Y.
96,433.—Wooden Pavement.—Lawrence Holms, Paterson, N. J.
96,434.—Carriage Seat.—Gilbert L. Hudson, Romeo, Mich.
96,435.—Fence.—George W. Hunter, Versailles, Ind.
96,436.—Gate.—John H. Hunter, Versailles, Ind.
96,437.—Salve.—Theodore Jarvis, New York city.
96,438.—Method of Uniting Artificial Teeth on Rubber Bases to Metallic Plates.—Elijah K. Jenner, Healdsburg, Cal.
96,439.—Hulling Machine.—Charles Jordan, East Bridgewater, Mass.
96,440.—Tin Can.—Roswell Judson and John P. Schenck, Jr., Matteawan, N. Y.
96,441.—Gas Burner.—Wesley L. Jukes (assignor to himself, Frederick McLewee, Prentice H. Putnam, and Bronson Murray), New York city.
96,442.—Case and Sample Card for Spooled Silk, etc.—Wm. G. Kelly, Oneida, N. Y.
96,443.—Stilt.—Lewis A. Kimberly, New Haven, Conn.
96,444.—Shingle Machine.—Samuel M. King, Lancaster, Pa.
96,445.—Copy Holder for Printers.—Horace W. Knight, Seneca Falls, N. Y.
96,446.—Spring Bed Bottom.—F. F. Lahm, Chicago, Ill.
96,447.—Screw Cap for Can.—Alexander N. Lapierre, New York city.
96,448.—Machine for Making Hoops.—Wm. Lawyer, Macomb, N. Y.
96,449.—Compound Wheel and Axle.—Benjamin F. Leet, Dayton, Nevada.
96,450.—Sawing Machine.—Joseph F. Lettellier and Adolph Leitelt, Grand Rapids, Mich.
96,451.—Clamp for Butter Firkins.—D. M. Lockridge, Otto, N. Y.
96,452.—Shoe for Cripples.—Henry S. Loper (assignor to himself and Henry S. Parsons), New Haven, Conn.
96,453.—Leather Punch.—John Lyle, Newark, N. J.
96,454.—Water Wheel.—Myron H. Matson, Horseheads, N. Y.
96,455.—Packing Auger and Spiral Conveyer.—J. Mattison, Oswego, N. Y.
96,456.—Truss.—G. Mayer, Sullivan, Ill.
96,457.—Horse-power Engine for Extinguishing Fires.—John C. McCarthy, New York city.
96,458.—Machine for Making Chair Seats.—Joseph C McCormick (assignor to himself and George Stiteler), Smicksburg, Pa.
96,459.—Bag Tie.—John C. Meloy, Hastings, Minn. Antedated October 23, 1869.
96,460.—Rectum Supporter.—Samuel P. Mervine, Jr., Philadelphia, Pa., assignor to himself and W. W. Lower, Washington, D. C.
96,461.—Carpet-beating Machine.—Loran Miner, San Francisco Cal.
96,462.—Hay Loader.—Benjamin J. Moore, Dresbach, Minn.
96,463.—Steam Engine Puppet Valve.—George F. Morse, Portland, Me.
96,464.—Implement for Destroying Quack Grass.—Chas. W. Moseley, Onondaga, N. Y.
96,465.—Compound for Priming Electric Fuses.—George M. Mowbray, Titusville, Pa.
96,466.—Velocipede.—Bernard H. Muehle (assignor to himself and Nicholas Jones), Buffalo, N. Y. Antedated October 30, 1869.
96,467.—Lathe Bath and Sponge Holder for Dentists' Use.—D. Murliess, Holyoke, Mass.
96,468.—Plant Protector.—H. K. Nelson, Penn Yan, N. Y.
96,469.—Mold for Welding Steel to Iron.—George Nock, New Monmouth, N. J., assignor to himself and Zadock Street, Salem, Ohio.
96,470.—Door Spring.—E. D. Norton, Cuba, N. Y.
96,471.—Apparatus for Drying Lumber.—F. I. Norton, Fremont, Ohio.
96,472.—Apparatus for the Discharge and Preparation of Granular Ore and Coal, and Similar Materials.—Peter Osterspey, Mechernich, Prussia, assignor to Adolphus Meier & Co., St. Louis, Mo.
96,473.—Wash Boiler.—H. Packer and G. W. Packer, Sandwich, Ill.
96,474.—Horse Hay Fork.—James A. Park, Lansing, Mich., assignor to himself and Wm. Woodhouse.
96,475.—Pump.—A. N. Parkhurst, Knoxville, Ill.
96,476.—Smut Mill.—Daniel Pease, Floyd, N. Y.
96,477.—Mode of Purifying Rancid Butter.—Calvin Peck, Marshall Ill.
96,478.—Cut-off for Pipes.—James H. Perkins, Omaha, Nebraska.
96,479.—Melting and Decarbonizing Iron.—Chas. Peters, Trenton, N. J.
96,480.—Printing Press.—James N. Phelps, Brooklyn, N. Y., signor to himself and Joseph Bayley, New York city.
96,481.—Dumping Car for Grading.—William Price, Cincinnati, Ohio.
96,482.—Device for Removing Dust from Threshing Machines.—Era Rose, Vernon, Ind.
96,483.—Apparatus for Turning the Leaves of Music.—Isaac M. Ross, Petersburg, Ind.
96,484.—Shovel and Tongs Stand.—Benoit Roux (assignor to M. Greenwood & Co.), Cincinnati, Ohio.
96,485.—Coal Stove.—George D. Sanford, Peekskill, N. Y. Antedated May 2, 1869.
96,486.—Water Cooler and Refrigerator.—Charles C. Savery, Philadelphia, Pa.
96,487.—Bread and Cake Receptacle.—Charles C. Savery (assignor to Barrows, Savery & Co.), Philadelphia, Pa.
96,488.—Electro-magnetic Gas-lighting Apparatus.—A. W. Scharit, St. Louis, Mo., L. A. Hudson, Syracuse, N. Y., and Darius Lyman, Parkman, Ohio.
96,489.—Ice Cream Freezer.—Paul Schumacher, New York city.
96,490.—Fruit Jar.—H. E. Shaffer, Rochester, N. Y.
96,491.—Paper Collar Machine.—Samuel Shepherd, Nashua N. H.
96,492.—Machine for Punching Metals.—H. A. Shipp, London, England, assignor to himself and Abner A. Griffing, New York city.
96,493.—Door Spring.—Joseph Simpson, Newark, Ohio.
96,494.—Draft Regulator.—James J. Smith, and Samuel Wood, Cleveland, Ohio.
96,495.—Ladder.—Martin Luther Smith, Battle Creek, Mich.
96,496.—Catarrh Remedy.—John Snow, Grand Rapids, Mich.
96,497.—Cooking Stove.—Asa Snyder, Richmond, Va.
96,498.—Railroad Car Heater.—Frank J. Steinhauser and Henry M. Shreiner, Lancaster, Pa.
96,499.—Balance Slide Valve.—William M. Stevenson, Sharon, Pa.
96,500.—Cattle Car.—Zadok Street, Salem, Ohio.
96,501.—Railroad Car Ventilator.—Overton J. Styner and John Egan, LaFayette, Ind.
96,502.—Wheel.—Edwin Swasey, Milford, Mass.
96,503.—Harvester Cutter.—J. M. Taft, Arcadia, Wis.
96,504.—Car Seat.—A. D. Tate, Peekskill, N. Y.
96,505.—Bitstock.—O. H. Taylor, Brooklyn, N. Y. Antedated Oct. 28, 1869.
96,506.—Butter Package.—J. Thayer, Palmyra, Wis.
96,507.—Window.—Levi Till (assignor to himself, B. W. Wells, and J. C. Butler), Sandusky, Ohio.
96,508.—Hand Stamp.—J. C. Tone and H. A. Clum (assignors to T. W. Tone), Rochester, N. Y.
96,509.—Culinary Boiler.—J. S. Totten, Lebanon, Ohio.
96,510.—Corn and Fertilizer Dropper.—A. Towberman and John Keys, Washington, Ill.
96,511.—Clothes Wringer.—Ambrose Tower, New York City.
96,512.—Washboard and Wringer Frame.—A. Tower, New York city.
96,513.—Land Roller.—E. A. Uehling, Richwood, Wis.
96,514.—Car Coupling.—M. Van Slyke and D. W. Wood, Rome N. Y.
96,615.—Wood Pulping Machine.—Heinrich Voelter, Heidenheim, Wurtemberg.
96,516.—Broom and Brush Holder.—B. D. Wallace, Boston, Mass.
96,517.—Hay Fork.—E. W. Walton and A. J. Brown (assignors to Matteson & Williamson), Stockton, Cal.
96,518.—Steam Culinary Vessel.—Cyrus Waterman, Providence, R. I.
96,519.—Faucet.—William Weaver, Nashua, N. H.
96,520.—Weighing Scale.—John Weeks, Buffalo, N. Y., assignor to himself and Buffalo and Niagara Scale Works.
96,521.—Bale-tie Lock.—Jay Wheelock, San Francisco, Cal.
96,522.—Water-wheel Governor.—J. A. Whitman, Auburn, Me.
96,523.—Ornamental Covering for Floors, Walls, etc.—Henry Whittemore, New York city.
96,524.—Process of Refining the Waste from German Silver and other Metals.—Frederick Wilcox, Waterbury, assignor to H. B. Wilcox, Portland, Conn. Antedated Oct. 29, 1869.
96,525.—Process of Utilizing the Waste formed in Cleaning Copper and Brass Goods.—Frederick Wilcox, Waterbury, assignor to H. B. Wilcox, Portland, Conn. Antedated October 29, 1869.
96,526.—Passenger Register for Street Cars.—W. W. Willis, Chicago, Ill. Antedated Oct. 30, 1869.
96,527.—Oiler Holder for Sewing Machine.—A. Wilmot, Cleveland, Ohio.
96,528.—Shampooing Apparatus.—M. L. Winn, San Francisco, Cal.
96,529.—Sleigh Brake.—Judson Wolfe and Wilson Wolfe, Harveyville, Pa.
96,530.—Ribbon Case.—George F. Woolston, Marshalltown, Iowa.
96,531.—Knitting Machine.—Henry C. Work, Philadelphia, Pa.
96,532.—Fire Kindler.—J. A. Fuller, Rockford, Ill.
96,533.—Extension Table Slide.—Albert H. Shipman, Arcadia, N. Y.

REISSUES.

11,711.—Calendar Clock.—Dated Sept. 19, 1854; extended seven years; reissue 3,694.—William H. Akins and Joseph C. Burritt, Ithaca, N. Y.
44,273.—Corn Planter.—Dated Sept. 20, 1864; reissue 3,695.—J. Armstrong, Jr., Elmira, Ill.
Design 2,792.—Trade Mark.—Dated Oct. 1, 1867; reissue 3,696.—Thos. Bakewell, Pittsburgh, Pa.
88,1 1.—Auxiliary Table.—Dated March 22, 1869; reissue 3,697.—James Blake and George Blake, Scranton, Pa., assignees of James Blake.
75,623.—Egg Carrier.—Dated March 17, 1868; reissue 3,698.—A. H. Bryant, Philadelphia, Pa.
81,059.—Breech-loading Fire-arm.—Dated Aug. 11, 1868; reissue 3,699.—Bethel Burton, Brooklyn, and W. G. Ward, New York city, assignees of Bethel Burton.
86,661.—Horse Hay Fork.—Dated Feb. 9 1869; reissue 3,700.—Elliott P. Gleason, New York city, assignee of Benjamin F. Gladding.
94,689.—Roofing.—Dated Sept. 7, 1869; reissue 3,701.—R. K. Kille, Mount Holly, N. J.
79,981.—Press and Strainer.—Dated June 16, 1868; reissue 3,702.—J. H. Littlefield, Cambridge, Mass.
94,365.—Dressing Saw Teeth.—Dated Nov. 24, 1868; reissue 3,703.—John Lough, Buckingham village, Quebec.
83,401.—Stovepipe Elbow.—Dated Oct. 27, 1868; reissue 3,704.—H. B. Morrison, for himself, and C. L. Morrison, assignee, by mesne assignments, of H. B. Morrison, Le Roy, N. Y.
34,316.—Plow Coupling.—Dated Feb. 4, 1862; reissue 1,598, Dated Jan. 5, 1864; reissue 3,705.—Geo. Owen, Jacksonville, Ill.
90,333.—Composition for Stuffing Leather.—Dated May 25, 1869; reissue 3,706.—Division 1.—Samuel B. Pierce, Samuel S. Johnson, Robert Andrews, and R. N. Austin, Milwaukee, Wis., assignees of Robert Andrews.
90,333.—Process of Treating Tar for the Manufacture of Stuffing for Leather.—Dated May 25, 1869; reissue 3,707.—Division 2.—S. B. Pierce, S. S. Johnson, Robert Andrews, and R. N. Austin, Milwaukee, Wis., assignees of Robert Andrews.
60,938.—Plow.—Dated Jan. 1, 1867; reissue 3,708.—F. F. Reynolds, Bethany, for himself, and J. H. Hines, Davisborough, Ga., assignee of F. F. Reynolds.
32,255.—Mode of Making the Skeins of Axle Arms for Carriages.—Dated May 7, 1861; reissue 3,709.—Gottlieb Schreyer, Columbus, Ohio.
74,252.—Fruit Frame.—Dated Feb. 11, 1868; reissue 3,710.—Chester Stone, Ravenna, Ohio.
25,992.—Apparatus for Cooling Beer and other Liquids.—Dated Nov. 1, 1859; antedated April 13, 1856; reissue 1,267, dated Jan. 28, 1862; reissue 3,711.—G. B. Turrell, New York city, assignee, by mesne assignments, of J. L. Baudelot.
75,500.—Device for Weaving Chair Seats.—Dated March 10, 1868; reissue 3,712.—G. A. Watkins, Proctorsville, Vt.

DESIGNS.

3,731.—Plate of a Stove.—S. W. Gibbs, Albany, N. Y.
3,732.—Door Knob and its Rose.—Wm. Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
3,733.—But Hinge.—Wm. Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
3,734.—Rack Pulley.—C. F. Hager, Buffalo, N. Y.
3,735 and 3,736.—Stove.—Conrad Harris and P. W. Zoiner, Cincinnati, Ohio. Two patents.
3,737.—Cylinder Stove.—Conrad Harris and P. W. Zoiner, Cincinnati, Ohio.
3,738.—Suspended.
3,739.—Ornamental Bridle Bit.—Louis Rommeiks, Newark, N. J.
3,740.—Cook Stove.—N. S. Vedder and Francis Ritchie (assignors to G. H. Phillips & Co.), Troy, N. Y.
3,741.—Trunk Cover.—N. B. Williams, New York city.

EXTENSIONS.

Refrigerators.—D. W. C. Sanford, of New Orleans, La.—Letters Patent No. 13,802, dated Nov. 13, 1855; reissue No. 455, dated April 21, 1857.
Sewing Machine.—L. W. Langdon, of Northampton, Mass. Letters Patent No. 13,727, dated Oct. 30, 1855.
Roofing Composition.—Jas. West, of Syracuse, N. Y.—Letters Patent No. 13,783, dated Oct. 30, 1855; reissue No. 491, dated September 8, 1857.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,906.—Permanent Way of Railways.—D. R. Pratt, Worcester, Mass. October 6, 1869.

2,908.—Washing Machine.—Wm. Hewes, Toronto, Canada. October 6, 1869.

2,917.—Parlor Skates.—W. P. Gregg, Boston, Mass. Oct. 7, 1869.

2,928.—Apparatus for Distilling Potable Water.—H. Wainwright New York city. October 8, 1869.

2,997.—Railway Carriage Wheel.—Z. Washburne, of the State of Massachusetts. October 14, 1869.

3,006.—Chain-Cable Stopper.—J. J. Emery, South Thomaston, and P Thurston, Rockland, Me. October 15, 1869.

3,025.—Manufacture of Iron and Steel.—J. Player, Philadelphia, Pa October 16, 1869.

APPLICATIONS FOR EXTENSION OF PATENTS.

Eccentric Explosive Shells.—Wm. W. Hubbell, of Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Jan. 3 1870.

Machines for Cutting Flocks and Paper Stock.—J. N. Pitts, Blackstone, Mass., has applied for an extension of the above patent. Day of hearing January 10, 1870.

Apparatus for Heating Buildings by Steam.—Stephen J. Gold, of West Cornwall, Conn., has petitioned for an extension of the above patent. Day of hearing Jan. 12, 1869.

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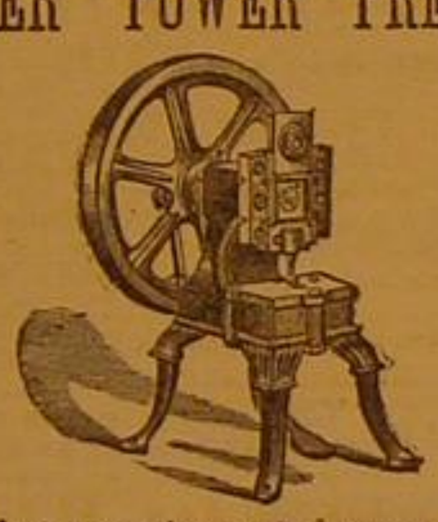

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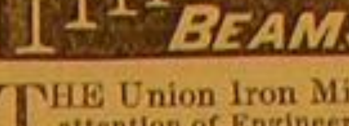

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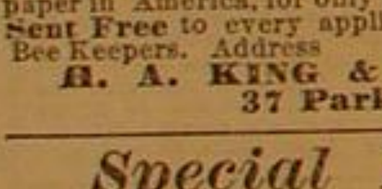

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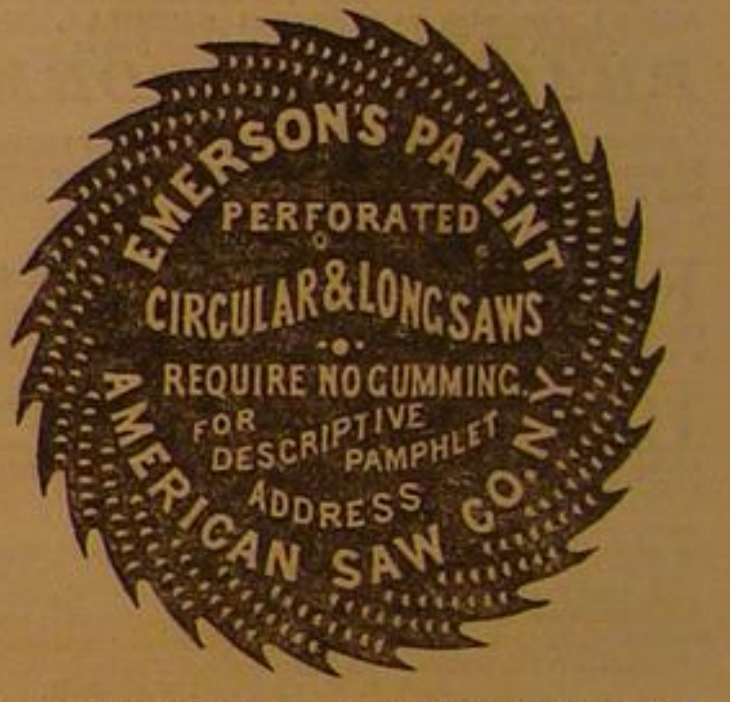

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Vol. XXI.---No. 22. [NEW SERIES.] | NEW YORK, NOVEMBER 27, 1869. | $3 per Annum. [IN ADVANCE.]

Dressing Millstones by the Use of the Diamond.

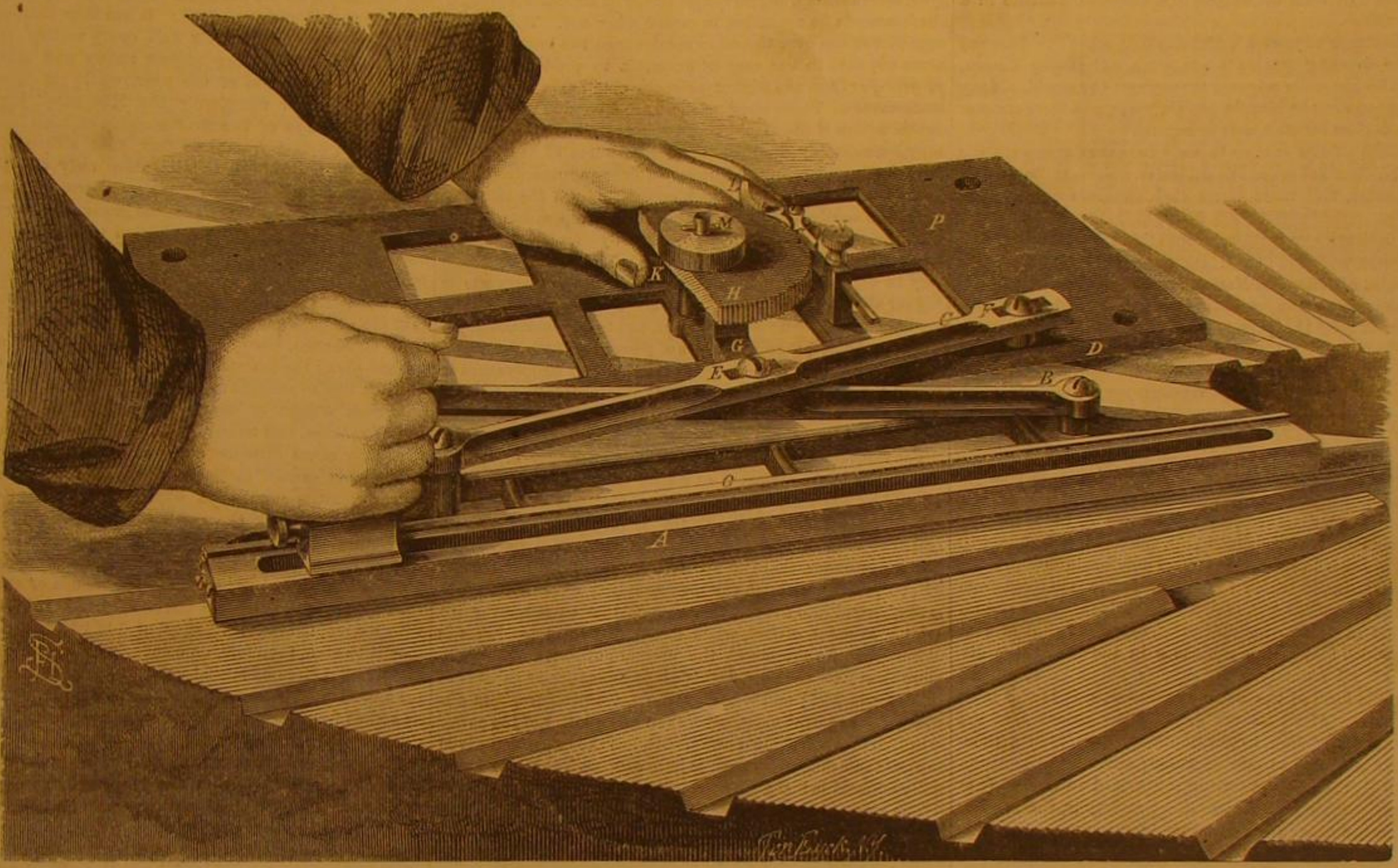
In an article, entitled "Diamonds and their Uses in the Mechanic Arts," published on page 49, current volume, we promised our readers an illustration and description of a very effective machine for dressing millstones by the use of the diamond, invented by Mr. John Dickinson, of New York city, and patented 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.

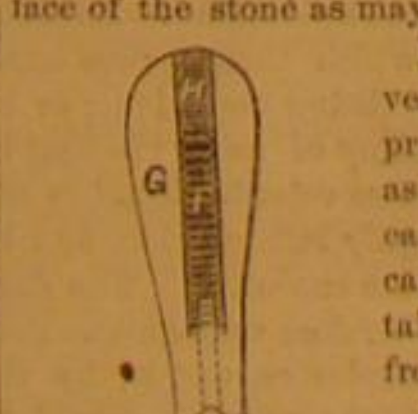
Diamonds set in an ordinary stem or ferule, were tried many years ago in Europe (and recently in this country) for producing lines upon millstones, and the millers were perfectly satisfied that the finest and most effective dress was attained by merely gliding the diamond lightly over the stone. The 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.

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 59° 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 atmosphere, 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

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."

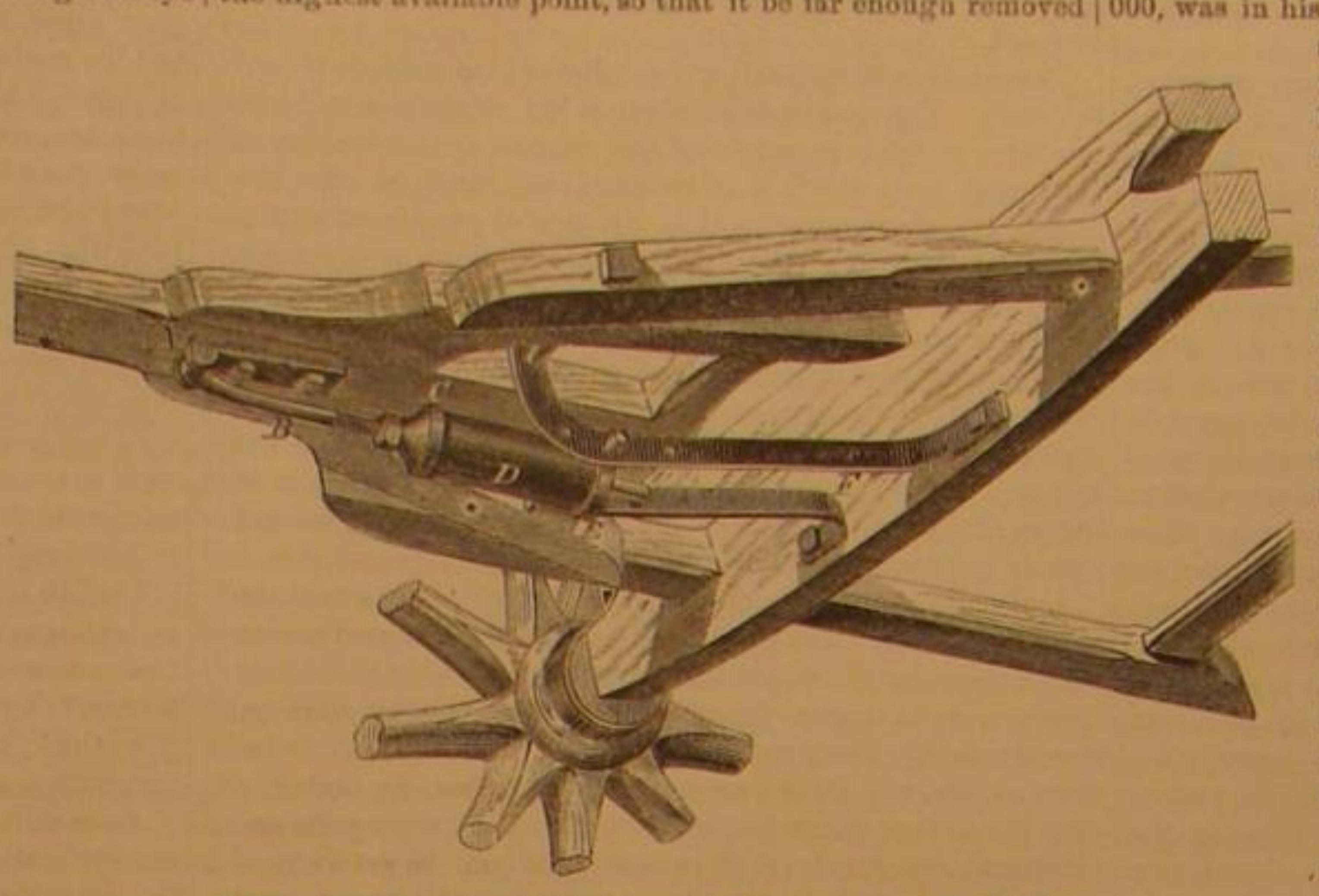
Improved Wagon Tongue.

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 lumping, 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.



ALEXANDER'S IMPROVED WAGON TONGUE.

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 Kweichow 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."

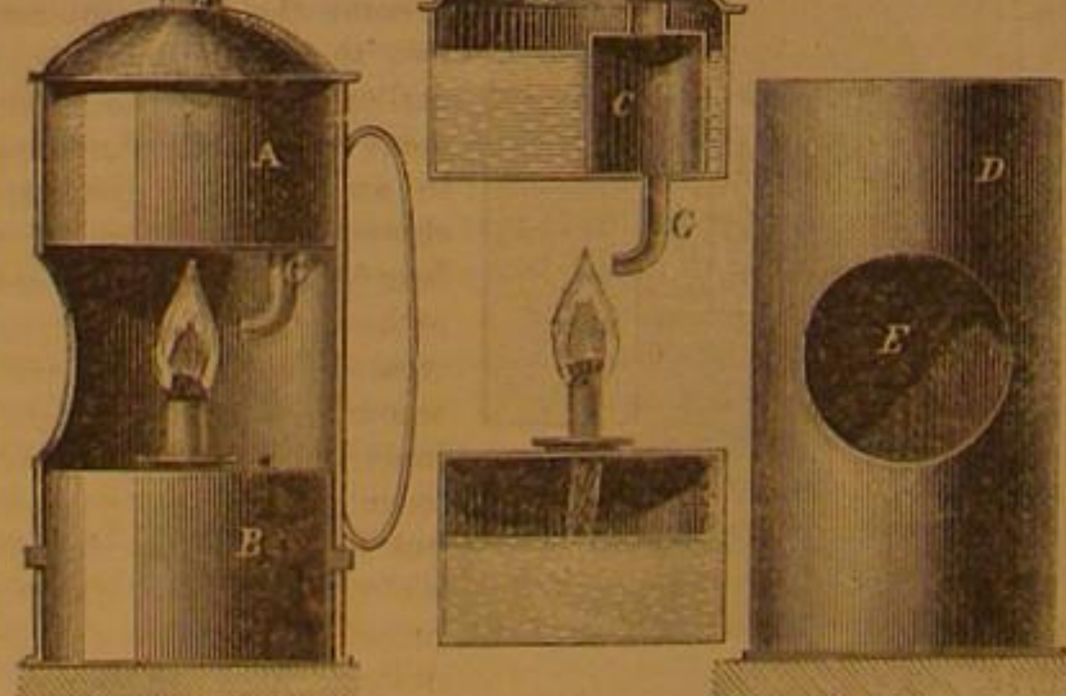
How, then, is this enemy so subtile and deadly to be dealt with? Most sanitarians have but one reply—put efficient traps and shut out the gas.

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.*

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 Kidderminster. 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

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 pressure 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.

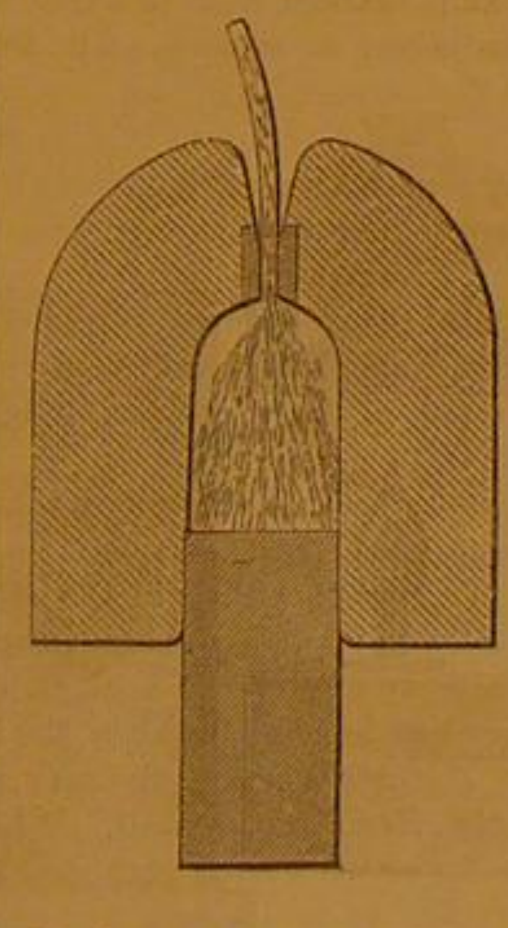
For a number of years the flowing property of the softer solid metals, such as lead and tin, has been taken advantage of very extensively, in the squirting of pipes and otherwise; and for thousands of years the malleable and ductile metals have been under treatment by man, and a vast number of facts 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.

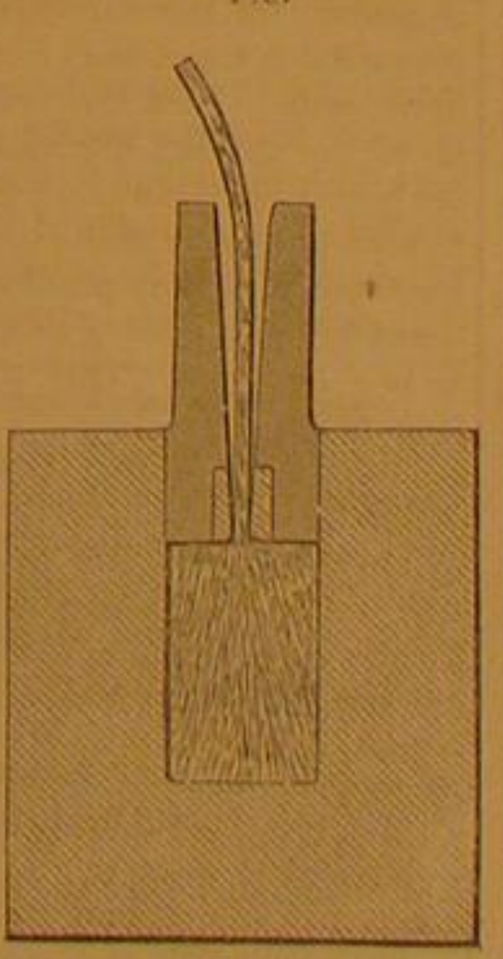
The diagram (Fig. 1) will explain the nature of apparatus which is employed to squirt these metals when in the solid state. It is a powerful syringe filled with solid metal, with pressure on the piston varying according to the dimensions; in some the force required is two thousand tuns. In the earlier 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.



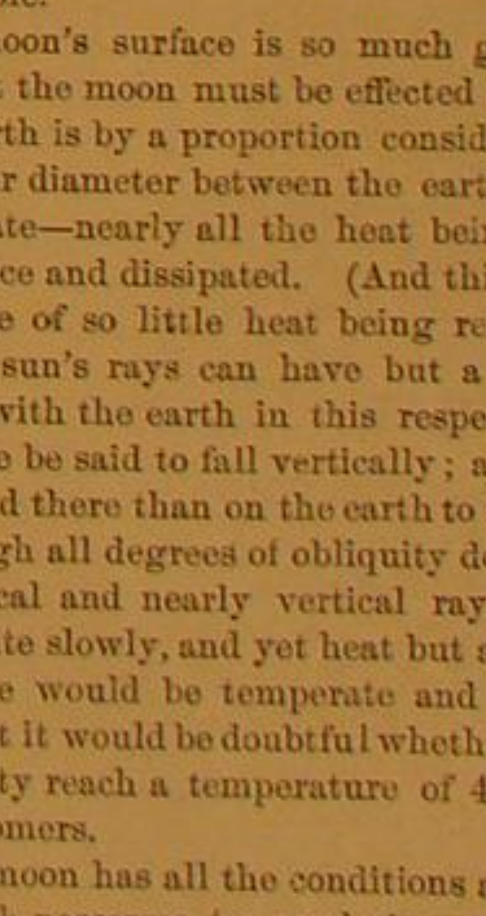
Pipes are made with the same facility as rods, by the mere insertion of a steel pin, the size of the required bore, placed in the bottom of the cylinder, and exactly in the center of the orifice, thus forming an annular space through which the metal flows outward as a continuous pipe; or, by making this 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

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 $22, 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 Gerand 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

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.

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

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

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

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

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

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

Facts about Varnishes.

From the Hub.

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

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

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

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

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

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

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

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

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

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

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

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

Improved Awning.

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

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

MILLER & McCLELLAN'S IMPROVED AWNING.

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

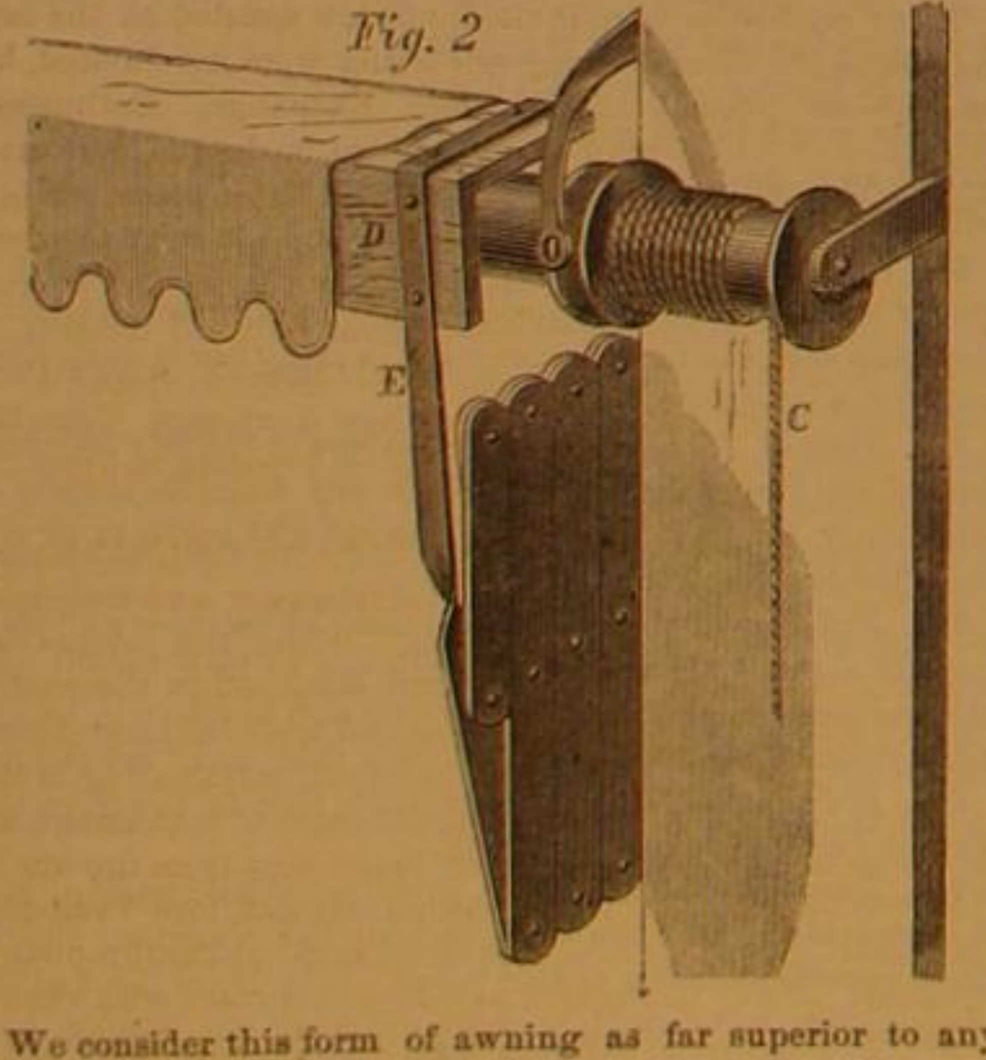
The frame is formed of two lazy tongs, shown extended in Fig. 1, and folded at A, Fig. 2. A coiled spring on each side, one of which is shown at B, Fig. 1, exerts a force sufficient to keep the lazy tongs extended when no resistance is offered to its action. A cord, C, Figs. 1 and 2, is wound upon the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

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

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

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

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.

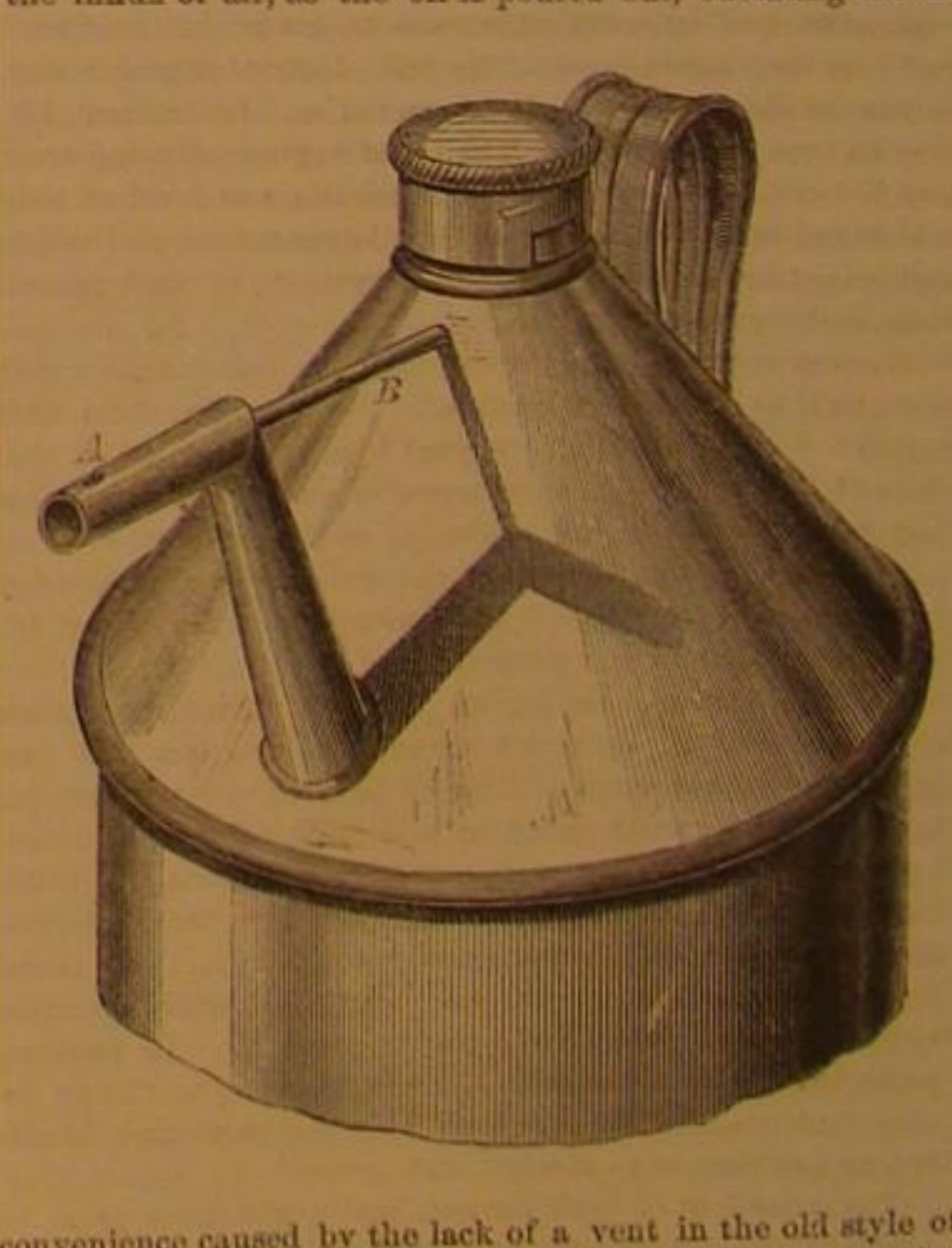
How to Choose a Steam Engine.

"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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VOL. XXI., No. 22...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, NOVEMBER 27, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

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-

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

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.

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 t o 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 n 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 .0,000 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 advertisemets 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 ot 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 tubular 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. Scank, 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 disturbed 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 York city.—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

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 tae 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 consists, first, in an arrangement upon a truck of two or more wheels, of two or more hoes or spades moving to and from the row, as the machine moves along by motion derived from the truck wheels, so as to scrape or hoe the earth up to the roots of the plants, the said spades or hoes being raised 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.

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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.

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.—Benendikt 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 him self 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. Octobe 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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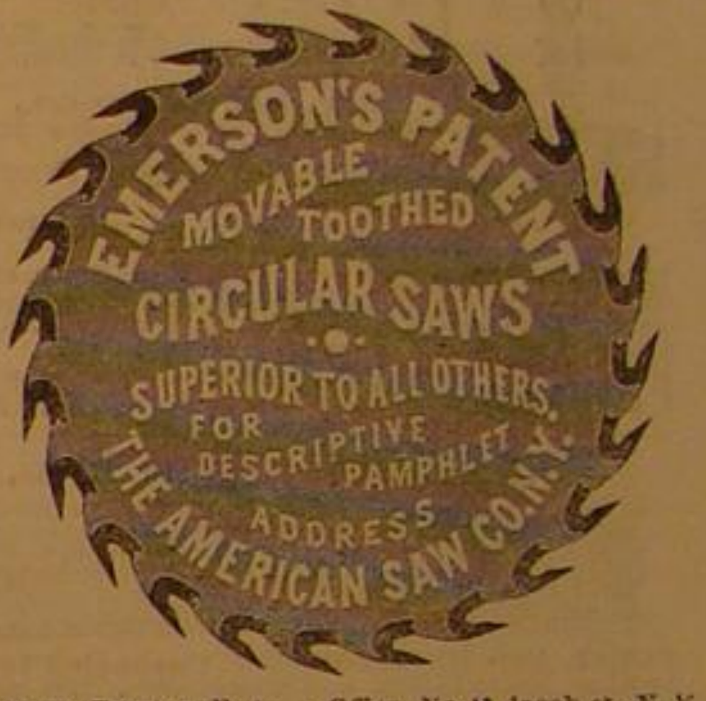

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Improvement in Battery Guns.

The accompanying engraving represents an improved ten barreled gun, recently manufactured at Colt's Armory, Hartford, Conn., under the supervision of R. J. Gatling, the inventor.

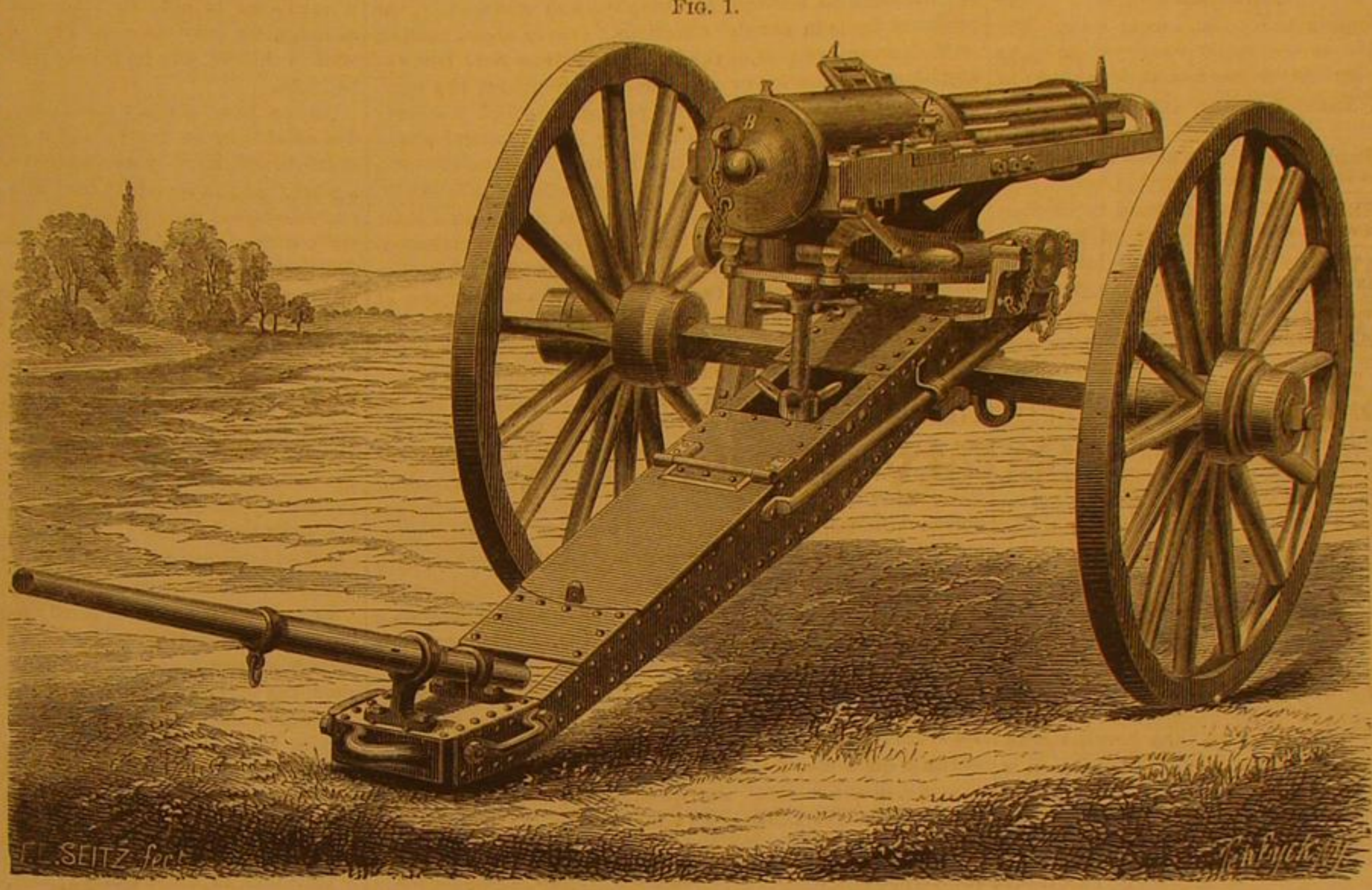
In this new gun there are many improvements upon the one published on page 17, Vol. XVI., of this journal.

First. The lock mechanism has been greatly strengthened and improved, and an adjustable plug, as shown at B, provides a means for taking out and putting in the locks, without taking the gun apart. By this arrangement, an old lock can be taken out and a new one, if desired, inserted in a few seconds.

Second. The gun has also a new cocking device, operated by a knob, shown at C, by the simple turning of which the gun is kept from being snapped when it is revolved while not in service; but in an instant, when desired, the gun can be made to snap or fire by simply reversing the position of the knob which operates the cocking device.

Third. The mode of feeding the cartridges to the gun has also been greatly improved by the use of automatic feed cases from which cartridges are fed to the gun through the hopper shown at A. These improvements enable the most inexperienced soldiers to work the gun without the least difficulty.

Fig. 1.



GATLING'S IMPROVED BATTERY GUN.

The cartridge for the use of this gun, a section of which is shown in Fig. 2, has been greatly improved. The cartridge shells, or cases, are now manufactured out of much stouter material than they were formerly, and are made with solid heads. They will now withstand the heaviest charges without the possibility of bursting, and the shells can be fired and then re-loaded, over and over again, for fifty or more times. The cases, or shells, being thus utilized, the cost of the ammunition will be but little more than that of the lead and powder used in reloading. The heads of the cartridges in front have square shoulders, which enable the shells to be easily extracted from the chambers of the barrels after they have been fired. The carriage upon which the gun is mounted has also been much improved. It has an adjustment which enables one man to give to the gun, when it is firing, a lateral train motion, so as to sweep the sector of a circle of more than twelve degrees without moving the wheels or trail of the carriage. In this way the gun can be played like a hose pipe, and made to cover five hundred yards, or more, of the enemy's front, and that too without interrupting its continuous fire. The gun fires with great rapidity, but always one shot at a time in rapid succession, so that the tendency of recoil is only that produced by a single shot, and this is entirely overcome by the weight of the gun and the carriage, and by a simple device attached to the trail of the carriage. The true elevation having therefore been once obtained, any desired number of shots may be rapidly fired with accuracy without resighting or any further adjustment of the gun. These are advantages not possessed by any other arm.

This peculiarity of *no recoil* is of special value in the defense of bridges, fords, mountain passes, etc., for the reason that such points are usually attempted to be passed during darkness, fog, or storm, when the movements of the enemy cannot be clearly observed. The gun, having once been properly located and accurately aimed to cover the threatened point, is ready at any time to pour its rapid and deadly fire with certainty of effect, while other guns placed under similar circumstances, after having delivered the first fire, must of necessity be readjusted and fired at random, and therefore with little effect.

The effective range of the gun is over two thousand yards, being greater than that of any other rapid firing arm; its accuracy is also very remarkable, and is claimed to be quite equal, if not superior, to the best rifled cannon. The inventor assures us that with it more "hits" in a given time can be made on a target placed at a distance, say of 1,500 or 2,000 yards, than with any other arm.

Such rapidity and continuity of fire must give the performance of this gun the greatest moral effect. Few troops can be found so brave as to contend against such a death-dealing engine of warfare. The use of such an arm must undoubtedly have a tendency to shorten wars and to lessen the number of troops required in service as well as to deter nations from going to war.

The Gatling system is equally well adapted to large or small caliber, which is not the case with other kinds of repeating arms. The projectiles of the largest caliber Gatling gun, like those of field artillery, may be solid shot, shell, or canister. A canister cartridge is shown in Fig. 3, and a solid shot in Fig. 4.

Four sizes of these arms are now being manufactured by Colt's Patent Fire Arms Company, at Hartford, Ct.

The gun is simple in its construction, strong, and durable, and in all respects stands first among the numerous ingenious fire-arms which have been brought into use during the past ten years.

Any further information may be had by addressing "Gatling Gun Co.," at Indianapolis, Ind., or "Colt's Patent Fire Arms Co.," Hartford, Conn.

Fig. 2

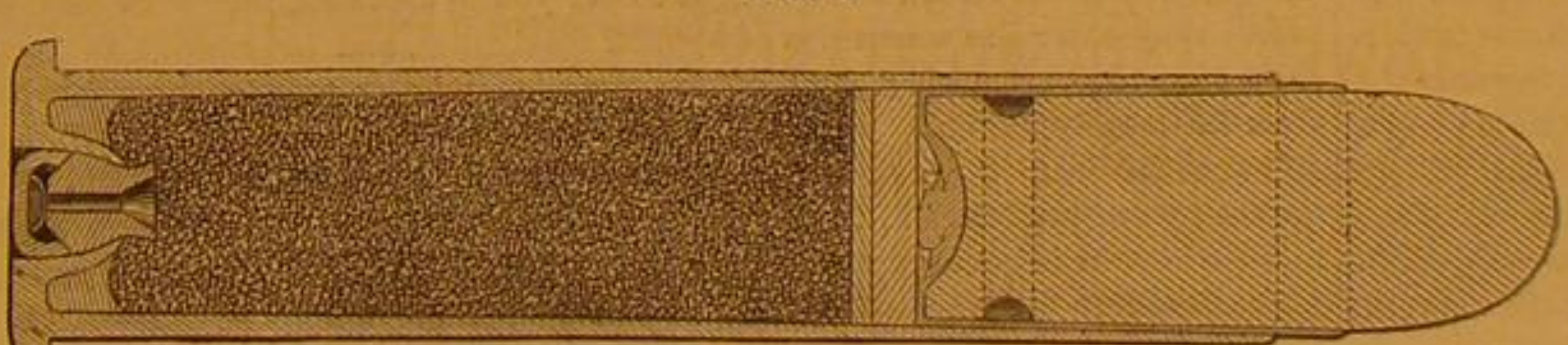


Fig. 3

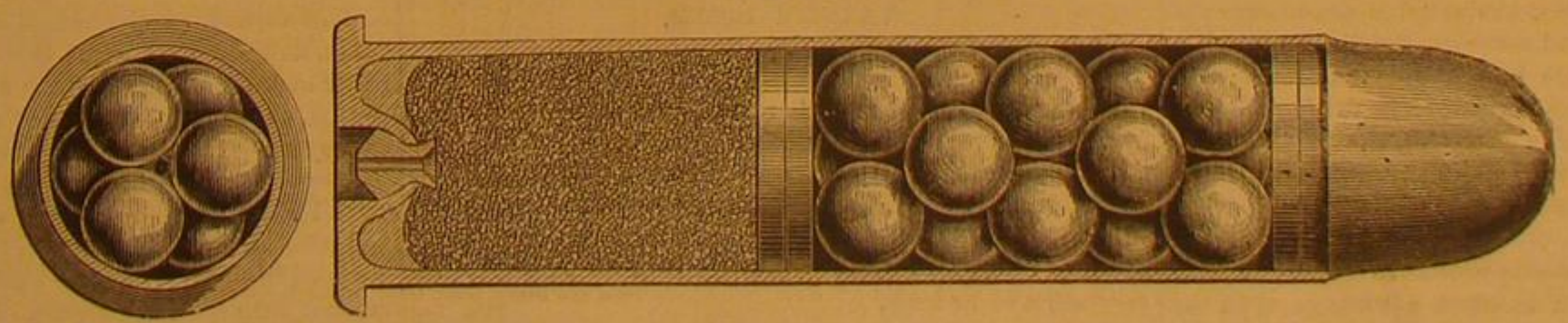
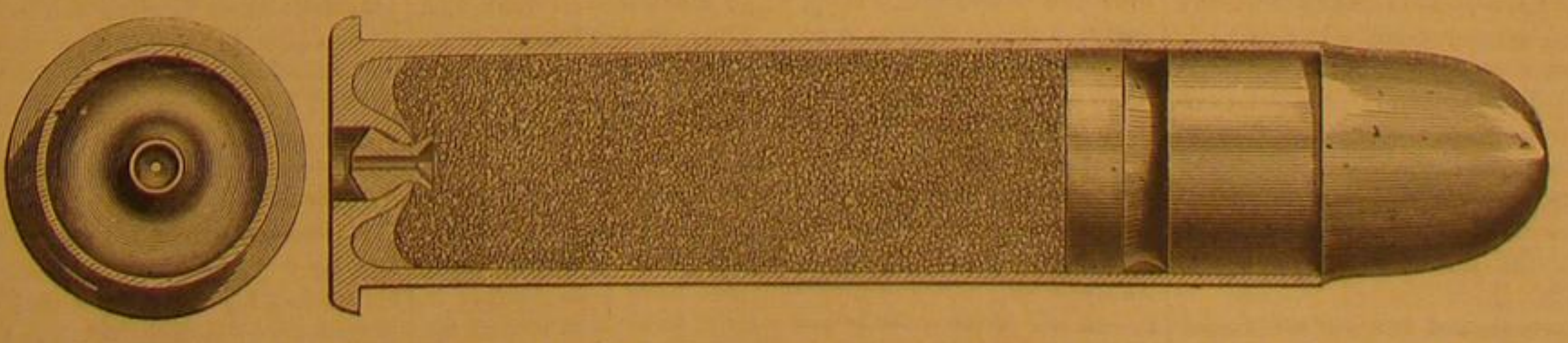


Fig. 4.



Blasting on the Pacific Railroad.

In several places, where one side of the road-bed was at grade, the other slope would be in seventy-feet cutting. Royal have been the salutes fired from this escarpment; immense the peaceful execution done. What enjoyment to have been here two months before, in the heat of the battle between intelligent force and mountain cohesion! The powder bill alone for the month of July was $54,000! From five thousand to ten thousand men were employed all the season. The times of firing along the whole cliff were limited to three a day. At those times, an immense broadside cleaved a little of the shell from the grand mountain side, transforming a goat's path to a way for the iron steed. Let me relate one instance of skillful execution. With one drilled hole, eight feet in depth, 1,440 yards of granite were thrown clear from the road-bed. The ieght-foot hole was drilled near a fine seam, lightly loaded, and fired. This enlarged the seam, which was lightly loaded, and exploded. This operation was performed carefully, several times, until the seam was widened to a considerable fissure, when an immense load was put in, the fire communicated, and three thousand tuns of granite were torn from their long resting place, making sad havoc with the sturdy pines beneath. I observed one rock, measuring seventy tuns, a third of a mile away from its accustomed place; while another, weighing 240 lbs., was thrown over the hotel at Donner Lake—a distance, certainly, of two thirds of a mile. In fact, the whole valley is covered with drops from these granite showers. As the season here is short, much of the work has been carried on night and day. Here we saw a retaining wall seventy feet in hight; there a tunnel of granite.—*Overland Monthly.*

THERE are no less than 3,642 spoken languages.

WIRE AND TUBE DRAWING.

[By John C. Anderson, C.E., in the Cantor Series of Lectures before the Society of Arts.]

Wire has been used in Europe for more than 400 years. At first it was made by drawing down, in blacksmith fashion, with the hammer upon the anvil. The draw-plate was invented in Germany about 300 years ago, but it was comparatively little used until recent times. Now, the rolling-mill and the draw-bench are combined into one system of manufacture, by means of which the rate and diminished cost of production have developed the trade so enormously as to have led to the use of iron and steel wire for ropes, bridges, fencing, telegraph, and so many other new purposes, that it has at length become a great branch of industry.

Hollow tubes are now manufactured of all sizes, and out of all the ductile metals. This apparently difficult process is accomplished in several ways. With one system it is done by first forming a hole through a short, dumpy piece of metal, either by casting or drilling; into this hole a mandril is inserted, and then the dumpy mass, by means of the drawing process or by rolls, is passed through a succession of holes until it covers the mandril from end to end. This mandril may be a fine wire, or large enough to form the tubes for a steam boiler. A similar process, but substituting rolls for the draw-plate, is mostly employed for the larger sizes. The same or similar principle is frequently employed to make tubes, close at one end, these tubes being of various sizes; in such case the holes are not passed entirely through the mass; the mandril is inserted and is then pushed through the successive holes in the draw-plate, until the metal is extended over the mandril. Sometimes the piece is formed from a disk into a thimble-form, and then put on a mandril to be elongated. There is also an extensive manufacture of iron wire and of iron tubes, both being covered with a thin brass tube, by which means not only beauty but greater strength is obtained at a reduced rate; and for such purposes as these articles are used, viz., picture-rods, hand-rails, shop windows, carpet rods, and such like, the arrangement fulfills the object equal to an entire brass structure. The iron wire or tube is made as before described; the outer brass tube is made in a similar manner, but sufficiently large to admit of its being slipped over the iron. The iron may now be considered as a mandril, and the two are drawn through the draw-plate together, thus fixing the thin brass tube upon the iron, while the whole surface exposed is brass.

The so-called copper wire which is now extensively used by upholsterers for the spring cushions of sofas, beds, and similar purposes, is merely iron wire, which is made in the ordinary manner until just before the last process, when it is immersed in a solution of sulphate of copper for a short time, sufficient to allow a thin film of copper to be deposited on the surface of the iron wire. The iron wire thus covered with copper is now drawn through a draw-plate, by which it is rendered hard and elastic and suitable for a spring, at the same time the dull surface of the deposited copper is made as bright as a new farthing, and serves to protect the wire from oxidation.

There is yet another application of the natural law, which a few years ago would have been reckoned an impossibility—it is the process for drawing conical tubes. Nothing yet said will explain how this can be done. A taper mandril will suggest itself, which, so far, is simple. But the die of varying diameter, how is that to be obtained? For a long time rolls for rolling taper gun-barrels have been in use, in which a succession of tapering grooves are formed, while, by dexterous management, the roller contrives to insert the thick end of the gun barrel at the precise point in the revolving rolls, and thus the gun-barrel is elongated towards the muzzle by means of the narrowing groove in the rolls; bayonet blades are likewise drawn out in the same manner. In the process to which I now refer, for the drawing out of the long tapering brass tubes, an expanding die is used for a draw-plate. This die consists of a ring of block-tin containing a small percentage of copper, to give it a little greater rigidity; this ring is applied at the smaller end of the mandril, and the brass is drawn through the die. By this means two effects are produced, first, the metal is drawn over the mandril to a small extent, and secondly, the die is destroyed, from the extension to which it has been subjected; it is therefore thrown into the melting-pot, to be cast into a new die, and thus by a succession of new dies, the metal is gradually drawn over the steel taper mandril, until it is covered with brass from end to end, when the steel mandril is withdrawn.

There is yet another remarkable process in connection with this natural property, which is taken advantage of in the formation of ornamental twisted tubes of various patterns, such as we see in the gas fittings of churches and other places. To produce such tubes, the brass is first drawn into a plain tube upon a mandril, in the way described; this plain tube is then passed through a succession of revolving blunt screw-tools, having the required form upon their interior surface. In form the tool is arranged as a screw-nut, but not being adapted to cut the metal, and the plain tube being without a mandril, its surface is slightly depressed by the screw pressure, and by a succession of such screw-tools, or nuts, it is finally depressed to the finished ornamental pattern as required.

We sometimes see these ornamental tubes of a diamond screw pattern, where the spiral is crossed by another spiral, uniformly along the entire surface. This is done by means of two sets of screw tools, one set turns to the right hand, the other set to the left hand, and between the two the pattern is formed. This pattern may be of any section, plain, square, octagonal, ribbed, rounded, or otherwise, all depending on two principles; first, the flowing properties of the atoms of the metal, and secondly, the copying arrangement, by which the required pattern is transferred to the tube under operation, thus shifting the relative position of the molecules, yet without cutting the metal.

Referring again to the wire-drawing process, such is the effect produced by the operation that, contrary to what might have been expected, the strength of the wire or steel is greatly increased. In the case of iron of an ultimate strength of 25 tuns per inch, it is increased in strength fully 10 tuns, and some of the best iron, with a strength of 28 tuns, is raised to 40 tuns. The most remarkable change in this respect is in the case of steel music-wire. The mild steel out of which this is made has a strength, when in the natural state, of from 30 to 40 tuns, according to its steeliness, but when tempered mildly, by being made red-hot and then cooled in oil, and elongated into wire, its strength is increased fully three-fold. At the same time, if such steel or even iron wire is made red-hot, so as to allow the natural law to assert itself, all these high conditions vanish, with only one redeeming quality, that the wire then becomes more pliable, and similar in strength to the iron or steel out of which it was made.

The knowledge that this treatment of steel has the effect of increasing its strength and toughness so enormously, has produced fruits in several directions. One of these, bearing on the present subject, is the attempt to draw steel tubes of any length, or section or substance. Throughout the engineering world there are many purposes (indeed wherever motion is involved) for which a strong light material would be extensively applied, provided it could be obtained at a moderate cost. To accomplish this operation, a hole or slit, according to the section required, is first formed in a short thick mass of steel; two dies are employed, the one internally (which remains in use throughout the operation), the other externally (which has to be exchanged for a smaller one at every passage). Then enormous hydraulic pressure is brought to bear in pulling it through the vacant space between the internal and the external dies, thus leaving a portion of the steel behind, which forms a reservoir of steel for the increased length, by future elongating with that which could not pass through at the rate of motion of the apparatus, but to follow suit as it has opportunity, and then, by annealing the mass of steel, and using smaller and smaller external dies in succession, the thick lump becomes gradually elongated into any length of any section, and, if necessary, with the high qualities of the music wire.

With the object of carrying out such a manufacture, a company was recently formed in London, to produce steel tubular forms of any size or section. A variety of remarkable specimens was produced by them which made every engineer's mouth water, and although commercially it has not succeeded (simply because the arrangements of the world were not quite ripe for it), still that, judging by all past experience, does not affect the question any more than the receding wave affects the rising tide. The grand fact remains that it is a possibility, by sufficient pressure and patience, to cause solid steel to flow into any hollow form of section without breaking its continuity; it is a wonderful triumph of mind over matter which cannot be ignored, and which has yet to accomplish most important results in the future history the mechanism of the working world of applied mechanics, and the advantages are so apparent and so numerous that its ultimate success is only a question of time.

My chief object in making the foregoing remarks, is chiefly to show that the natural laws which govern materials and things, are a great lesson to be taught to our young students, before they enter the workships of applied mechanics, and to show that the varied operations of the practical worker are thus intimately blended with the profoundest philosophy, and that the fashioning of matter into the various forms required by our civilization, is not the drudgery to a thinking mind which it is generally considered to be, but that we are fellow-workers in carrying out and taking advantage of the natural laws, as laid down for men by the Grand Designer of the Universe.

VARNISH ROOMS.

From the Hub.

There are few good varnish rooms in this country—very few. Consequently, there are plenty of poor ones, and, for the sake of example, which may illustrate those features of a varnish room which are objectionable and should be avoided, we shall describe a certain poor one which we have in mind, and which we assure our readers is by no means the very worst of its class.

This shop is situated in the outskirts of a city. The varnish room is a small one, in the second story, and directly over the blacksmith's shop, while above it is an unfinished garret in which stock is stored. The room has two windows, which open only at the bottom. One window is shaded by a large elm tree, which is considered very attractive, but as the room is dark and this tree shuts out half the light which would otherwise enter, its shade is very objectionable. The light from the other window is partly obstructed by a series of shelves, upon which are arranged a variety of varnish and japan cans. The ceiling and walls are of rough boards black with age, and here and there pictures have been hung. In the middle of the ceiling newspapers have been tacked up, in order to prevent the passage of dust which rattles down from the cracks between the boards every time any one enters the third story.

It is not difficult to perceive that in such a shop the varnisher must be obliged to labor under many serious disadvantages. In the first place, his room is dark, whereas he needs the best light possible. Not only are the windows too few in number, and partly obstructed, but the walls and ceiling, being dark, cannot reflect and make the most of what light there is. Again, he has no proper ventilation, and this he must have in order to guarantee good work. The windows cannot be opened, for if this were done, an inward draft would be created and dust might be brought in. Even the cracks in the ceiling are rendered useless as ventilators, being covered with piles of lumber. Consequently, if you visit this shop on a warm summer day, you will find this room as hot as an oven, and the air so drenched with the moisture which comes from the rapid evaporation of the water upon the floor that it is difficult to see across the room. Every painter knows the effect produced upon varnish by a moist, muggy day; then who can expect that varnish will do its best in such an atmosphere as we have described. In the third place, the work in this shop is never safe from dust, for the walls and the ceiling being rough, they will hold a great amount of dust suspended, and this is liable to sprinkle down upon the fresh varnish whenever any jarring is caused by the workmen below, or by heavy teams, or even by the movement of the door, when the varnisher leaves the room at night. His work is therefore in constant danger of being spoiled in this way. If, under all these disadvantages, a varnisher is able to turn out perfect jobs even occasionally, he may be considered as eminently fortunate as well as skillful, and he cannot justly be blamed for frequent bad jobs.

As we have already mentioned, the shop which we have described is by no means the worst of its class, but is one that is looked upon by its owner as a "very comfortable sort of a place," and as we once heard him remark—"Anybody who can't dew good worruk in that 'ere shop, better jest go and try it with my gran'ther, who allus did all his varnishing in the back yard. That 'ere shop is where I done all my varnishing when I was a young 'un, and if there's anybody can do betterer varnishing than me in 1840, I'd just like to look at him."

In past times it seems to have been the policy to set apart, for varnishing, the odd room which couldn't be used for anything else; whereas, the varnisher ought to have first choice, and should have the best situated and the best fitted room in the building. The varnish room should be the "parlor" of the factory, for it is there that the most delicate part of the operation is performed. In some new shops we are glad to say that some improvement may be noticed in this respect, but still there are very few that approach perfection.

In conclusion, we shall briefly mention the several requirements of what we consider a model varnish room. These requirements refer to the railroad shop as well as the carriage shop, but more particularly to the latter, because the class of work is nicer, and also for the reason that in the carriage factory we find the faults are generally more serious. The paint room in a car shop must of necessity be roomy, and this will help ventilation, and the light is generally good.

1st. Every varnish room should have the best degree of light that is possible. A corner room with plenty of windows, is therefore to be preferred; and, if situated in the upper story, skylights will aid very considerably. The ceiling and walls should be white and smooth, as they will then reflect the rays and greatly increase the degree of light. Rays of sunlight must not be allowed to fall directly upon work, and each window should therefore be provided with a white curtain, which can be drawn when necessary.

2d. The varnish room should have a perfectly arranged system of ventilation. The windows should all be made to open at the top, and one or more of them ought constantly to be opened for an inch or two. If the room is in the upper story, as is usually the best situation for the varnish room, skylights will be found to give the best ventilation.

3d. Every precaution should be used to prevent the presence of dust. In the first place, the walls and ceiling should be finished smooth, so that dust cannot find place to lodge. Plaster, with hard finish, gives the smoothest surface, and we would advise its use in all new shops. When finished with wood, the boards should be planed and matched, and a coat of varnish or permanent wood filling added. In old shops, finished roughly, it is well to tack sheets of brown paper over the ceiling. In the second place, no shelves, cans, clothes, or pictures, should be allowed in the varnish room, as they are all liable to hold dust. The varnish room should be a perfect void—bounded by six blank smooth surfaces Then let the room be carefully dusted, swept, and sprinkled, and two or three hours afterwards the carriage may be wheeled in lightly, and the work of varnishing can be commenced with some confidence. Some varnishers have a silk suit to slip on before entering the varnishing room. This is a good plan, as they thus avoid carrying in much dust which would be likely to cling to their ordinary clothes. Thirdly, no one except the varnisher should be allowed to enter the varnish room. It should be the "*sanctum sanctorum*" of the factory.

4th. An even degree of temperature should be maintained. For this reason, it will be seen that the best situation for the varnish room is in the northern end of the building or in the northeast corner, for there the sun will not lie in during the day and raise the temperature. Steam is the best method of heating the varnish room. When this cannot be employed, care should be taken to select a good stove, that does not require constant attention, and this should be placed near an aperture in the wall, in such manner that it may be fired from the adjoining room, and furthermore, it should be inclosed in a tin or sheet-iron casing, made conical at the top, and this will prevent any dust from arising when the fire is replenished, or the ashes shaken down. The degrees of heat

which are best adapted for varnishing range from sixty degrees Fahrenheit to about seventy-five degrees, and are about the same that make the room seem comfortable to the varnisher. A good thermometer should be hung up, and great care should be taken that an even temperature is maintained during working hours, and until the varnish "sets." If possible, the heat should be preserved throughout the night.

THE BERLIN HEATING GASWORKS.

From Engineering.

During the past five years gas heated furnaces of various kinds have come into extensive use in a large number of important works both in this country and abroad, and everywhere the great cleanliness and convenience attendant upon the employment of gaseous fuel have won for it a good name even under circumstances where its economy alone would not have been sufficient to do so. Gas heated furnaces, in fact, bear much the same relative position to ordinary furnaces using solid fuel that a gas light does to a lamp or candles; and it is probable that ultimately the gaseous will supplant the solid fuel as universally for heating as it now does for lighting purposes. Under present circumstances, however, there are certain practical difficulties in the way of of applying gaseous fuel universally to heating purposes. Ordinary coal gas, as supplied from the gas works, is too dear to be extensively used as fuel, while gas producers, such as are used by Mr. Siemens in connexion with his well known regenerative furnaces, do not work well on a small scale, and, in fact, do not give the best results unless they are worked in groups of, say, four or more; and it thus follows that where merely a small supply of heating gas is required they could not be satisfactorily adopted.

This being the state of affairs, it appears to us that what is wanted is a supply of cheap gas specially intended for heating purposes; and we are glad to see that the subject has attracted attention on the Continent, and that plans have been already brought forward for furnishing such a supply to the city of Berlin. The "Berlin Heating Gasworks" Company as it is named, proposes to establish works at Fuerstenwalde, a town distant about thirty miles from Berlin, where there are extensive mines of lignite, this latter being the material from which it is intended to manufacture the gas. At Fuerstenwalde it is proposed to erect twelve retort houses, each 165 ft. long by 62 ft. wide, these houses containing seventy retort furnaces with ten retorts in each. The retort furnaces are to be heated on Mr. Siemens' regenerative system, three gas producers being provided for each furnace; and the arrangements are to be such that the lignite may be tipped direct into the retorts from the wagons in which it comes from the mines. From the retorts the gas is to be conducted to the condensers, where any unconverted tar, water, or other condensable matters will be separated, and it is then to pass to the blowing engines by which it will be forced through a 4 ft. main to Berlin.

The blowing engines are to be four in number, and each is to have a 5 ft. 9 in. steam cylinder, and 7 ft. 7½ in. blowing cylinder, the stroke in each case being 6 ft. These engines are rated at 360-horse power each, but they are to be capable of being worked up to 500-horse power each in case the extension of the works should render it requisite. The blowing engines are to force the gas into the main under a pressure equal to 16 ft. head of water, or about 7 lb. per square inch, it being considered that this comparatively high pressure will by enabling a smaller main to be used, in the long run give more advantageous results than larger pipes and less powerful engines.

The main leading to Berlin is, as we have stated, to be 4 ft. in diameter, and it is to be constructed of ¼ in. wrought-iron plates, and is to be carried above ground, being supported on piers of masonry placed at convenient intervals. This arrangement will give perfect facilities for examination and repair, and it is considered that, under the circumstances, it will be found preferable to burying the main below ground. Provision will, of course be made for the expansion and contraction due to changes of temperature. It is calculated that this 4 ft. main will, under a pressure equal to 16 ft. of water, pass 407 cubic feet of gas per second; while, if the pressure is increased to one atmosphere, the conveying power of the tube will be increased to 584 cubic feet per second, the actual weight of gas passed through per second under these latter circumstances being, of course, nearly three times as great as that flowing through in the former instance. At Berlin the gas is to be received in twelve gas-holders, each 154 ft. in diameter, 40 ft. high, and having a capacity of about 720,000 cubic feet each; and from these holders it is to be distributed by pipes to the various parts of the city in the same manner as gas for lighting purposes.

From experiments which have been made at the laboratory of Dr. O. Ziurek, the consulting chemist to the Berlin Board of Health, it is stated that it has been determined that there can be produced from lignite, by a simple process, a gas mixture well suited for heating purposes. The specific gravity of this gas mixture is 0·5451 (that of air being taken as the unit), and its chemical composition is given as follows:

Hydrogen	42·36
Carbonic oxide,	40·00
Marsh gas	11·37
Nitrogen	3·17
Carbonic acid	2·01
Condensable hydrocarbons	1·09
	100·00

The proportions of carbonic acid and nitrogen are, it will be seen, extremely small, and if this chemical composition can be maintained in regular practice, the gas mixture will certainly possess very high heating power, although for lighting purposes it would possess but very little value. Experiments have, in fact, shown that 3,000 cubic feet of this gas mixture are equal in heating power to one Prussian tonne (2 200 lbs.) of lignite, or one-third of a tonne of pit coal. It is proposed to supply the gas at Berlin at the price of 6d. per 1000 cubic feet, and supposing the results of the above-mentioned experiments to be practically correct, the heating power of a tonne of pit-coal will thus be supplied for 4s. 6d., a cost which is certainly low.

With the arrangements for consuming the gas, the Berlin Gas Heating Works Company propose to have nothing whatever to do, it being their intention to merely supply the gas by meter at the price we have named, leaving the purchasers to do what they like with it. The annual supply which the works are laid out for manufacturing, in the first instance, is about 9,500,000,000 cubic feet, or about 2,627,000 per day, and it is estimated that this quantity would provide sufficient fuel for domestic purposes for about half Berlin, or about 8,000 houses.

Whether or not the Berlin Heating Gasworks will prove a commercial success—and we really see no reason why they should not—they will certainly be regarded with great interest as the first really practical attempt to make gaseous fuel available for domestic purposes. That gaseous fuel will, when once its proper management is understood, be as generally appreciated as coal gas for lighting purposes now is, we have little doubt; and although at first there will be many prejudices to overcome, yet we fully expect that one of these days we shall regard cheap gas for heating purposes as a domestic necessity.

The British Ironclad, "Glatton."

The London *Artizan* says: "This turret ship which is in course of construction at Chatham Dockyard will be the most powerful ship, for offensive and defensive purposes yet built. The *Glatton* is being constructed from the designs of Mr. E. J. Reed, C. B., and the utmost exertions are being used to have her completed as early as possible in the ensuing year. From the circumstance of the *Glatton* being the first vessel built by the Admiralty on the pure turret principle, with an exceedingly low freeboard, more than the usual amount of interest is taken in her construction. She will be constructed with a single turret, in which will be placed a couple of 25-tun guns. The thickness of the armor plating on her sides will be no less than 12 inches above the water line, and the remainder 10 inches in thickness, worked to a teak backing of 20 inches. The inner skin plating to which the timber backing is attached consists of two thicknesses, each one inch thick, laid on the usual iron frames 10 inches deep, placed two feet apart. The total thickness of the iron and teak of the *Glatton's* sides will thus be 3 feet 8 inches. The armor plates on the turret will be 14 inches in thickness in the most exposed parts, and 12 inches thick in the remainder, worked on a backing of teak of 15 inches, with two thicknesses of skin ⅝ inch each. The entire base of the turret is inclosed by a breastwork carried to a hight of 6 feet 6 inches above the deck, the whole being covered with armor-plating 12 inches in thickness, laid on a backing of teak 18 inches thick. The turret guns will fire over the breastwork, the *Glatton* when in action having a freeboard of only two feet, measured to the deck, the turret guns being exactly 11 feet 6 inches above the water line. This arrangement of breastwork possesses the advantages of raising the turret to a convenient hight, whilst at the same time it affords great protection to the lower part of the funnel, hatchways, and other necessary openings from the deck. The arrangement for the turret are such that the 600-pounder guns will command a fire round the bows, to within about twenty degrees of the fore and aft line on each side; while a single gun can be trained and fired from this line round to a right aft fire on each side. On the top of the breastwork the plating is 1½ inch thick, and on the deck outside the breastwork 3 inches thick. When not in action her mean draft of water, forward and aft, will be 19 feet, but she can be submerged to any depth by means of water ballast, pumped into tanks specially fitted for this purpose. At her 19 feet draft her deck will be only 3 feet above the water, her armor extending 4 feet below and 2 feet 6 inches above the water, a 6-inch oak deck covering the upper edge of armor. Above the breastwork will be fitted a flying bridge, from which on all ordinary occasions the ship will be conned; in action, however, an armor-plated conning tower, specially fitted for this purpose, will be used. Stowage accommodation is provided for 250 tuns of coal in her ordinary bunkers, but this quantity can be increased to between 500 and 600 tuns by using the water ballast tanks for stowing the coals. She is to be fitted with engines of 500-horse power nominal, capable of working up to 3,000-horse power actual, and her estimated speed will be from 9½ knots to 10 knots per hour."

French Forgeries.

When photography became established as a practical art, it was found that bank notes printed with black ink lent themselves too readily to the machinations of the forger. Thereupon, the Bank of France determined to employ blue ink, which baffles the photographic imitator, and to have some engraved device or other on both surfaces. This plan has been completely successful. In regard to other modes of falsification, an experienced chemist is constantly employed in studying all new discoveries that may perchance be brought into requisition, in order to devise means of averting roguery. Forgery of the notes is now extremely rare. On one occasion, three persons attached to a deposed royal prince were found to have been concerned in a deep-laid scheme of note forgery; a packet containing twelve false notes of one thousand francs each was presented to be cashed, but the fraud was detected in time to avert loss. About 1853, a more determined attempt upon the bank was made. False one hundred franc notes came to the bank with great rapidity and regularity. They were so admirably executed that no banker, money-changer, or trader, could detect the fraud, and therefore no reason presented itself for refusing to take them in the ordinary way of trade. The experts at the bank alone detected them by means of a tiny black spot near the figure of Mercury. For eight years continuously did these notes make their appearance, defying all endeavors on the part of the authorities to discover the malefactors. The bank did not like to make the fraud known, lest it should shake the confidence of the public in the one hundred franc notes generally. At last the clever scoundrel was discovered; he was an engraver, and it was found that he had successfully put into circulation false notes to the value of nearly two hundred thousand francs. His end was strange and horrible. Transported to Cayenne in 1862, he tried to escape into the Dutch settlements; faint and exhausted, he became fast embedded in the thick slimy mud of a river, and was there *eaten alive by crabs!*

Interesting Discoveries in Canada.

During the summer just closed good work appears to have been done by the Geological Survey in the Lake Superior region. Professor Bell's party have all returned to their winter quarters, after having experienced many of the hardships and privations incident to the life of the first explorers in the distant wilderness. We understand that the results of the expedition include a complete topographical and geological survey of Lake Nipigon, and an exploration of much of the surrounding country. This lake, it appears, will rank, in point of size, with the other great lakes of the St. Lawrence, forming the sixth and last in the chain. Professor Bell has not yet been able to map the whole of his extensive survey, but thinks the area of Lake Nipigon will be found to exceed that of Lake Ontario, or even Lake Erie—some 500 miles or more of coast line having been traversed. This great lake is drained by the Nipigon river, or upward continuation of the St. Lawrence, beyond Lake Superior, which is described as a very large clear-water stream, about thirty miles in length. Upward of a dozen rivers, of considerable size, are reported to empty into Lake Nipigon from all sides. We understand that one of the most singular features in the geography of this beautiful lake, is the immense quantity of islands which are scattered throughout its whole extent, and presenting a great variety in size, form, and elevation. It appears that geological discoveries of a highly interesting and important nature have been made, and that, contrary to common belief, a large extent of level land, with deep and fertile soil, exists in the Nipigon country. Professor Bell had received instructions, in addition to his geological explorations, to obtain as much information as possible in regard to a route to our great Western territory, and his discoveries in this direction, are, perhaps, not the least important of the results of the expedition. If we are not mistaken, he has found that this country, so far from being a difficult one, offers great facilities for railway construction. Further, he has, we believe, ascertained that the elevation of Lake Nipigon above Lake Superior is very moderate, and, consequently, this lake may be found useful for the purpose of navigation in the desired direction.—*Toronto Globe.*

Hager's Rules on Treatment of Platinum Vessels.

Every beginner in chemical analysis, must learn that, though little effected by acids and other powerful agents, except its solvents, platinum may be injured or destroyed by many other articles which hardly ever effect glass or porcelain. Platinum vessels, such as crucibles, dishes, wire, and rods, are at no time to be brought into contact with, or used for fusing either of the following:

I. Alkaline or alkaline earth sulphides, or their sulphates when liable to be reduced to sulphides.

II. Nitro-muriatic acid, or anything which might evolve free chlorine, iodine, bromine, sulphur, selenium.

III. Those processes in which silica is separated at a high temperature.

IV. Fusion, and heating of the caustic alkalies and alkaline earths, as well as their nitrates, and all the salts of lithia.

V. Fusion, or reduction from their oxides, of the fusible metals, like lead, bismuth, cadmium, tin, as also of the oxides of nickel, copper, etc., which give off oxygen at high temperatures.

VI. Heating or fusion of phosphoric acid and acid phosphates with carbonaceous matter or other deoxidizers.

VII. Evaporation or calcination of readily decomposable chlorides, *e. g.*, sesquichloride of iron, etc.

VIII. Fusion of iodides and bromides.—*Chemist and Druggist.*

ONE of the most extraordinary passages ever undertaken and performed has recently been accomplished by the steamer Helen Brooks. On the 5th day of August, 1869, the steamer Helen Brooks left Baltimore, Md., for Bayou Teche, La. She left Baltimore by way of the Chesapeake Bay, and passed through the State of Delaware by canal; up Delaware river to Trenton, N. J.; through the State of New Jersey by canal; down Raritan river to New York city; up Hudson river to Troy; through the State of New York by the Erie canal to Buffalo; thence by way of Lake Erie to Chicago; down through the Illinois canal to the Illinois river, and thence down the Mississippi river, arriving at Napoleon, Ark., on Thursday morning, October 14, after a circuitous journey of over 3,000 miles.

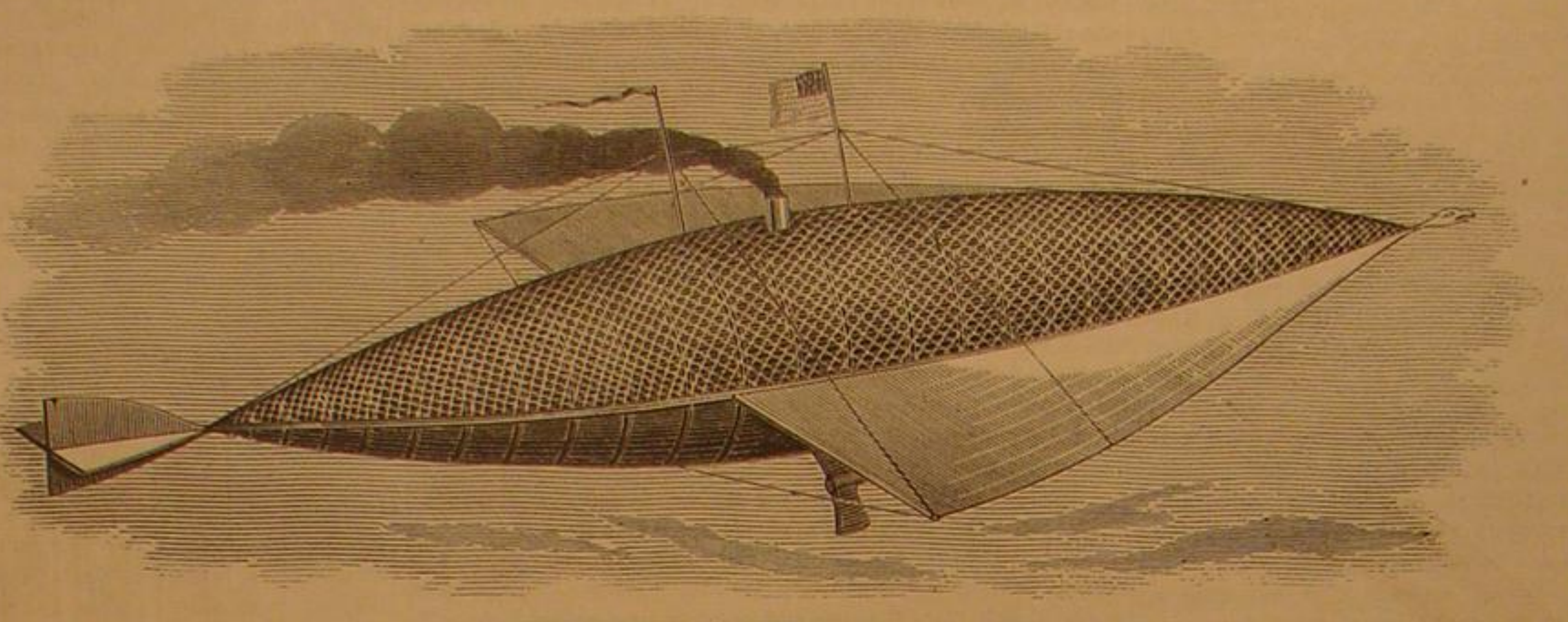
AERIAL NAVIGATION.

NUMBER FOUR.

Subsequent to the experiments of Mr. Porter, Dr. S. P. Andrews, of Perth Amboy, N. J., a gentleman well known in scientific associations, and of high reputation as a successful inventor, devoted much time and money to the subject of aerial navigation, and with partial success.

Having been early acquainted with scientific principles, and had extensive experience in mechanics, his projected enterprise gained much confidence with many intelligent men, who supposed him to be more competent to accomplish this long desired scientific improvement than any other man; and this confidence in his ultimate success yet remains, in the minds of many, unimpaired. But to give our readers a chance to judge for themselves, we shall give a general description of his ingenious arrangement. The float or buoyant supporter consists of three cylindroids—cylindrical three fourths of their lengths, but tapering to points at the end. These are placed side by side, horizontally, and connected to each other three fourths of their length, which is 100 feet, and the diameter of each cylindroid is 20 feet. The contents of the united three, when inflated, is 80,070 cubic feet, and their buoyant power 5,720 lbs. This combination float is furnished with an efficient rudder for steering. About thirty feet below this combined float, an open basket saloon, sixteen feet long, is suspended by a large number of wires or cords; and within the saloon is a longitudinal rail track, upon which is a car freighted with ballast, and so connected to a crank windlass, and a pulley at each end of the saloon, that the car may be readily moved from one end to the other, though its natural position is on the center, which is a little lower than the ends of the track. When the car is brought to the rear end of the saloon, the float is thereby made to incline from ten to twenty degrees; so that when a small quantity of the ballast is discharged, the float will rise; and its upper surface, presenting about 6,000 square feet to the air above, it will naturally shoot forward, on the principle of the sails of a ship, with a side breeze. And when it has attained a sufficient altitude, the car is moved forward, which has the effect to reverse the inclination of the triple float; and by letting off a portion of the gas, the float will immediately commence descending, and, by its reversed inclination, will continue its forward motion. The ballast may be replenished as often as the saloon descends to the earth; and a supply of densely compressed hydrogen gas may be carried, whereby the float may also be replenished. Dr. Andrews has probably other improvements and facilities projected, which will be developed in the future. This machine made one ascent, some time ago, but, for reasons best known to the inventor, it did not travel far; and whether he intends to give it another trial, we are not informed. Such experiments are expensive, and the enterprising projectors are entitled to the respectful consideration of the public.

On the second of July last an exhibition of a flying machine, named by its inventor, Mr. Frederick Mariott, "The Avitor," took place in a large room of the Avitor Works, at Shell Mound Lake, Cal. We give herewith an illustration of this machine. The hopes which were first raised by the success of the experiment as performed under cover, have been since dashed by unsuccessful attempts to navigate the machine against currents of wind.



MARIOTT'S "AVITOR" AIR SHIP.

This was only a trial machine, the balloon being cigar-shaped, thirty-seven feet in length, and eleven feet from bottom to top, measured at the middle of the apparatus. Lengthwise around this balloon or float was a light frame-work made of wire, wood, and cane, and on both sides of this frame were attached wings, as shown in the engraving. A complete description of this machine was published on page 75, current volume of the SCIENTIFIC AMERICAN. The machine, as we have stated, operated quite well when shielded from the influence of winds.

But it is not enough that a machine should fly in a closed room or in still air. It must be equal to stemming very strong currents, and until this is accomplished air navigation can never be a practical success.

Manufacture of Optical Glass.

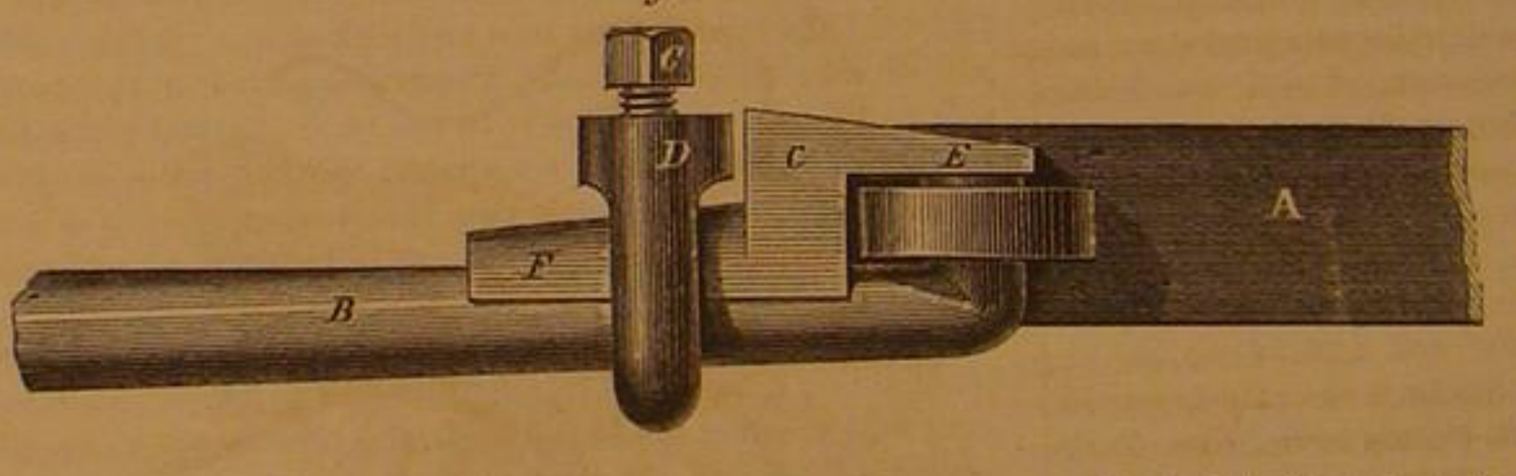
The materials are fused in the furnace; and when nearly ready for working are stirred about with cold iron rods to break the cords and lessen the cloudiness. Sometimes the metal is ladled all from the crucibles, and thrown into cold water. This stirring and ladling has the effect of breaking the strica. It is then closed up in the crucible again until it is perfectly fused in the ordinary manner, but is not worked out—as is the case at Whitefriars Glass Works—for working either with the glass-maker's rods or the iron ladle renders it worse. When a large crucible is declared to be perfectly ready, it is allowed to cool until the whole mass is one solid piece of ordinary glass, weighing about twelve or sixteen hundredweight. This mass is sure to crack up into large boulders, and from these pieces are selected those which are to be made into lenses; they are placed in large clay molds made of the best fine clay. When a piece has been selected of sufficient hight and size, it is put into a mold of the required dimensions, and then gradually re-heated until the glass has melted exactly the shape of the mold. Then, when it is sufficiently annealed, it is polished by the glass cutter in the regular manner.

Other kinds of glass are made for optical purposes by being blown with the iron tube of the glass maker, as other things are blown, such, for instance, as glass for magnifying purposes. The glass is ladled from the crucible, then taken from the ladle on the end of the iron tube, and blown of an uniform thickness, exactly the shape of a lady's muff. When annealed it is cut up one side with a diamond, and then exposed to considerable heat. When the heat causes the glass to open where the diamond cut it, as it gradually opens it is laid on a flat surface, and spread out into a large square of thick optical glass. It is again annealed, and polished to the required magnifying power. It will be easily seen from all these processes that fine optical glass must necessarily be very expensive.—*English Mechanic.*

WOOD'S HARVESTER PITMAN CONNECTION.

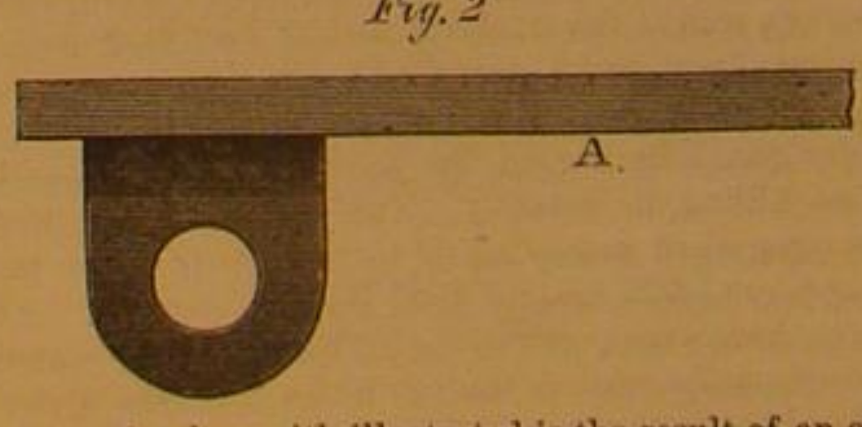
Our readers need not be told that any real improvement upon mowing or harvesting machines is important and valuable. No class of machines ever invented has perhaps produced more important results than these, and their adoption has become so universal, that it is almost as difficult to find a large farm unsupplied with one of them, as it would be to find one without a plow or a harrow.

Fig. 1



Much attention has therefore been latterly turned to the perfecting of details, which shall add to their durability, convenience, and utility.

Fig. 2



The invention herewith illustrated is the result of an effort of this kind.

It is obvious that any play on the pin which connects the pitman of a harvester to the sickle-bar must produce a blow at each reverse motion of the bar, the force of which will be in proportion to the amount of play permitted. This blow commonly called "end-shake," is productive of a disagreeable noise, and adds to the wear upon the working parts, not only of the pitman and sickle bar, but of the gearing which drives them. It is the object of this invention to obviate these evils by a simple and easily applied device, which may be employed in any of the machines now in use, and the expense of which is a mere trifle in comparison to its usefulness.

Fig. 3

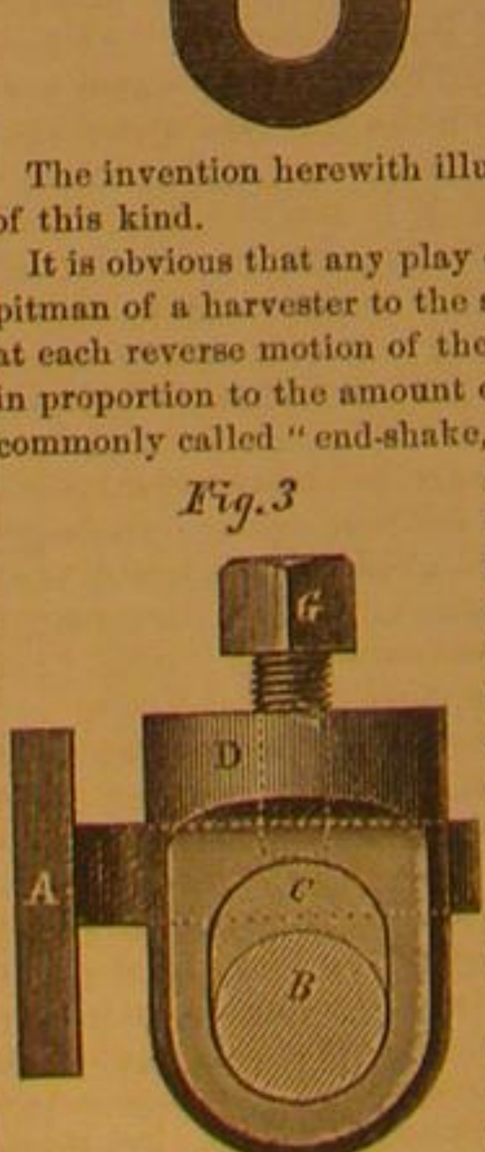


Fig. 1 shows a portion of a pitman and sickle bar connected together, and having this improvement attached. Fig. 2 is a sectional elevation of the same, and Fig. 3 an elevation of the eye and a portion of the sickle-bar. A, in each of the engravings, is the sickle-bar, and B, Figs 1 and 3, is the pitman, both of which are constructed in the usual manner. C and D, Figs. 1 and 3, are the parts of this improvement. C, Fig. 1, has two arms, E and F, placed longitudinally to the sickle-bar and pitman. F is concave on the inner side to fit the pitman, and its outer surface is convex to fit the collar, G, Fig. 3. E has its inner surface flat to fit against the connecting pin.

The collar, D, Figs. 1 and 3, is placed over the pitman, B, and held firmly by the set-screw G. The flat face of the body of the piece C, may, by this means be brought up flush to the eye of the sickle-bar, and the wear of both pin and eye, be taken up as often as needful. The body of the piece, C, also receives a portion of the wear, and thus relieves the pin and adds to its durability.

The attachment and adjustment of this improvement can be made with the utmost facility, and by the use of the wrench only.

Patented through the Scientific American Patent Agency, October 5, 1869, by Rufus C. Wood, of Le Roy, Kansas, who may be addressed for rights or other information.

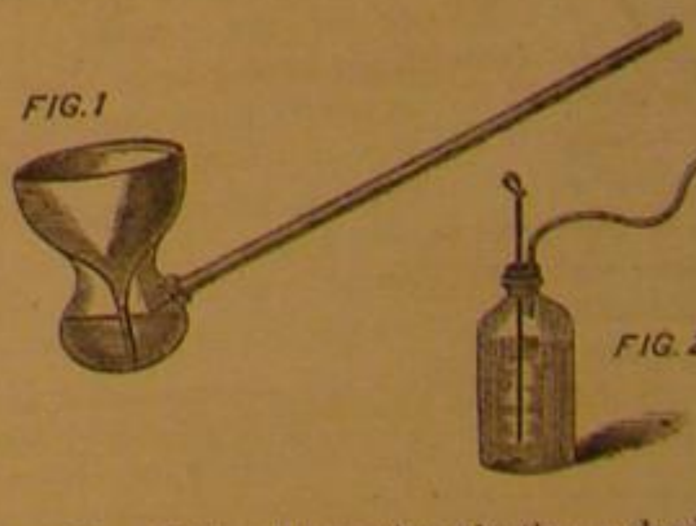
Pneumatic Tubes.

The pneumatic tube which has been erected by the Union Telegraph Co., connecting the offices of that company with the Chamber of Commerce in this city, is found to be extremely useful. The following is a brief description of it: The tube extends from the Merchants' Insurance Company's building diagonally across La Salle and Washington streets, to the Board of Trade hall, sufficient apertures having been cut through the thick stone walls of both buildings to admit the pipe or tube. This is of heavy brass, three inches in diameter inside, and one hundred and thirty-five feet in length. It is in sections which are fastened together at the joints and padded with rubber so as to render the tube air-tight. The process of transmitting the messages is simple. They are placed in a leather cup, of the shape of a dice-box, and made to fit the tube. By means of an ordinary bellows placed in the operating room, the cup can be forced over into the Board of Trade hall with great rapidity by the pressure of air. The suction of the bellows brings the cup back. The tube is supported by a tightly stretched cable of galvanized wire which extends between the roofs of the two buildings, and from which iron guys are attached to the tube to keep it in its place.

The construction and placing of the tube was a difficult matter. A small inclosure is constructed in the Board of Trade hall, where messages are sent, received, recorded, and dispatched across to the telegraph office for transmission, and where also messages for members are received almost instantaneously from the office. Messengers are on 'Change to deliver dispatches to members. The cost of the enterprise is between $3,500 and $4,000.—*Chicago Journal of Commerce.*

THE TURKISH HOOKAH.

This luxurious pipe of the Orientals is simple in construction, though often made of the most expensive materials. It is, however, generally composed of a red-clay bowl and a cherry stick stem. It washes the smoke precisely as gases are washed in the chemical laboratory, by passing them through water. It not only washes but condenses a great portion of the essential oil which would otherwise pass into the mouth



with the smoke. This oil contains nicotine, a deadly poison, and the active principle of tobacco; therefore the use of pipes of this kind is not so injurious as that of ordinary pipes. Its operation is as follows: The upper part of the bowl contains the tobacco, and a tube runs from it into the lower part, which is half filled with water. When the air is exhausted by "drawing" through the pipe, the smoke rushes down the tube and escapes through the water.

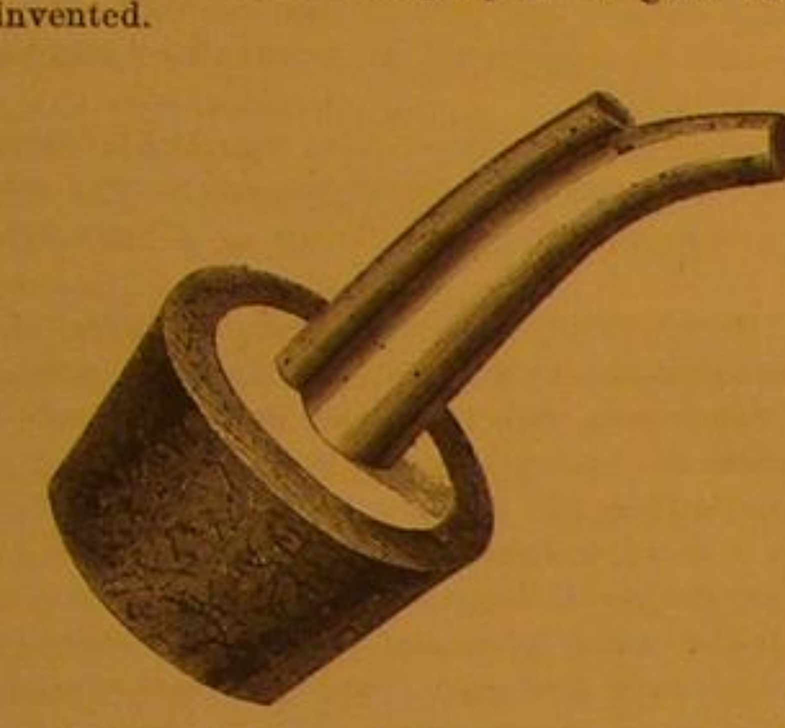
THE velocity of light is so enormous, about 185,000 miles per second, that it can readily be imagined that any motion which we can experimentally produce in a source of light is at rest in comparison.

PRATT'S PATENT VENT STOPPER.

Within the past six or eight years, the great improvements made in the use of tin plate in the manufacture of cans, and every variety of articles for domestic use, have excited the wonder of all who have not made themselves familiar with this subject. The enormous consumption of cans for different purposes, has led to many patented improvements tending to reduce their cost, or to add to their utility and convenience.

The constantly increasing price of oak timber for staves, and the difficulty of obtaining such as are suitable for the secure transportation of oils and other penetrating fluids, render the substitution of cans almost a necessity. Nature has given us an unfailing supply of iron, the basis of tin plate, and the cost of the latter, notwithstanding the large duty upon it, has become so low, that with the advantages of improved machinery, and the economy of a well organized business, packages for the transportation of oils, can be furnished at almost the same price in proportion to capacity as well-seasoned barrels. For these reasons, together with freedom from leakage, and the avoidance of danger and loss by spilling, or changing of goods from barrels or casks by the dealer or retailer, it has now become a universally acknowledged fact that it is cheaper to buy oil, spirits of turpentine, etc., in such cans, than in barrels.

Among the many candidates for public favor in this line, "Pratt's Guaranty Patent Can," of which we give herewith an engraving, has gained an enviable reputation, and is probably as perfect a device for the purpose designed as has ever been invented.

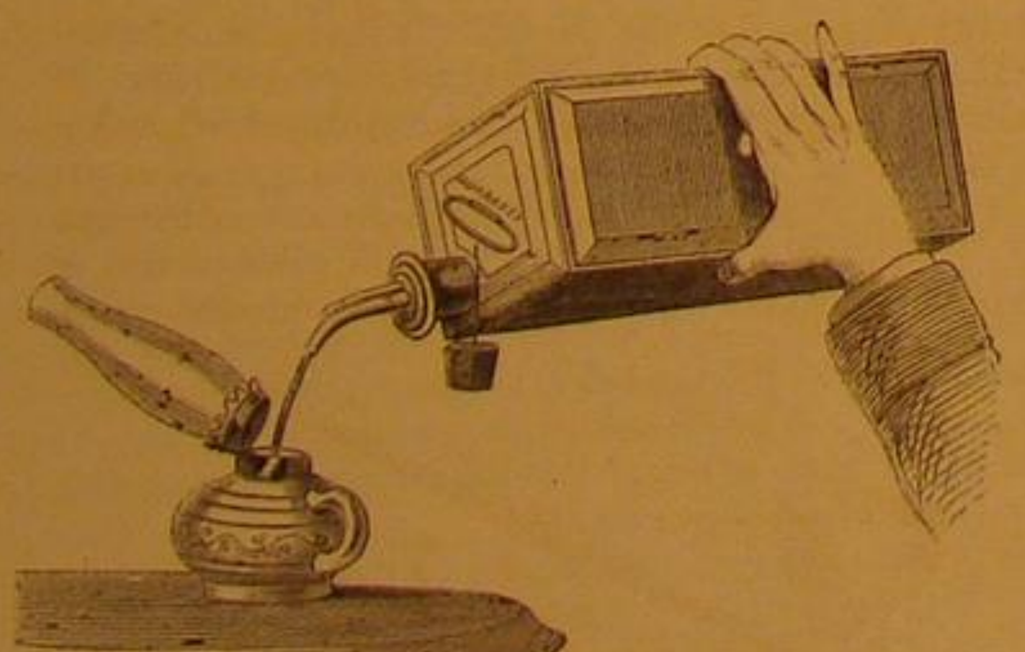


From the extended use of these cans a necessity has arisen for some simple and cheap means for overcoming the difficulty, which has been experienced in emptying cans and small vessels without spilling some of the contents, resulting principally from the fact that there was no vent or conduit for admission of the air to the can, while the liquid was being poured out. To remedy this difficulty, vent-nozzles or other like devices have hitherto been used with cans or vessels; but such appliances have always been costly, and their use has been attended with inconvenience, while they require cans of special construction, and indeed, are permanently united with and form parts of the cans.

A device of this kind, however, has been recently invented and patented by Charles Pratt, 108 Fulton street, New York city, which is worthy of attention. It is simple in construction, can be easily and cheaply made, may be readily removed from or applied to the can, and used with any can of ordinary or suitable construction, and may be manufactured and sold as a distinct article, not necessarily accompanying the can.

The invention consists of a stopper, also shown in the engravings, for oil cans, or other liquid-holding vessels (for whatever use), provided with an opening or spout for the outflow of the liquid, in combination with a vent for the ingress of the air.

The manner in which this device can be constructed and used will be readily understood by reference to the drawings.



The body of the stopper, which is here represented as composed of cork (but which may be made of any other suitable material), carries a tube or spout for the outflow of the liquid, and another and smaller tube to act as a vent. The two tubes pass down through the body of the stopper and open into the interior of the vessel, the smaller, or vent-tube, being arranged upon one side of, and so as to follow the curve of the larger tube, so that when the vessel is tipped to pour the liquid, the larger tube will be beneath, by which arrangement the oil or fluid will flow only through its proper channel, the larger tube, or spout, leaving the smaller tube or vent free for the passage of the air.

The tubes are fastened to the cork by means of metal disks, which are soldered to the tubes at such a distance apart as to compress the body of the cork between them, the turned-up edges of the disks entering the cork and holding it tight. As already stated the device may be formed of cork or of any other suitable material capable of closing the orifice in the can, it may also be of metal and can be screwed into or upon the neck of the can.

In any event, however, a detachable stopper will be obtained, in which the spout or opening for outflow is combined with a vent; and this device can be applied to any can, vessel, or receptacle for liquids, whatever its shape or size, provided that such receptacle be provided with a neck or mouth, into which the stopper can be fitted.

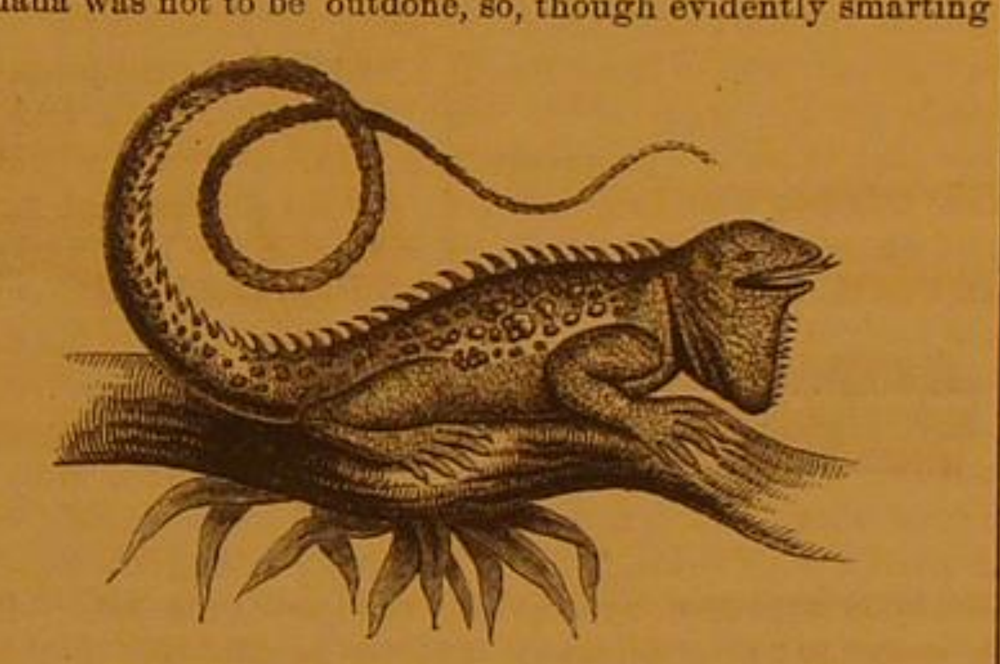
For the Scientific American.

IGUANAS.

Iguanas, or guanas, are a genus of lizards, one species of which is known to zoologists as the *Iguana tuberculata*. They are of a bright, green color when young, that hue changing to a dusky brown as the reptile advances in age. According to Webster, the term, Iguana, is derived from the Spanish name given to the animal by the natives of Haiti, in which island the iguana abounds. They are found also in the other West India islands and in some parts of South America. The size of these creatures varies from that of the common lizard, or nuto, to over four feet in length from the nose to the end of the tail. The head is similar in shape to that of an ordinary lizard, and is covered with a scaly armor of a pink color, tinged occasionally with blue and brown. The eyes resemble those of a fowl, and though small are very bright. The back is provided with a serrated comb, which extends from the nape of the neck to within a few inches of the end of the tail. The animal can elevate this or depress it at will, and with its tail can deal a lusty whack, inflicting sometimes a severe gash with this saw-like comb, some anecdotes of which peculiarity will be given further on. In old age, the skin assumes the appearance of old leather, being wrinkled in many parts, and it is so tough that with difficulty can it be penetrated by a shot.

Iguanas inhabit, generally, thickly wooded spots, where they perch on high trees, and, as they are of a green color, they can easily conceal themselves among the branches and leaves while they await their prey. Unlike chameleons, they are very lively in their movements, and will even pounce from a tree to the ground in order to seize what they want.

The food of guanas consists of herbage, insects, and poultry and their eggs, the latter of which they devour with great avidity and are very cunning in perceiving them. I once saw one of these reptiles attack a hen with her brood of chickens. Darting from a tree, it made a rush at the chickens, on which the mother flew at it and pecked it; but Mr. Guana was not to be outdone, so, though evidently smarting



with pain, it turned round and dealt the hen a lusty blow with its tail, thereby stunning her, and seizing its desired food it made for its haunt there to devour the poor chicken at ease. When it had finished this, it returned with full intent to pursue the same course, to which, however, I put a stop by discharging one barrel of my fowling piece at the rapacious monster. As soon as the smoke caused by the discharge had cleared away, I was much surprised to see the guana spring into a neighboring tree. But I was not thus to be foiled; so raising my gun, I discharged the second barrel at it, which took effect killing it instantly. The spot from which the guana sprung when ascending the tree was marked with blood, therefore I felt assured that the first shot hit it, the more so as there were perforations in the skin of the reptile that had assumed a whitish tinge, which is the case after the charge has been in the body some time.

How true it is, I do not know, but it is asserted that the guana is provided with a pouch under its throat, in which it conceals eggs very often. It happened on one occasion that I was out hunting, accompanied by my dog; and, returning, I thought I would pass through my poultry-yard to ascertain if I could shoot any more of these destructive creatures. I had not long entered the gate when my attention was attracted by a cackling among the fowls, and soon found it to be occasioned by the presence of a huge guana, which was disputing the right of a hen to some eggs upon which she was sitting. Wishful of seeing the procedure of the reptile, I watched it narrowly; it deliberately raised its whip-like appendage and brought it down on the back of the poor fowl; of course, she could not stand that, so she dashed upon it with all her force; the guana taking advantage of the opportunity was going to seize an egg to make away with it when I started my dog at it. Ready for defense, the agile lizard raised its tail, and laid it two or three times over the dog, sending her away howling, while it made for the bush hard by.

Although applied with considerable force, the blow given by means of the tail of the guana cannot make an incision through the hair of an animal, or feathers of a bird; but it inflicts a most unsightly wound in the flesh of a man, if the guana be large and if it apply the serrated portion of the whip to the object of its rage.

The flesh of this disgusting creature is esteemed by some persons as a great delicacy, and it is said that it bears a resemblance to chicken when stewed. The eggs, I believe are eaten by some epicures, but I think the former has too strong a likeness to that of frog's flesh, and the latter to the eggs of serpents to be relished by persons not accustomed to such diet.

I have noticed several specimens of the guana exhibited in some of the druggists' windows in this country, some of which, I presume, have been brought from the island St. Thomas, D. W. I., to which place the foregoing narrative has reference.

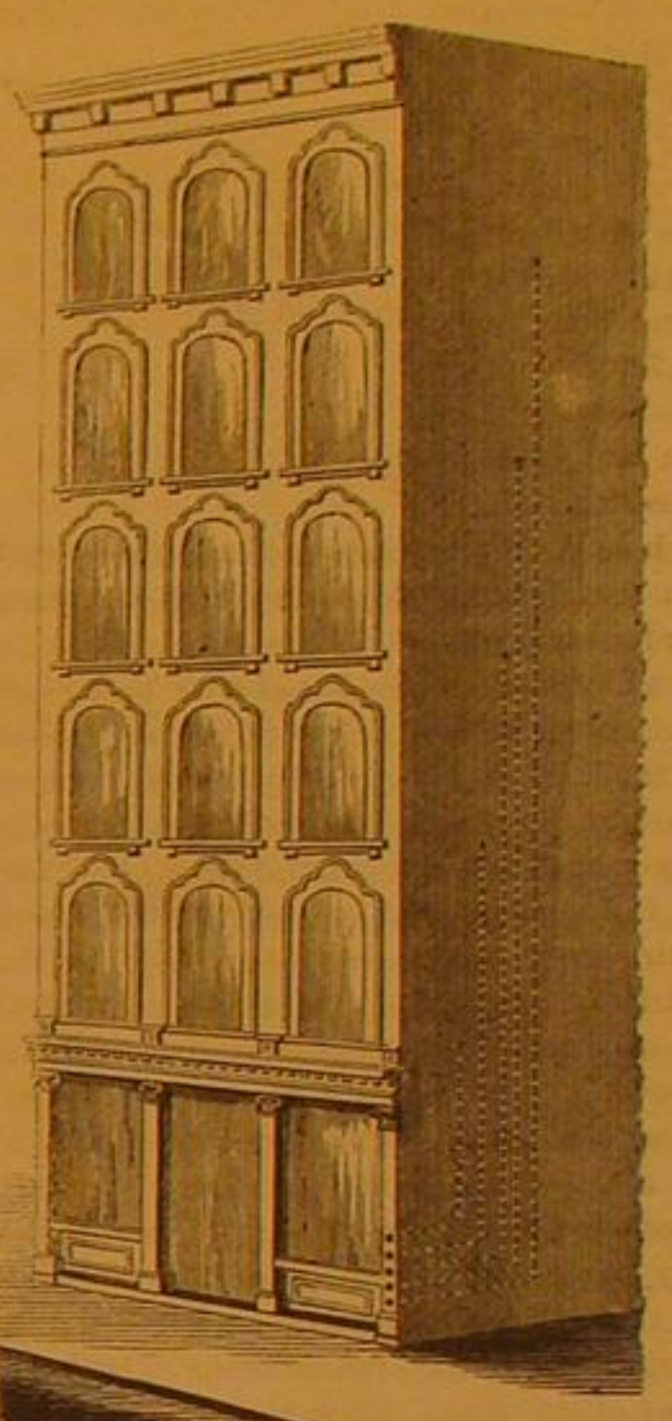
J. R. G.

Correspondence.

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

Extinguishing Fires in Buildings.

MESSRS. EDITORS:—I send you a plan of apparatus for extinguishing fires, which is original with me and may be new to others, and although not perfect in itself may lead to some thing better. It is this: In constructing the walls of a building, carry up within the wall, cast-iron or other metal pipes, one for each story, each pipe of the capacity of at least one steam fire engine; the lower ends opening near the ground to



which a hose can be attached, the upper ends opening in upon the several floors above. If there is no dead wall in the front or rear, the pipes can be constructed within the partition walls (see drawing), the dotted lines showing the position of pipes within the partition wall. The openings in the street need not be exposed, but may be placed in the sidewalk, inclosed, numbered, etc.

Now the successful application of this plan is upon the theory that if the floor of a building is flooded with water, its destruction (by fire alone) is prevented, and all above may be consumed whilst the submerged floor and all below are safe, and that all of the upper floors are made water-tight as near as possible, the openings, stairways, partitions, etc., constructed to insure the complete flooding of the floor—one or two inches is sufficient; and no matter if the floor is well stored with combustibles, water will find its way before fire. It has always been a mystery to me why more attention has not been paid to the construction of water-tight floors, when we so often witness the destruction of large and costly stocks of goods by water alone, when fire occurs in upper stories, which are often occupied for hazardous occupations. These fires always prove most destructive because inaccessible.

A building being constructed as before stated, on the breaking out of fire above, the fireman attaches his hose to the pipe leading to the floor on which it originates, and although it is not entirely extinguished, is greatly retarded when other ordinary means can be used.

This idea was suggested to me by the burning of the Lindell Hotel in this city nearly three years ago. In this case the fire commenced in the seventh story, and continued for nearly one hour before any serious apprehensions were felt for the safety of the building.

The following is an extract from the Chicago *Tribune*, in reference to a fire nearly two years ago, and I have noticed recent destructive fires in other cities in which this plan would have been applicable and saved a large amount of property:

"The great conflagration of Tuesday evening, which has shocked the entire community, and which will be remembered hereafter as an epoch in the city's history, will be worth all it has cost if it shall compel us to mend our system of constructing buildings. It is time that our penny-wise and pound-foolish economy in building was abolished, and that stores and warehouses were constructed under a system of public inspection, and with heavy penalties to insure them at least against external fires, and to keep the destruction within the walls where it begins. Burch's Block, though consisting of nine stores, four fronting on Wabush avenue and five on Lake street, burned as freely and scientifically as if the the entire building had consisted of one room. One reason

for this—and the same reason will apply to nearly all the commercial blocks of this city—is that the buildings are all too high, rendering it impossible to employ the fire apparatus effectively, or to raise the water to the required elevation. This was painfully evident at the fire on Lake street."

The plan I propose is practicable and cheap (the latter may be its most prominent feature); however, as before stated, it might be perfected, and I would suggest that although the floor is saved the walls may become so hot as to endanger the ends of the joists or timbers, metal baseboards perforated over each timber would retard its destruction by keeping the wood saturated with water. ARCHIBALD DOUGLASS.

St. Louis, Mo.

Thermometric Experiments.

MESSRS. EDITORS:—I would like an explanation of the results of some thermometric experiments, the object being to ascertain by Fahrenheit's thermometer the temperature of any liquid.

My apparatus is a glass jar and two thermometers, one of which is immersed, the other partially so (see annexed sketch). I fill the jar with a warm liquid, temperature 114° Fah., then I subject the apparatus to outdoor atmosphere, which indicates 34° Fah. at 7:30 o'clock A.M. Below please notice discrepancies.

	Thermometer immersed.	Partially immersed.	Temperature of atmosphere.
7:35 o'clock A.M.	112°	113°	34°
7:40 " "	108°	110°	34°
7:50 " "	105°	108°	34°
8:00 " "	98°	102°	34°
8:10 " "	97°	98°	34°
8:20 " "	89°	95°	34°
8:30 " "	86°	92°	35°

I now reverse operations somewhat by filling the jar with cold liquid—temperature 40°—and subject the same apparatus to indoor atmosphere, time 9:40 o'clock A.M.

			Temperature of room.
9:55 o'clock A.M.	41°	51°	66°
10:00 " "	43°	55°	68°
10:15 " "	45°	58°	70°
10:30 " "	49°	64°	74°
10:40 " "	51°	68°	75°

QUESTIONS.—1st. Why is it that the thermometer partially immersed indicates in both instances a higher degree of heat than the one entirely immersed?

2d. In either case which thermometer is giving most accurately the temperature of liquid. P. MILLSPAUGH.

Glen's Falls, N. Y.

[Any fluid undergoing a change in temperature has its upper strata warmer than the bottom ones. The hotter particles rise and the colder ones fall. The expansion of mercury in the bulb of a thermometer is as much greater than that in the stem, as the bulk of mercury is greater. It follows that thermometric indications depend chiefly upon the expansion of the mercury in the bulb. One of the bulbs of our correspondent's thermometers is at the top in a warm stratum of fluid, the other is at the bottom in a colder stratum. Of course the upper one must give the highest indication, and neither would give the mean temperature, which can only be determined by calculation approximately. The varying discrepancies will depend partly on the form of the vessel. The deeper it is in proportion to its diameter, the greater will be these variations as the cooling progresses. We are not prepared to say that the figures given are correct in this experiment if the drawing is a correct representation of the apparatus used. We are somewhat inclined to doubt the accuracy of the thermometers, as the discrepancies seem almost too large for so small a vessel with the bulbs in the positions indicated.—EDS.

Cotton Picking by Machinery.

MESSRS. EDITORS:—Fearing that the communication of A. D. C., of New Madrid, Mo., may dampen the ardor of inventors now engaged upon the cotton-picker, I write with a view of keeping the ball in motion. When an individual says that such and such mechanical contrivances are beyond the scope of human ingenuity, he certainly takes a great liberty with the public, and must pardon some of us if we differ from him.

Many of us at the South have heard our fathers relate that it was the custom in their young days for each member of the family to pick the seed from his or her quart of cotton before retiring for the night. We now have saw gins for the same purpose, some of them capable of doing as much work as probably 500 men in the old way. The improvements in spinning and weaving have been even greater than in the gin over the fingers, and yet we are utterly devoid of a machine for taking the cotton through the first and simplest process. The reason is obvious: Heretofore, Southerners had a very effective though troublesome machine in the African, which under the *good old plantation* system, and occasionally greased with a little *hickory ile* did the work thoroughly; and it was then very uncommon to make more than could be gathered. On the other hand, the Northern man was interested in the spinning and weaving process, and gave his attention almost entirely to the improvement of machinery for this purpose. Now, North and South are equally interested in keeping up the waning supply of raw material. The African is no longer a machine, and his place must be supplied by a cotton picker, or cotton is not a living "king," but a dead dog. All other work in the production of the plant can be done by labor-saving machines now in existence; but it yet remains for some one to crown his brow and fill his pocket by the invention of this much needed machine.

Since the publication in the SCIENTIFIC AMERICAN, of my first letter on the subject, hundreds of letters have been written to me by inventors from Canada to Texas, some of them announcing the actual discovery of the machine—one claiming to pick as much per day, as can be done by one hundred hands; others more modest in their claims; and others yet, making inquiry in reference to the plant and process of gathering, etc., etc.

This argues that there is an interest in the subject, and I am not willing that friend A. D. C. shall kill it; let it go on for a while, and if we do not have a picker soon, I will join him in his *horticultural problem*.

Allow me, in closing, to say that I cannot correspond with *every body* on the subject of the cotton plant and picker. I have already exhausted time and patience, and in future (without intending offense) must claim the privilege of answering only such letters as strike me.

Winnsboro, So. Ca. T. W. WOODWARD.

Care of Carpenters' Tools---Filing and Setting Saws.

MESSRS. EDITORS:—Your article on "How to File and Set a Saw" gave me much gratification. I have long wished that something upon this and cognate subjects might appear in your paper. Much has been said, from time to time, upon the use and care of machinists' tools, but the carpenter has not received so much attention. I will venture to say that the carpenters' trade contains more botches than any other in this country. Raw country boys are employed at a few dollars per month and their board, and, having worked one season perhaps building barns, come out in the fall finished carpenters and joiners in their own estimation.

But a prominent source of botches is want of knowledge how to properly sharpen and keep tools in order. This, coupled with carelessness and slovenliness, is a common fault. I find frequently the most common tools shamefully out of shape. This great evil might be, to a great extent, remedied by proper instructions in the columns of such papers as the SCIENTIFIC AMERICAN.

The article I have referred to is in the main correct as far as it goes, but a few words more about the saw may yet be of benefit.

I always file my rip saw from point to handle instead of from handle to point. I claim that in so doing the teeth can be kept at a more uniform length, which is all-important for a straight running saw. I file all from one side, and square across, or at right angles with the line of teeth, and I raise the handle of the file a trifle above the point, say at an angle of two degrees. I have found that if I hold the file horizontal I would get the edges of the teeth nearest to me a trifle lower than those on the opposite side, and the result would be that the saw would run crooked. Then I file the teeth for about six or eight inches at the point at a much less angle than I do the rest of the saw, and give them about the same pitch that I do a crosscut saw; the object in this is to facilitate sawing through knots, as a rip saw catches too much in knots. A great many are in the habit of changing saws when they come to a knot and saw through it with a crosscut; but if a rip saw is filed at the point, as I have stated, it will readily work through knots, by simply raising the hand and sawing with short strokes until the knot is cleared. All new saws (back saws excepted) will be found high in the middle and I keep mine in that shape, say one-fourth inch swell in a 26-inch saw. It is almost impossible for any one to maintain a parallel stroke forward and back; the hand will naturally fall a little in pushing a saw forward, and rise in drawing it back, so a saw that is full in the center will counter-balance that rocking motion of the hand, but that motion should be avoided as much as possible.

In filing crosscut saws too much pains cannot be taken to keep the teeth of a uniform length, and this can only be done by often jointing the saws. They do not necessarily need much jointing at a time, but little and often is my plan, and the same in filing. I would rather file twice or three times, and file but little at once, than file a good deal at one time. I have often heard mechanics complain that they would invariably get the teeth the shortest on the side they filed first, and this, in fact, used to be my fault; but I found the remedy is to not file the first side quite up to the points, then turn and file the other side, then turn back and finish the first side—if necessary, turn again and finish the second side. But if a saw is not very dull, three times filing across is sufficient; if it is very dull better go over it the fourth time. After a saw is filed, round off the last tooth at the point; this will prevent this tooth catching in the kerf as the hand is drawn clear back and at the instant of starting it forward, and lessen the danger of bending or breaking. Almost any one can saw (or rather tear) a board in two, but few can handle a saw nicely.

Much might be said upon this point, but I have already made this communication too long. I will only add that a saw should always be used with great care, and with even, steady strokes, not short and quick, and all jerking either up or down should be avoided. The full length of the saw should be used as much as possible, and the saw should not be crowded, but given a chance to clear itself of sawdust.

Whoever will follow out the above directions will have as nice, smooth, and straight running saws as he will wish for.

Cleveland, Ohio. A. A. FRADENBURG.

Preservation of Brown Stone Fronts.

MESSRS. EDITORS:—I read in your paper, No. 20, current volume, page 313, an article, entitled, "What is to Become of our Brown Stone Fronts?" I also find on page 307 of the same issue an article headed "Damp Walls." May not the latter paragraph be considered as an answer to the former? Is there any reason why the discovery of Mr. Frederick Ransome, therein described, cannot be used for this purpose? If so used, would the stone retain its natural appearance or be covered with a glossy, vitreous coating?

New York city. J. H. HAMERSLEY.

[There is hope that Mr. Ransome's process will answer for the purpose mentioned by our correspondent, but it must be borne in mind that the trial of any process designed to effect this object must extend through a considerable period, and it would not be safe to assume that Mr. Ransome's process has yet been sufficiently tried to test its efficacy as a protection to brown standstone in our climate.—EDS.

Friction or Percussion?

MESSRS. EDITORS:—Your correspondent, "C. C. H.," in your issue of November 13, page 310, failing to agree with me in the conclusions arrived at in my former article on this subject, published on 246, current volume, and evidently wishing some further explanations, with your consent I will say a few words in reply.

First, he says that while I consider the heating of a nail on a grindstone to arise from the percussion produced by its leaping from one granule of the stone to another, I "estimate, indirectly, that in the majority of cases heat claimed to arise from friction is the result of percussion instead."

If he will again refer to the article alluded to, he will see that I merely suggested that it is impossible to show at what point, in cases similar to the "nail and grindstone," percussion ceases and friction begins, intimating that friction and percussion may often be one and the same thing; not that the result should be considered as produced by percussion "instead" of friction.

Again, to quote—"Let 'Spectrum' take in his fingers a smooth brass button and rub it briskly up and down a planed pine board, and he will soon drop it," etc., "if he does not the theory."

"C. C. H." seems to think that in this case, under these conditions, nothing like percussion could possibly occur, and I grant that apparently such would be the result; however, let him examine his "smooth brass button" under a powerful microscope, and he will see that its apparent smoothness is a delusion. It is true that in this case there would be no perceptible percussion of bodies as in the grindstone experiment; still, if the button be applied with any degree of pressure, it would not only produce waves in the wood immediately in front of it, no matter which way it be moved, and against which the particles of the button would strike or impinge, but the microscopic roughness of the button—its grooves, indentations, and prominences—would produce a like result, for the elastic wood being forced into these grooves and depressed by the minute prominences, alternately, would acquire a very rapid undulatory motion, which, by contact, would be communicated to the button, rendering it unpleasantly warm to handle.

Now, to say that there would be in reality no percussion in such cases is to affirm that if a huge boulder be rapidly dragged over a rough, stony piece of land there would in the result be no percussion between it and any other against which it might be impelled—one is but an exaggerated illustration of the other. I hold that so long as we are unable to produce a body or mass of material which shall be of perfect hardness and smoothness, and totally inelastic, there will be in rapidly rubbing any two solid bodies together more or less percussion, whether perceptible or not to our imperfect senses.

Again, if, as he suggests, the superior heat-conducting power of the large hammer, owing to its being longer in contact with the metal hammered, prevents the iron from becoming as hot as with the small one, why, after it has become too hot to touch, will it not continue to grow still hotter—red hot?

Lastly, he says, "Will 'Spectrum' inform me why it is that while iron can once be heated by percussion [?], but if suffered to cool, the heat cannot be reproduced in the same manner until after the iron has been heated by the absorption of foreign caloric?"

Now, the words last quoted show that "C. C. H." evidently makes no distinction between the heat produced by percussion and that rendered sensible by compression. Iron, in its ordinary state, contains a certain amount of heat which is insensible both to the hand and to the thermometer, called its latent heat, and by changing the condition of the iron, by condensing it, more or less of this heat is expelled according to the degree of pressure sustained.

Iron in this condensed state cannot be made to assume its former bulk by any other known force then that internal antagonism of its particles caused by the intensely rapid molecular agitation known as heat, but if "C. C. H." should take the same piece of iron which, as he thinks, has "once been heated by percussion," though in reality it is scarcely more than condensed, and submit it to the action of a series of minute hammers, the blows of which succeed each other with great rapidity—for instance, let him apply it to the grindstone, and I think he will find that it can be heated without the aid of "foreign heat," and that, too, by means of true percussion.

I have been somewhat prolix, but the subject is an interesting one; and hoping that the "percussion" or "friction" of ideas may produce sufficient light for the discernment of truth, I again sign myself SPECTRUM.

Havana, N. Y.

Oscillation of Railway Carriages.

MESSRS. EDITORS:—On page 280, current volume, SCIENTIFIC AMERICAN, I notice a piece entitled "Why do Railway Carriages Oscillate?" I agree with the writer in some part of his heory, namely, effect of cone-shaped wheels upon

a straight track. There is no doubt but wheels of this form will caused a greater oscillation than cylinder-shaped ones. But in passing around curves, give me the cone shape.

To substantiate my theory, let me ask Mr. C. F., if his assertion is correct about the running of a car around a curve, why is it that the inner side of the shorter rail is always rusty and not worn off like the opposite one? What experience I have had with cars, is that it would be far more dangerous upon curves to use cylinder wheels, and I think that the friction and wear would be double what it now is. I make the assertion that the cone shape does lessen the danger upon curves. The cone-shaped wheel is not altogether the cause of the oscillation on a straight line. I have measured one thousand new wheels with a metal tape-measure and hardly found any two of them the same size, although many of them were cast in the same chill. You will perhaps say, "Why is this difference?" I reply that the iron when it flows from the cupola into the different ladles, is rarely of the same quality in each, and when poured into the molds the temperatures vary widely. The hottest iron will shrink the most, and if the mold is not set to a dead level, the wheel will become oblong in cooling. I have frequently found them one eighth of an inch out of round. Furthermore, the men who have charge of pressing on these wheels, are usually common laborers, who make no pretensions to mechanical skill. They are supplied with an old, rusty, rickety pair of callipers (which a true mechanic would not use a moment), and with this tool they begin to operate, first applying one leg near the flange and passing the other down the opposite side. The rickety old machine will hit about the same anywhere from the tread next the flange out to the edge, and the conclusion is, "She is all right, lets shove her on." Now this I know to be the case in three prominent railroad shops, and at one of these same shops I measured two new wheels upon the same axle, and one was three eighths of an inch smaller in circumference than the other.

No wonder oscillations occur under such circumstances. If, as *The Times'* correspondent says, a cone shape does no good in passing around curves, why are street cars raised on to the flange to round corners? Cone-shaped wheels have been experimented with, and the proportion of one in twenty, I believe, has been taken as the standard. What is wanted is a remedy for the evils I have specified. If cylinder wheels are used, a train of cars will certainly haul harder around a curve because there will be more back slip to the inside train of wheels.

On March 28, 1865, through the unrivaled office of the SCIENTIFIC AMERICAN, I had a patent issued on a car axle which obviates all difficulties herein mentioned. Upon this plan, the old callipers may be thrown aside, the common laborers eye is good for determining the size of wheel. No matter what the size of wheels no oscillation can possibly occur.

J. W. HARD.

Decorah, Iowa.

How to Remove the Sulphur Compounds of Petroleum.

MESSRS. EDITORS:—Having some two years ago discovered a process for removing the sulphur compounds of petroleums—such as are found in Canada, Kentucky, and Tennessee—and as my process has been disclosed to some of the refiners of oil in Canada, by a workman I then had employed, I desire through your columns to give it to all who choose to use it. I am aware that certain persons have discovered the use of plumbite of soda independent of me, but I believe none can claim priority, as my discovery was made as early as June, 1867; evidence of which fact I have on record. The details of my process are as follows:

The crude oil should be distilled in the usual manner, making the proper specific gravity for burning oil. The distillate should be allowed to remain in open tanks for one or two days, to allow the free sulphureted hydrogen to escape, and thereby saving chemicals in its removal. The oil should then be pumped into an agitator and the treatment begun, first, with a solution of plumbite of soda—made by saturating a boiling solution of caustic soda of 20° strength, with litharge. About one quart of this solution to the barrel is quite sufficient. The oil, in a few minutes after the solution is added, and brisk agitation made with air, becomes brown and then black. The agitation should be continued for about fifteen minutes, and the oil allowed to settle. The formation of a heavy brown deposit of sulphide of lead is the phenomenon to be then looked for. Sometimes it occurs by the time agitation is finished, at other times several hours afterward, and again not until a further treatment is given it. The oil is allowed to remain in the agitator 12 hours, in case the precipitate does not fall sooner, and at the expiration of that time; if no precipitate has formed and the oil becomes clear, then the following treatment:

A solution of penta-sulphide of soda is made by boiling 2 lbs. of sublimed sulphur in 10 galls. of a solution of caustic soda 20° strength, until it is all taken up, and the liquid becomes of a clear deep brown. About one quart of this solution to every bbl. of oil, is added to the oil in the agitator, after the settled plumbite of soda has been withdrawn, and agitation with air continued for half an hour. If the precipitate does not form in that time, the solution of soda is allowed to settle, drawn out, again boiled with half its original sulphur, returned to the agitator, and agitation made for half an hour. This seldom ever fails to cause the precipitate.

The oil is then carefully run off the precipitate, by tapping the side of the agitator, into the proper tankage, where it can be pumped back again. The agitator thoroughly cleaned by washing, the settled oil is returned to it for further treatment, as follows:

Sulphuric acid in the proportion of one lb. to the barrel of oil, is added, and agitation with air begun. The air before being introduced into the oil, should be passed over chloride of calcium to remove all moisture. Within an hour after air has begun to pass through it, sulphurous acid gas is given off in large quantities, and continues until every trace of sulphur is oxidized in the oil. After 18 hours' agitation the tar is allowed to settle for an hour, drawn off, and a fresh amount of acid added, and agitated again 18 hours. This treatment is continued until a sample of the oil will not be tinged, when shaken with a solution of plumbite of soda, and left to stand for six hours. Three or four treatments of this kind are generally sufficient, though it varies with the kind of oil under treatment. After the acid treatment, the usual amount of caustic soda is added, and the oil thoroughly washed. The chemical reactions which take place I have noticed very closely, and will at some other time give you my theory.

H. T. YARYAN.

Supt. Tenn. Oil Works, Nashville, Tenn.

Naphthaline.—The Cause of Serious Accidents.

MESSRS. EDITORS:—When hearing of the first explosion that occurred last spring in Jersey City in saturating wood with carbolic acid oil for the purpose of making it fit for preservation, I was not in doubt for one moment as to the true cause of this accident. A second explosion followed soon after in San Francisco, where this process was being introduced, causing, as you state, the loss of seven lives and more than $50,000 worth of property; and now a third sad accident is reported, resulting in the death of the chemist and an operative employed in the wood preserving establishment.

I do not propose to enter into any of the many hypotheses forwarded in regard to the probable cause of these explosions, but shall simply relate some facts which I have observed in distilling the same kind of oil employed in the process referred to. This process consists, so far as I am informed, in the impregnation of timber by the hot vapors of "dead oil," which, in being the source of carbolic acid, is sometimes, but improperly, termed carbolic acid. This oil is produced as a by-product in the manufacture of gas from coal, and is composed of from five to fourteen per cent of carbolic acid, a large and varying quantity of neutral oils, and from twenty five to forty per cent of naphthaline. This latter is deposited by the oils distilled from the tar in granular crystalline masses, called "salts" by the workmen. It is then thrown away, or, at best, burned for lamp-black.

In subjecting dead oil to distillation, naphthaline comes over during the entire distillation, and, according to Bowditch (*vide* his "Analysis, Technical Valuation, Purification, and Use of Coal Gas"), hardly a sample of commercial benzole can be obtained which does not contain naphthaline, although the boiling point of the latter substance is 410° Fah., and of the former but 176° Fah.

This hydrocarbon (the naphthaline) has a very great tendency to stop up the coils of the stills, especially in cold weather, and, in accumulating there very rapidly, it is easy to comprehend that explosion must occur, when the tension of the vapor inside of the still becomes greater than the resisting power of the shell. I have had tuns of naphthalized oils distilled, but being acquainted with the facts by previous experiments, and fully aware of the danger attendant upon a neglect on my part, I never failed to keep the water of the condensation tank at a temperature of about 160° Fah. At this degree of heat there is never any danger of obstruction, the oils run off fluid, but, after having left the coil they will soon assume a buttery consistency. In order that I might at any time be able to liquefy the naphthaline, should emergencies require it, I had a steam pipe attached to the upper part of the coil. This proved to be a very efficient arrangement.

Naphthaline is a constituent part of our gas, and readily stops up the gas pipes in winter. Besides for lamp-black, it is now employed to a limited extent for the preparation of dye-stuffs as a carbureting material, and quite recently has been proposed by a chemist in this city as an ingredient of an explosive in combination with chlorate of potassa. As to its efficiency as a preservative, I still entertain some doubts. It is by no means an explosive material, as little as charcoal in gunpowder, since it may be thrown into a red-hot crucible, when it volatizes and decomposes, condensing in the air in snowy spangles.

I append a table indicating the boiling points and specific weights of various constituents of the oils from coal tar:

	Boiling point.	Specific gravity.
Benzole	176° Fah.	·85
Toluole	230° "	·87
Cumole	284° "	·86
Amyle	311° "	·77
Cymole	338° "	·85
Caproyle	395° "	·75
Naphthaline	410° "	1·04

ADOLPH OTT.

New York city.

Has the Pacific Railroad Changed the Climate of the Plains?

MESSRS. EDITORS:—Without presuming to fully answer the interrogatory of Mr. Whitford, on page 214, current volume of SCIENTIFIC AMERICAN, I will offer an opinion, founded on years of observation, and I think corroborated by reasonable probability.

I have for the last four or five years advocated the idea that the extending of railroad tracks through the country, was changing the climate from the destructive droughts, we formerly experienced to the salubrious climate we have been enjoying for seven or eight years. The facts in the case are that here, in Central Ohio, the farmers have quit calculating on droughts and remember them as things that were; the complaints are that there is so much rain that they don't get an opportunity to cultivate crops; and all this is happening against counter-causes, such as artificial drainage and removing forests.

The cause of the change I have assigned as aforesaid; the reason is this: Railways, as now constructed, clamped together at the meeting of rails form complete and powerful conductors of electricity, and having contact with other railroads at crossings, etc., make a network of electrical conductors wherever they go, which, no doubt, has a tendency to promote electrical equilibrium. I believe it is now generally conceded that aerial disturbances and meteorological phenomena are dependent on electricity; and may not a more equable state of electricity in the air be productive of more equable and uniform falls of rain?

I have no doubt but the extending of the iron rails of the Pacific Railroad has produced the effect noticed by said observers. The turning up of soil and comparatively slight elevations and excavations in grading, could have no appreciable effect.

I have written the foregoing in hopes of eliciting the views of observing and practical meteorologists.

JOHN F. LUKENS.

West Mansfield, Ohio.

The Russian Fair Not a World's Fair.

CONSULATE-GENERAL OF RUSSIA TO THE U. S.,
New York, Nov. 18, 1869.

MESSRS. MUNN & CO., *Gentlemen*:—In reply to yours of yesterday, I beg leave to state that I have not received any official notification of the Fair in preparation in St. Petersburgh for 1870. But I read in Russian newspapers that it is not intended to be a *world's fair*, but merely an exhibition of *Russian* products. I am, very respectfully yours,

R. OSTEN SACKEN, Consul-General.

Editorial Summary.

WIENER KALK.—The *Horological Journal* states that the material generally used by watchmakers on the continent for polishing hard and soft steel, as well as brass, is a white substance called wiener kalk; it polishes much quicker than crocus, and with a beautiful black gloss. It is used in the following manner: The piece to be polished is first put on a piece of cork fastened in the vice and rubbed with a piece of plate glass, on which is put a little oil and oilstone dust, till it is perfectly flat and all the file marks have disappeared. It is then cleaned with a brush and soap and water, and dipped in spirits of wine, and, after being dried with a clean cloth, put on another clean piece of cork, in the same way as before, and rubbed briskly with a flat polisher, made either of bell metal or block tin, in which is put a little wiener kalk and fine oil, mixed to the consistency of a thick paste. It is necessary to prevent any dust getting in the polishing stuff or on the piece to be polished. Wiener kalk can be had at Mr. Ehnhus' watchmakers' tools and materials warehouse, in Frith street, Soho square, London, where it is sold under the name of diamantine, and perhaps at some of the tool shops in Clerkenwell.

THE BAKER'S OVEN THERMOMETER.—This useful instrument for indicating the temperature of an oven, is the invention of Mr. J. Bailey, of Salford. Bakers have hitherto generally baked bread satisfactorily; nevertheless, housekeepers know that sometimes the bread is slack baked, while at others it is burnt; the fact being that the bakers judge the right heat of their ovens by the appearance only, and, as a consequence, they must sometimes be deceived; but by the use of a proper thermometer (heat measure) no error can well occur. This instrument is also useful to the japanner and others who use ovens and pottery furnaces.—*S. Piesse.*

WE learn from the London *Mining Journal* that England has sent more locomotives to Russia, Egypt, and Australia this year than heretofore, but in many other directions there has been a falling off. In August, steam engines were exported from the United Kingdom to the value of only £169,495, as compared with £189,639 in August, 1868, and £187,781 in August, 1867. In the eight months ending August 31, this year, were exported, however, the aggregate value of £1,128,541, as compared with £1,075,635 in the corresponding period of 1868.

THERE is a *papier maché* church, says the *Churchman*, actually existing near Bergen, Germany, which can contain nearly 1,000 persons. It is circular within, octagonal without. The relievos outside, and statues within; the roof, the ceiling, the corinthians capitals, are all *papier-maché*, rendered water-proof by a saturation in vitriol, lime-water, whey, or the whites of eggs.

As tallow-melters, oil-boilers, varnish-makers, and others, are very liable to accidents by fire, Dr. Piesse suggests to them the application of Sir Humphrey Davy's discovery of wire gauze, as in the miner's lamp, for the prevention of accidents, by covering the boilers and vats during operation with a drum-head or dome of wire gauze.

HEMMING SEAMLESS BAGS.—A correspondent complains that it is a common fault to hem seamless bags with a single-thread machine, and that the thread breaks, the hem speedily unravels, the bag cannot be securely tied, and its contents get wasted in handling, and asks why the lock-stich is not employed in the hemming of such bags. Will manufacturers answer why?

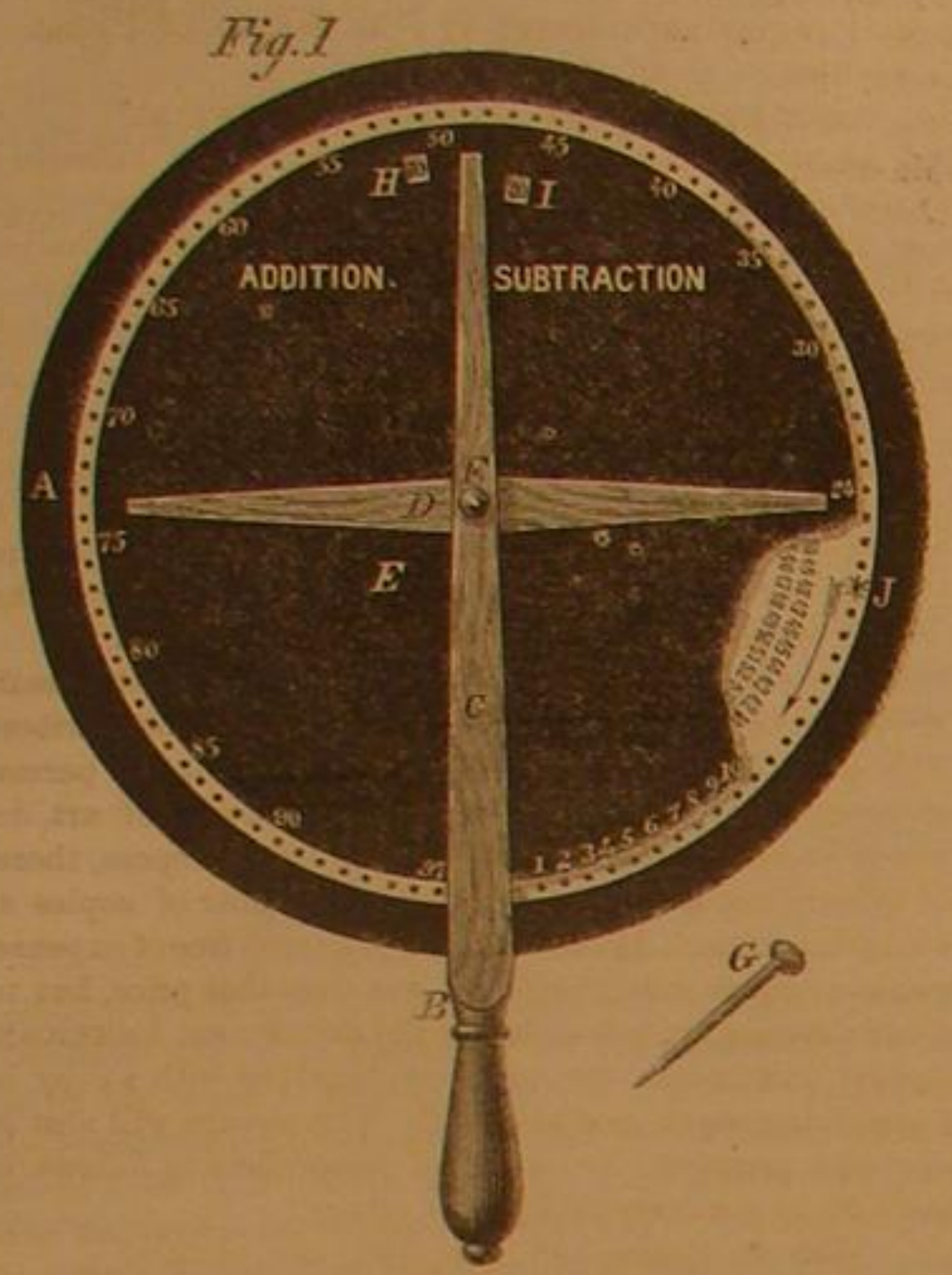
PETROLEUM oil, such as is used for lamps, is an effectual preventive against the destructive propensities of worms in timber. The timber is to be washed over with it.

REFFELT'S CALCULATING MACHINE.

Many attempts have been made to devise a simple and cheap calculating machine. For the most part these attempts have been confined, in the cheaper class of machines, to performing only the one operation of addition. The machine,engravings of which accompany this article, is capable of performing the four fundamental operations of arithmetic—addition, subtraction, multiplication, and division being executed with equal facility and accuracy.

The engravings give views of opposite sides of the machine, the converse operations of addition and subtraction being performed on the side shown in Fig. 1, and multiplication and division on the side shown in Fig. 2.

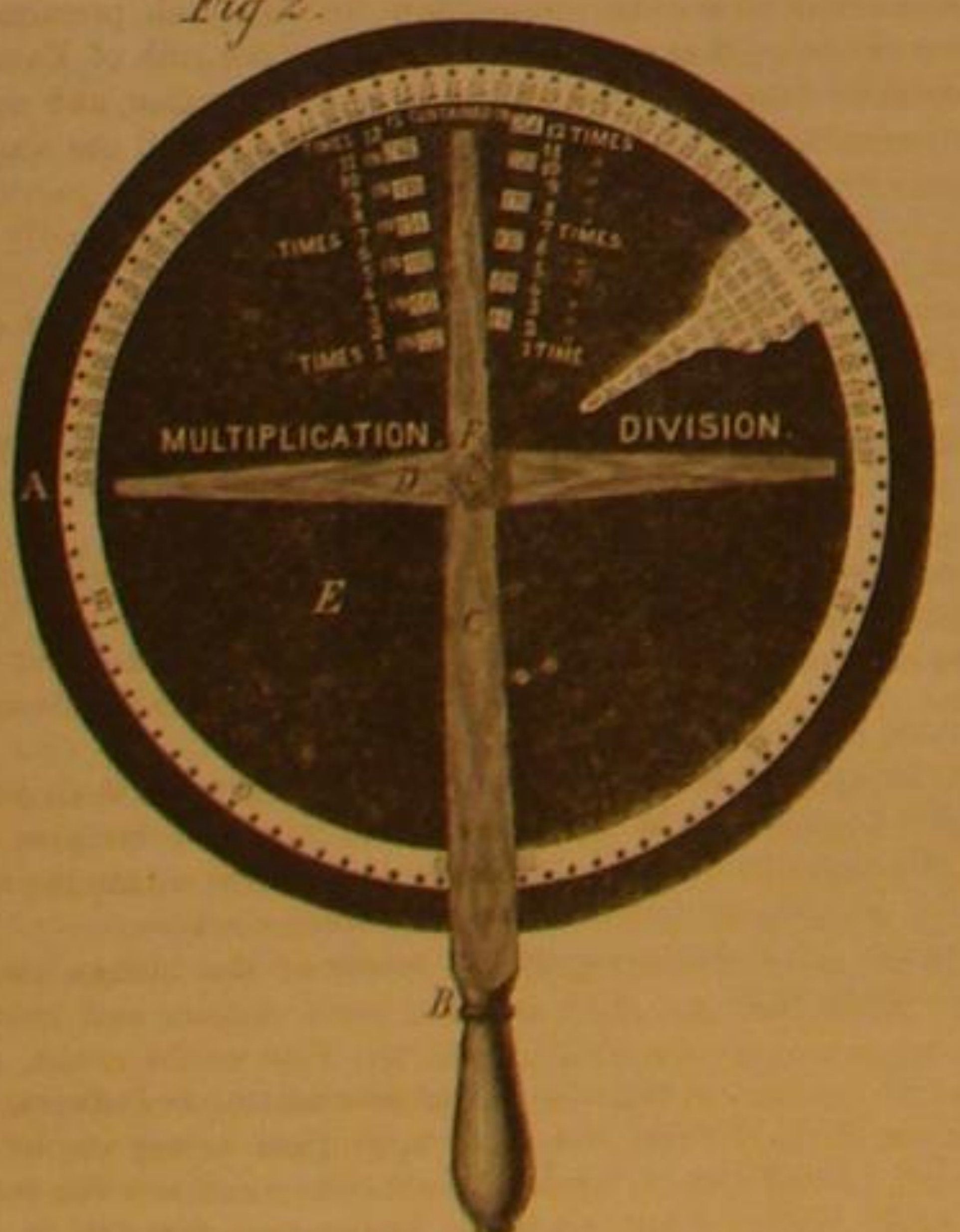
Fig. 1



An external rim or hoop, A, is fastened to a bifurcated handle at B, the bifurcations, C, extending up on each side of the frame, and forming, with the pieces, D, crosses, to which the stationary disks, E, are fixed. Beneath these stationary disks is a revolving disk which turns on a central pivot, F, when actuated by the style, G, Fig. 1, the latter being held in one hand of the operator, while the handle, B, is grasped in the other hand, and the style, G, being inserted in one or other of the small holes drilled in the outer edge of the revolving disk, as hereinafter explained.

The fixed disks, E, are smaller than the external hoop, A, or frame, and, also, smaller than the revolving disk, the edge of the latter fitting in a groove cut on the inside of the hoop, A. Thus, an annular space is left between the hoop and the disks, E, through which the outer part of the revolving disk is seen. On the outer part of the latter, next to the hoop, are shown the holes which receive the point of the style, G, when the machine is in use. There are one hundred of these holes.

Fig. 2.



On the addition and subtraction side, the fixed disk, E, has marked on its outer edge numbers from 1 to 100 inclusive, placed at equal distances from each other, only the first ten of these being shown in our engraving, drawn in full,the rest being indicated in fives on account of limited space.

Upon this side of the revolving disk are two concentric rows of numbers, progressing in opposite directions from one to one hundred inclusive, portions of which are shown where a portion of E is broken away. As the revolving disk is turned by the style, the numbers in the outer row appear successively at the aperture, H, in the disk, E, and those in the inner row at the aperture, I.

Suppose, now, it is desired to add 6 to 7. One of the holes, J, to which the style is applied, is conspicuously marked. The style being placed in this hole, the revolving disk is turned in the direction of the arrow until the style is brought flush with C, when 0 appears at each of the apertures, H and I. The style being now placed in the hole at 6, the movable disk is rotated until the style stops at C, which brings the number, 6, to view at the aperture, H. The style is then withdrawn, and again inserted in the hole next to 7, and carried back to C, which brings 13, the sum of six and seven, to view at H. Two columns of figures can be operated upon at once, as it is just as easy, by this machine, to add 36 to 47, as to add 6 to 7, and by making a mark or tally every time a hundred is passed, the addition may be carried to any extent, thus: 70, 81, 96, 48, would be added in the following manner, J being first brought to C. Carry the style from C to 70, and bring that number to C; do the same with 81, and make a tally mark for the hundred passed; 51 now appears at H. Next carry 96 round to C, and tally for the second hundred passed; 47 now appears at H. Next carry 48 round to C; 95 now appears at H, which, with the two hundreds tallied, make the sum 295. A very little practice will enable the operator to carry the hundreds in the mind without recording them. In this way, two columns, of any length, may be added simultaneously. The sum of each successive two columns being set one place below the preceding sum, and two places to the left, and the several sums added, enable the machine to be applied to adding any number of columns.

Subtraction can be, of course, performed in a converse manner, but it is more convenient to reverse the order of succession in a second row of figures, hence such a row of figures is added, which successively appear at the aperture, H. Suppose it is required to subtract 29 from 36, the instrument being set to zero. The style is placed in the hole opposite 36 in the fixed disk, E, and brought back to C; this brings 36 to view at the aperture, I. Next the style is placed in the hole corresponding to 29, and again brought to C, when the required difference, 7, appears at the aperture, I.

On the multiplication and division side, Fig. 2. The movable disk has upon it concentric rows of numbers, portions of which are shown by the breaking away of a part of the fixed disk, E. The inner row contains the numbers from 1 to 100; the next, the numbers from 2 to 200, which are divisible by 2; the next, those from 3 to 300, divisible by 3; and so on to the outer concentric row, which contains the numbers from 12 to 1,200, divisible by 12. As the revolving disk is rotated by the style in the same direction as in adding or subtracting, the numbers in these rows are successively brought under the apertures placed at the right and left of C, at the upper part of the fixed disk, E. The annular space between the hoop and the fixed disk, E, has upon it a row of figures from 1 to 100, inclusive, progressing in a contrary direction to the numbers on a clock dial. These numbers are so arranged, that when any one of them is brought by the rotation of the revolving disk flush with the bar, C, the products obtained by its multiplication into the odd numbers from 1 to 11, inclusive, appear at the left hand series of apertures, and the products obtained by its multiplication into the even numbers from 2 to 12, inclusive,appear at the right-hand series of apertures, the smallest product in each series being the inner one, and each series of products increasing regularly outward.

It is evident, therefore, that the multiplication of any number from 1 to 100, inclusive, by any number from 1 to 12, inclusive, is performed by bringing the multiplicand flush with C, by the use of the style, when the required product will appear in the aperture adjacent to the multiplier. Conversely, the quotient of any number from 1 to 1,200, inclusive,exactly divisible by any number from 1 to 12, inclusive, divided by any number from 1 to 12, inclusive, is found by bringing the divisor flush with C, when its quotient will appear opposite the dividend, which latter will show itself at one or the other of the apertures.

For the multiplication of the larger numbers, the amounts are divided. For example, suppose 123 to be multiplied by 5,689, the latter number is first multiplied by 12, and again by 3; and the latter product being set beneath the former, and one place to the right, the products are added, the sum being the true product.

Besides being adapted to business purposes, this machine is applicable to use in schools, for purposes of instruction. Further illustration of its operation is not needful, as the means of extending its use to many arithmetical operations will suggest themselves to arithmeticians.

Patented through the Scientific American Patent Agency, Sept. 14, 1869, by J. H. R. Reffelt.

For instruments,or rights to manufacture,address E. Steiger, publisher and dealer in German books, 22 and 24 Frankfort street, New York.

To Correspondents.

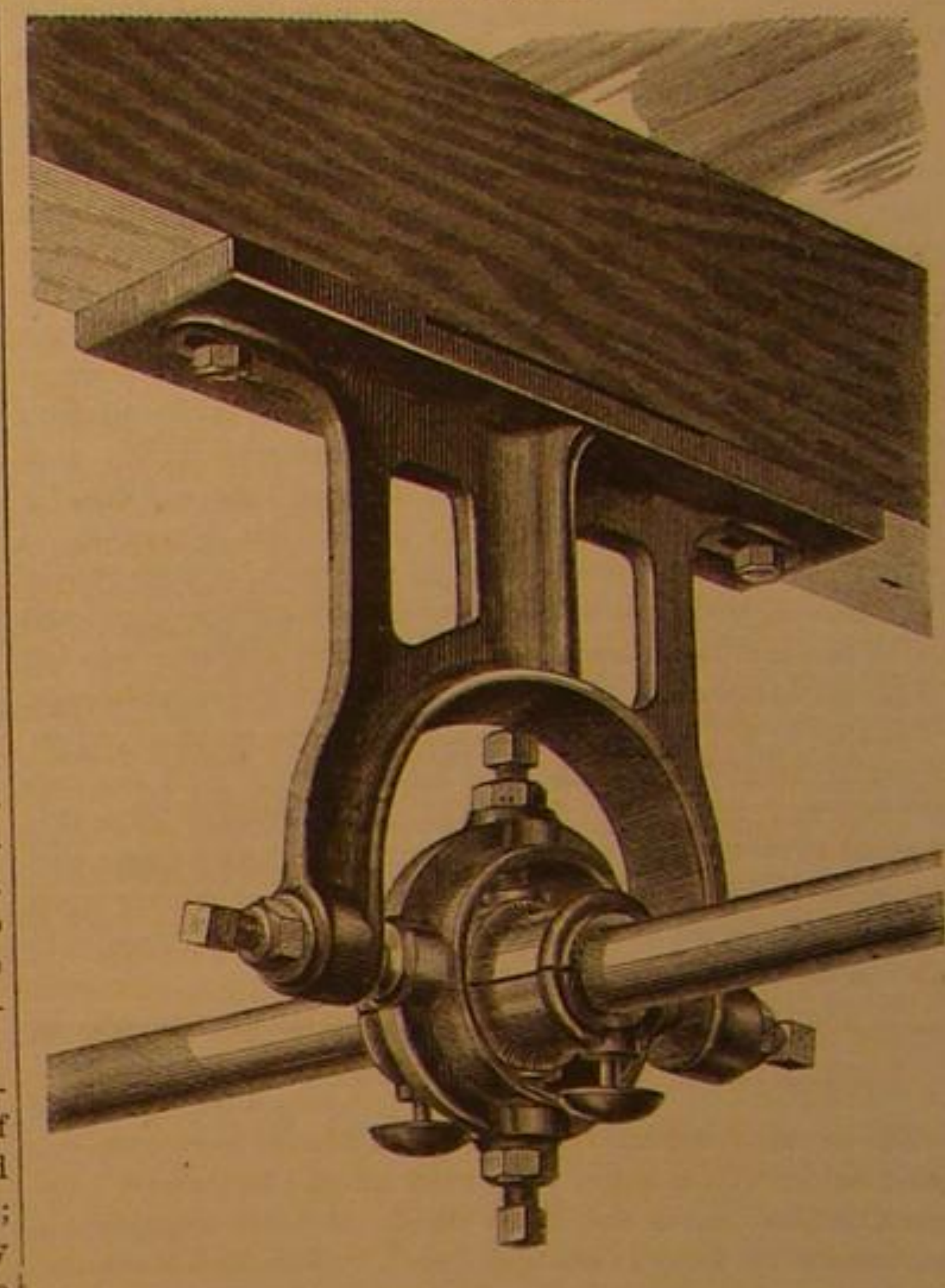
We have on hand a mass of interesting and valuable correspondence, and there must necessarily be some delay in its appearance; but it shall be attended to as fast as space will permit, and we shall be glad to get more of the same sort. If you have got anything practical you wish to bring forward send it along, and don't be too diffident about sending it in homely dress. We will take care that it does not put to blush the orthography and grammar of those unskillful in writing for publication.

We invite the attention of our readers to the announcement for the forthcoming Volume, 1870, on another page It will be seen that premiums are to be given to all who send lists of subscribers of twenty names and upward.

IMPROVED UNIVERSAL HANGER FOR SHAFTING.

The form of hanger known as the universal hanger for shafting, from its utility in leveling and lining shafting, and the reduction of friction accomplished by its use, has grown into general favor. Our engraving illustrates still another improvement upon this form of hanger.

The engraving will show that the same general principles of construction as have hitherto been employed, are retained, viz., bearings having their axes placed at right angles; but the vertical screws engage with the upper and lower halves of the box, which is divided as shown.



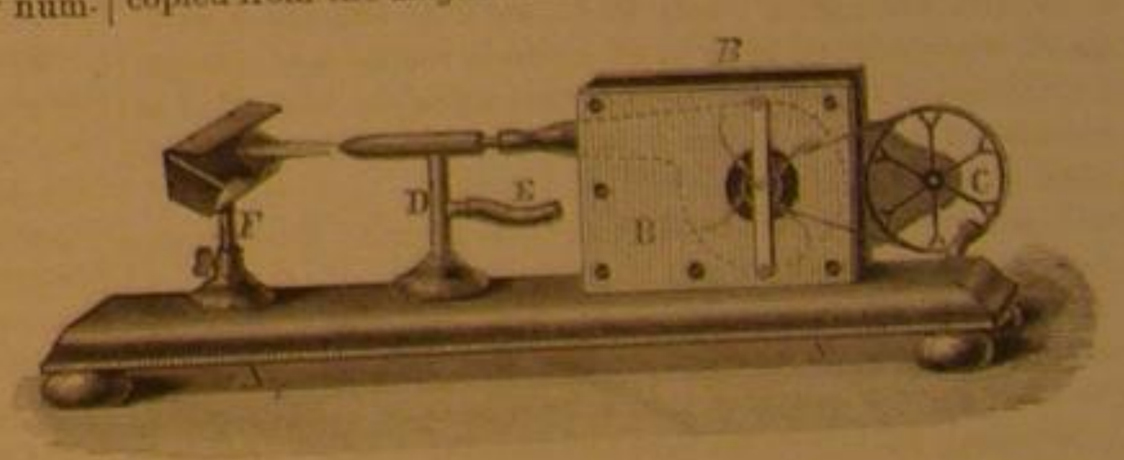
This arrangement enables the box to be made in halves and held together without the use of special bolts for this purpose, the upper and lower bolts in this hanger performing a double office.

The convenience of this arrangement is manifest, and besides the additional convenience, the fact that the wear of boxes may be taken up by the vertical screws, is another consideration in favor of this form of hanger.

An application for a patent on this improvement is now pending through the Scientific American Patent Agency, by J. Gallatin, Jr., of New York, and the hangers are manufactured by the Gallatin and Brevoort Machine Works, 223 Front street, New York.

USEFUL BLOWPIPE.

We give herewith engravings of two useful blowpipes, copied from the *English Mechanic*. The first illustration, Fig.



1, consists of a wood stand, A, a fan with sheet-iron frame and wood sides, B, a small driving wheel, C, and a blowpipe, D, with foot and blast tube running through its center connected by a flexible tube to the fan. E is the tube which conveys the gas to the flame, the gas escaping from an annular opening around the nozzle of the blast tube. F is a sheet-iron support for charcoal on which the article to be brazed is placed.

Fig. 2 is a blowpipe for light work which a contributor to the paper alluded to above, says he has used, satisfactorily, for six years. F is the flame, G is a gas tube, M the mouth piece, H the hand of the operator to draw the slide, S S, out a little for a large flame, and to compress it for a small one, T is the outside tube, into which tube, S S, slides; I is the iron wire stand; W is a gas swivel, and P the gas pipe to swivel on the stand adjustible on I.

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NEW YORK, SATURDAY, DECEMBER 4, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

OSCILLATIONS OF WATER IN STEAM BOILERS.

The peculiar oscillations of water in steam boilers, as indicated by the steam gage, have been a subject of common remark. The causes for these oscillations are imperfectly understood by many in charge of such boilers, and in conversations with engineers of justly high reputation, we have found that certain causes of this fluctuation in hight are unrecognized.

We may regard the following propositions as thoroughly established laws.

First, the pressure of a homogeneous liquid is as its depth. Second, a liquid subjected to pressure from a supernatant fluid, obeys the same laws of pressure as though it were free from the pressure of the over-lying fluid, and the degree of pressure thus sustained upon its surface does not modify or create exceptions to this rule. Third, if the supernatant fluid be a gas, and the liquid upon which it rests be water, a certain amount of the gas, increasing with the pressure, will be dissolved in the water. Fourth, in the absence of nuclei, which serve by their adhesion to assist the escape of a gas from a liquid supersaturated by that gas, the escape will be irregular, unequal, and will partake of the nature of an explosion. Fifth, in the absence of nuclei, the boiling points of liquids are higher than when such nuclei are present. Sixth, when a liquid is agitated so as to render it of unequal depths in different parts, the pressure upon the bottom of the containing vessel and upon the sides against which the liquid rests will be unequal.

A pressure gage, attached to any one point in the side of a vessel thus agitated, would show by its fluctuations the variations of pressure at that point, provided they did not succeed each other so rapidly as not to give time for this gage to act, in which case it would only show the mean pressure.

A water gage is only a form of pressure gage, communicating at the top with the supernatant steam, and at the bottom with the water upon which the steam rests. The pressure of the column in the gage back toward the interior of the boiler is equal to the weight of a column of water having for its base the section of the aperture which connects the boiler and gage at the bottom, and of a hight equal to the hight of the water in the gage above that aperture, added to the pressure of steam upon the upper end of the column. The pressure outward toward the gage is equal to the weight of a column of water having the same base as before, and of a hight equal to the depth of the water in the boiler above the aperture connecting the boiler and gage at the bottom, added to the pressure of the steam upon the top of the water column as before.

When both steam and water are at rest, the water, obeying the same laws of pressure as though there were no supernatant steam pressing upon its surface, seeks and finds a common level in both boiler and gage.

In a boiler supplying steam to an engine, or blowing off steam, the state of internal affairs is *never* one of rest. To suppose the contrary would be to suppose a uniform pressure maintained, a constantly uniform heat applied to all parts of its heating surface, and the escape of steam from the water unattended by ebullition.

That the pressure is never a constant quantity where steam is generated in a closed vessel, any one may see by watching a steam gage attached to such a vessel. The indication of fluctuations in pressure may also be detected in the variable sound of the steam when a boiler is blowing off. It is for this reason that in testing the evaporative power of boilers, it has been found necessary to eliminate the element of variable pressure, by allowing free escape to the steam, so that the pressure is constantly that of the atmosphere only.

We do not, however, regard the constant short bubbling of water in boiling as of much effect in producing the fluctuations of water indicated by the water gage. There are two causes, however, which are sufficient to account for such oscillations.

In the absence of nuclei the steam is generated under tension and escapes with a sort of explosive action; this occurring at one end of a boiler would raise a wave on the surface, which wave would travel along the surface of the water precisely as it would in an open vessel, and when this wave reaches the end of the boiler where the water gage is attached, the water would rise in the gage and recede with the recession of the wave.

Where a boiler is supplying steam to an engine performing variable work, the supply of steam will not be uniform, and the pressure in the boiler cannot be uniform. Whenever the pressure is diminished suddenly the steam escapes from the surcharged water like the gas from so-called soda water, and the volume of mingled steam and water expands; the water in the gage, obeying the same law as the water in the boiler, except in so far as its temperature may be less.

These causes would account for the oscillations of the water even admitting a uniform heat to be maintained in the furnace, a supposition which variations in draft, variable condition of the fire, and quality of the fuel, etc., forbid.

Where two or more boilers supply steam through a common supply pipe, connected to the boilers by branch pipes, the elements of variation in pressure must be still more multiplied, a point upon which it is unnecessary to dwell.

A consideration of the facts we have thus explained coupled with observation, will enable the intelligent reader to determine the causes of peculiar oscillations in individual boilers.

DIRTY SHOPS AND SLOVENLY WORKMEN.

Charles Reade has asserted that workmen are a dirty set and a reckless set. Is this true of American workmen? His observations have been confined to English workmen; would he have occasion to modify the general character of his statement were he to visit and inspect American shops?

Candidly we must say there would be too much in the general want of cleanliness and order in our workshops to justify the assertion. The shops in which cleanliness and order prevail are rather the exception than the rule; and the individual workman who, in the midst of all the carelessness which prevails in this regard, maintains a scrupulous care for personal cleanliness, order in the arrangement of tools, and method in the performance of his work, may be regarded as a rising man.

On our occasional journeys in those most disagreeable conveniences of the age, horse cars, at times when workmen are returning from their daily work, we frequently notice them with begrimed faces and smutty hands, on their way to homes perhaps no less attractive than their persons.

If this were compelled by circumstances, and the unavoidable conditions of their toil, it would be unkind indeed to find fault with it. We should indeed be the very last to look down upon the necessary accessories of honest toil, and, if any American workman is so situated that he *must* utterly disregard cleanliness, let it be distinctly understood we do not complain of him. But cases of this kind are rare, if they exist at all. What then is the reason for the inexcusable slovenliness of a large majority of workmen?

The first reason is that proprietors and overseers do little or nothing to encourage tidiness in their subordinates. They too often look upon a man who is making attempts to keep himself and his work-bench tidy, as a cat in gloves who will catch no mice, and speak contemptuously to him of being afraid to dirty his hands, although his hands may at the time bear the honorable evidence that his duty has been faithfully performed. But tell us pray, is it necessary that they should bear that evidence home with them? Is it necessary that the face should be soiled as well as the hands, and that clothes should be smirched as well as hands and face?

In imagination we hear some mechanic exclaim, "I should like to see that editor do my work a little while, and keep himself clean! I guess he would find it harder work than sitting in his comfortable office and finding fault with us poor fellows, who have no such good luck!"

To whom we reply that, good luck or not, we often sigh for the light-hearted days, when we did just such work, and earned thereby a good appetite and the means wherewith to gratify it; and further we know that you can't get down on your knees in sand, and face your molds with powdered charcoal, and perspire amid a cloud of black dust, and keep your faces and shirts white. Bless you, we know all that, learned it years ago, but it is not *you* we find fault with. It is that slovenly chap who goes in to work at his lathe, on Monday morning, with a clean shirt on, and who, in less than half an hour, has managed to get two or three streaks of black oil down his back, and sundry patches of it on his face, while the handle to every tool on his lathe and even the lathe itself is japanned with the same unctuous material. We can see the use of the black dust and perspiration in a foundery, but we don't see the necessity of a man in a well-ordered machine shop, painting himself up like an Indian on the war-path, and carrying it home with him to the annoyance of those who are, perhaps, obliged to sit in the same seat with him, and who do not care to get into too intimate contact with black-grease and oil.

Personal cleanliness leads to order in work and business, and elevates the moral character of all who exercise it. It is a virtue second only to godliness, and exercises not only a benign influence upon moral character and physical health, but upon intellectual growth.

Would proprietors and superintendents enforce more thorough order and cleanliness in their works, and encourage it in the habits of their employés, they would get more and better work for their money, would render their help more manly and honorable in the discharge of their duties, elevate the character, and increase the welfare of the working classes throughout the world.

ANNOUNCEMENT FOR 1870.—A SPLENDID WORK OF ART AND CASH PREMIUMS TO BE GIVEN.

The SCIENTIFIC AMERICAN enters its twenty-fifth year on the first of January next, and to mark this period of a quarter of a century in which it has maintained its position as the leading journal of popular science in the world, we have purchased from the executors of the estate of the late John Skirving, Esq., and propose to issue on New Year's day, the fine steel engraving executed by John Sartain, of Philadelphia, entitled

"MEN OF PROGRESS—AMERICAN INVENTORS."

The plate is 22x36 inches, and contains the following group of illustrious inventors, namely, Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, J. Saxton, Dr. W. T. Morton, Erastus Bigelow, Henry Burden, Capt. John Ericsson, Elias Howe, Jr., Col. Samuel Colt, Col. R. M. Hoe, Peter Cooper, Jordan L. Mott, C. H. McCormick, James Bogardus, Frederick E. Sickles.

The likenesses are all excellent, and Mr. Sartain, who stands at the head of our American engravers on steel, in a letter addressed to us says "that it would cost $4,000 to engrave the plate now," which is a sufficient guarantee of the very high character of the engraving as a work of art.

The picture was engraved in 1868, but owing to the death of Mr. Skirving, a few copies only were printed for subscribers at $10 each. A work embracing so much merit and permanent interest to American inventors, and lovers of art, deserves to be much more widely known. We propose, therefore, to issue, on heavy paper, a limited number of copies at the original price of $10 each, to be delivered free of expense. No single picture will be sold for less than that price, but to any one desiring to subscribe for the SCIENTIFIC AMERICAN, the paper will be sent for one year, together with a copy of the engraving, upon receipt of $10. The picture will also be offered as a premium for clubs of subscribers as follows to those who do not compete for cash prizes:

For 10	names	one	year	$30	one	picture.
" 20	"	"	"	50	"	"
" 30	"	"	"	75	two	pictures.
" 40	"	"	"	100	three	"
" 50	"	"	"	125	four	"

In addition to the above premiums we also offer the following cash prizes:

$300	for	the	largest	list of	subscribers
250	"	"	second	do	do
200	"	"	third	do	do
150	"	"	fourth	do	do
100	"	"	fifth	do	do
90	"	"	sixth	do	do
80	"	"	seventh	do	do
70	"	"	eighth	do	do
60	"	"	ninth	do	do
50	"	"	tenth	do	do
40	"	"	eleventh	do	do
35	"	"	twelfth	do	do
30	"	"	thirteenth	do	do
25	"	"	fourteenth	do	do
20	"	"	fifteenth	do	do

Subscriptions sent in competition for the cash premiums must be received at our office on or before the 10th of February next. Names can be sent from any post office, and subscriptions will be entered from time to time until the above date. Persons competing for the prizes should be particular to mark their letters "Prize List" to enable us easily to distinguish them from others.

Printed prospectuses and blanks for names furnished on application.

WORK PERFORMED BY THE HUMAN HEART ESTIMATED IN HORSE POWERS.

That wonderful little pumping engine which we all carry around in our bosoms, and which runs without cessation till death ruthlessly closes the throttle, performs an amount of work so great as to be almost beyond belief till substantiated by arithmetical calculation.

If we scrutinize the mechanism of the heart, we shall find that it involves in its operation nearly all the principles of hydrodynamics. It may, therefore, be brought within the domain of mathematics as well as any other machine.

In the attempt to calculate the power of the human heart for a given time, we shall arrive at some curious and interesting, not to say astonishing results. Few would credit, at first, the statement that the hearts now beating in and around the city of New York, exert an aggregate power ample to propel a large steamer across the Atlantic ocean at a fair rate of speed, yet we shall be able to demonstrate that this is as much a fact, as that any of these steamers ever crossed that storm-torn sea.

Blood is heavier than water; its specific gravity being, according to Booth, of from 1·0527 to 1·057. For convenience, however, we shall consider it as being of the same weight as water, extreme accuracy not being essential to our purpose and in our computations we shall, for the most part and for the same reason, throw out fractions and use round numbers.

The pressure required at the mouth of the aorta to force the blood through the vessels of the human body, is estimated by Hales, as being equal per square inch of surface, to

that exerted by a column of blood seven and one half feet high. The pressure per square inch was estimated by Poiseuille as four pounds three ounces. Others have estimated the pressure as that of a column of water six feet in hight. The results vary in different experiments, but they are sufficiently accurate to give us an average that we may rely upon as within bounds. They are also something more than mere estimates, as this pressure has been measured by pressure gages inserted into the blood vessels.

We shall consider the pressure as that of a water column six feet in hight, the weight of which would be nearly forty-two ounces, which, for simplicity, we will consider forty-two ounces, or two pounds ten ounces avoirdupois.

The average discharge of the heart at each pulsation may be estimated at one and one half ounces, and its number of beats at seventy-five per minute; making an aggregate of 112 ounces, or seven pounds discharged per minute.

The average internal diameter of the aorta, or the first great artery through which the blood passes from the heart into the general circulation, may be taken as being in adults three quarters of an inch.

Seven pounds of blood per minute is therefore forced through this artery against a pressure of forty-two ounces, equivalent to raising seven pounds six feet each minute, equal to raising forty-two pounds one foot, or forty-two foot-pounds.

From the diameter of the aorta and the amount of blood forced through it we might compute the velocity of flow, but that is not essential to our purpose. All consideration of friction in the performance of this work is also omitted, so that the estimate of forty-two foot-pounds per minute must be considered as considerably less than the actual work performed, this result corresponding to what is called *useful work* in the performance of machines.

Forty years of this work would be equal to the work of twenty-six thousand seven hundred and fifty-seven horses for one minute of time, or the work of one horse for forty-four and one half days of ten hours.

The work of seven hundred and eighty-six adult hearts is equal to one-horse power; therefore seven hundred and eighty-six thousand hearts would perform the work of one thousand horses. The aggregate population of New York, Brooklyn, and Jersey City, was, according to the census of 1860, one million one hundred and twenty-two thousand, and it may be safely estimated now at one and one half millions. Considering this as equal to an adult population of twelve hundred thousand, their united heart-beats exert a power equal to that of one thousand five hundred and twenty-seven horses. Averaging the power of the united pulsations of adults and children as equal to that of four fifths the entire population, and taking the census of 1860 as a basis for calculation, the work done by all the human hearts in the United States nearly equals that of thirty-two thousand horses. The work done by the beating of all the human hearts on the globe is equivalent to the power of one million forty-six thousand and fifteen horses. The nominal horse power of the engines in the *Great Eastern* is four thousand; considering the actual horse power to be ten thousand, the power exerted by the united human heart-beat of the world is sufficient to propel a fleet of one hundred and four *Great Eastern's* at full speed continually. This power could only be generated in average steam engineering practice by the combustion of four thousand six hundred and eighty tuns of coal per hour.

When we reflect that the human family is small in comparison even with the great class of mammalia, of which it forms a part, and that many of the same class, as the whale, the elephant, the rhinoceros, the hippopotamus, giraffe, etc., have hearts of very much greater size and power than the human heart; and when we conceive of the enormous additional work performed by the hearts of reptiles, birds, fishes, mollusks, and insects, and to this work add in imagination the power expended in the movement of the respiratory apparatus of animals, and voluntary muscular movement, necessary to obtain sustenence for these animals, we may gain some feeble conception of the enormous expenditure of mechanical power required to sustain animated existence on the earth.

PROGRESS OF INVENTION IN THE SOUTHERN STATES.

One of the most noteworthy features of the revival of industry in the Southern States, is the apparent disposition on the part of the people in that section to render themselves as far as possible independent of other sections for their supply of utensils, machines, and other essentials to the conduct of their agricultural and manufacturing pursuits.

One of the most striking evidences of this fact is found in the increased numbers of original devices calculated to advance the progress of the various branches of industry peculiar to that large, fertile, and, soon to be, most flourishing region. And not only are the Southern inventions which come under our notice in the course of our business applicable to the wants of the South, but many of them will find a widely extended application throughout all sections of the country.

This is a most encouraging sign of future prosperity, and one which all lovers of our common country must rejoice to see.

In this connection it will be interesting to notice some of the more recent and prominent Southern inventions.

A Memphis paper states that George W. Grader, a citizen of that city, has taken the bull by the horns and invented a machine for ginning cotton and relinting cotton seed and cotton motes, which promises to revolutionize the whole system of cotton ginning in the country.

Taking cotton from the boll, Mr. Grader's machine leaves no motes, the falls comprising nothing but the dirt. It cleans the seed, making them more valuable for manufacturing purposes, and saves the planter a large per centage on his crop.

The Memphis paper pronounces this invention of Mr. Grader one of the most extraordinary of the present time.

Mr. Henry Thompson of Mobile, has invented, and obtained a patent on, a submarine telescopic lantern, an ingenious design admirably adapted to the purpose of examining objects at any depth under the surface of the water, as the bottoms of vessels, foundations of piers, giving light under the water, and taking photographs of any objects, even at the bottom of the sea. At the same time it is an invaluable aid in enabling submarine divers to see how to work in laying pier or other submarine foundations, wrecking vessels, and recovering the bodies of persons drowned or valuable articles hidden under the sea.

This instrument is of simple construction, similar to a pilot's sounding pole, sectional tubes joined together with reflectors, mirror, and light at one end, so artistically arranged as to reflect objects under the water to the eye of the observer above.

The same versatile inventor has taken out patents on a life, surf, business, and pleasure boat, and, according to the Mobile *Daily Tribune*, has invented one of the most graceful, rapid and safe three-wheeled velocipedes ever devised.

The Boden safety valve is another Southern invention. According to the Louisville *Courier Journal*, it has been submitted to the most satisfactory tests, and has come out triumphant. It consists of two valves, one of which opens on the inside of the boiler and the other on the outside. Thus it will be seen by any one at all acquainted with the workings of a steam boiler, that an over-pressure of steam will open the outside valve, and a suction or vacuum will open the inside one.

We are in receipt of numerous letters from Southern men, making inquiries in regard to projected improvements, which indicate that an active spirit of invention pervades the Southern mind.

Gen. G. T. Beauregard, of New Orleans, recently obtained letters patent through the Scientific American Patent Agency, for improvements in apparatus for propelling cars and other vehicles on land, and boats on canals or rivers, by means of overhead wire rope, operated by stationary engines or other power placed at intervals along the route.

His invention comprises novel and ingenious clamping devices and spring attachment for the same, attached to the car, for engaging and disengaging the propelling rope, in a manner to avoid shocks and jars to the cars or boats.

In a recent letter to us on the subject, he says: "Thanking you for your prompt attention in obtaining my patent, I would state that this improvement of mine is destined, I believe, to create a rapid increase in the number of street railways in and about cities, and of canals in the country, by materially diminishing their current or running expenses. Moreover, in northern latitudes, where, owing to the ice, canals remain idle part of the winter, they will be used in connection with the stationary engines and endless wire ropes of my system, as so many railways for properly constructed cars and boats. When these arrive at any locks they will be easily transferred from one level to the other by a lifting platform."

We are happy to chronicle these signs of growing prosperity among the Southern people.

HOW SHOE-PEGS ARE MADE.

Shoe-pegs were invented in 1818, by Joseph Walker, of Hopkinton, Massachusetts. At least the invention is attributed to him, though the evidence upon which this opinion is based is not altogether satisfactory. A shoe-peg is a little affair, but its invention was by no means an unimportant event. It worked perhaps as great a revolution in a most important branch of industry as was ever effected by a single device. Before its introduction the soles of all boots and shoes were attached to the uppers by sewing; now, nearly ninety per cent of all the boots and shoes manufactured are pegged.

It has given birth also to numerous other important inventions; pegging awls of improved form, rasps for cutting off the parts of the pegs inside the boot, pegging machines, which will peg on a sole almost before one can think about it, machines for cutting, polishing, and bleaching pegs, etc., etc.

It is within the memory of the writer that shoe-pegs were made by hand. The timber from which they were made was sawed into blocks across the grain, of such a thickness as would, when the block was split into pegs, make them of the right length. Slabs, or bolts, thin as the body of the pegs wanted, were then split off by the use of a long thin knife and a hammer; the knife being used like the instrument called a "*frow*" by coopers and shingle makers. The bolt or slab was next beveled on both sides of one edge. The slab thus prepared was next split into pegs one by one.

Of course such a rude method as this was destined to be supplanted by a far more rapid and perfect one, and there is probably no article so well made and finished that is sold cheaper than the modern shoe-peg.

It is worthy of remark that the same principles are applied to their manufacture by the best modern machinery, as were adopted in the hand method.

The wood must be of some hard, close-grained variety, which splits easily. Hard maple and birch are the favorite woods for this purpose; birch, however, is, we believe, the shoe-peg timber *par excellence*.

The wood is cut into lengths of about eight feet, and is sold by the cord, at three or four times the price of the same kinds of timber cut into fire-wood. The logs are received at the factory in the green state, and are worked up as wanted.

The first operation is peeling off the bark, an adze being employed for this purpose. The logs are next sawed into blocks across the grain, a little thicker than the length of a peg. These blocks are placed on a planing machine and the side which is intended for the heads of the pegs is planed smooth.

The blocks are now ready to be grooved. This is done very rapidly by a machine in which a cutting tool reciprocates rapidly across the face of the block, the block being at proper intervals of time carried along by feed rollers. After the blocks have been grooved one way, they are again grooved at right angles to the first grooves, and both sets of grooves being V-shaped, the surfaces of the blocks on one side, now present a regular succession of quadrangular pyramids, which are the points of the yet embryo pegs.

The next operation is splitting, which is done on machines operating very rapidly and with great precision. The splitting knives on these machines are pivoted at one end, and the other end is made to play rapidly up and down, the motion being similar to that of a shears-blade for trimming sheet iron. The pivoted end may be raised or lowered so that the knife may only enter the wood as far as required, the object being to not split the pegs entirely apart, but to have them hang together at the heads. The blocks are fed to the splitting knives by fluted rollers, the flutes of which fit the grooves in the blocks made by the grooving machines. The blocks are fed in with the planed side downward, and the splitting knife at each stroke enters the wood at the bottom of the V-shaped grooves with great accuracy. Thus the splitting is done from the points towards the heads of the pegs. When the block has passed through the splitting machine once, it is turned and fed through again at right angles to the direction in which it was first fed through, and after this operation the pegs are very nearly split apart, but they still hang together somewhat like a bunch of split lucifer matches. The object of keeping them thus together is to enable them to be fed to the machines in a mass. After the second feeding the block is forcibly thrown off the table of the splitting machine on to the floor, and the pegs fall asunder. The pegs at this stage are of different colors, somewhat rough on their sides, unseasoned and dusty. They are therefore dried in a tumbler heated by steam pipes, bleached with sulphur fumes till they assume a uniform white color, run through a fanning mill to free them from dust, and finally packed for market.

The extent of this manufacture is much greater than would seem possible to most people. It would seem at first, that if all the people in the world were shoemakers, they must be overstocked with pegs. There are numerous factories in the Eastern States turning out from fifty to one hundred bushels and upward of shoe-pegs per day, and still the demand keeps up. Anything in universal demand even if individually the demand is small, must foot up large in the aggregate for the civilized world. The New England States manufacture the greater part of all the shoe-pegs used, Germany, we are informed, being one of the best customers.

The Russian Exposition.

We notice that a resolution was unanimously adopted by the Louisville Convention requesting Ex-President Fillmore to appoint a delegation of six persons to attend the Russian Exposition in 1870, these Commissioners to take charge of all specimens that exhibitors in the United States may desire to send, and they are specially instructed to procure thousands of samples of cotton from various States.

The papers containing the report of this proceeding add that the suggestion came from Europe, and that a hundred thousand American specimens are asked for, to show the importance and the diversity of production in our country.

A letter from Baron Osten Sacken, Consulate General of Russia to the United States, published in another column, states that the Exposition is intended only for the display of Russian products. We invite attention to this letter. Before the Commissioners are appointed by the venerable Ex-President, it might be well to first find out if they are wanted.

A Letter from Dr. Livingstone.

There can no longer be any reasonable doubt of the safety of Dr. Livingstone, and there can be no doubt either, that if his life is spared to narrate the incidents of his last great tour in Africa, it will prove a most remarkable narration. The extracts from a letter of Dr. Livingstone, sent by Dr. Kirk from Zanzibar to Sir Roderick Murchison, contain the following information:

"Dr. Livingstone had traced a chain of lakes, connected by rivers, from the tracts south of the Lake Tanganyika to south latitude 10 degrees to 12 degrees, and he conjectures that these numerous connected lakes and rivers are the ultimate southern sources of the Nile. When he wrote he was about to travel northwards to Ujiji, on the eastern shore of Lake Tanganyika, where he expected to find some information from home, of which he had been entirely deprived for two years, as well as to receive provisions and assistance."

Our predictions in regard to the effect of high-heeled shoes upon female health have been verified. A French physician states that this fashion "has produced distinct diseases not only of the distorted foot, but of the body. As the frame is thrown permanently into an unnatural position, it affects the spine, and as it is a question of balancing, nervous irritation sometimes occurs. You see by the expression of the face how much a woman suffers who has walked about or even stood in high-heeled boots. Besides, we have accidents from falls very frequently."

Tartaric and Citric Acids.

Tartaric acid, when pure, is in colorless, inodorous, very sour crystals. It is soluble in two parts of water, and also in alcohol. The watery solution has no smell, is perfectly limpid, and is very acid. The specific gravity is 1·59 and 1·75. Heated on a piece of metal over the flame of a lamp, it swells up, emits a very peculiar smell, and leaves a porous coal. The solution exposed to the air very soon mildews on the surface and turns to vinegar.

The composition of pure anhydrous tartaric acid is: Carbon, 36·40; hydrogen, 3·02; oxygen, 60·58 parts in one hundred, but the crystals always contain 11·84 per cent of water.

Tartaric acid is manufactured from cream of tartar (bitartrate of potassa), which latter, as we have stated in a previous article, contains 70·18 per cent of this acid. The mode of its preparation is fully described in all recent works on chemistry applied to the arts and manufactures.

It is frequently adulterated by admixtures of cream of tartar, bisulphate of potassa or lime. These are readily detected as follows;

1. The acid, if pure, dissolves without leaving the slightest sediment.

2. Alcohol must dissolve the whole of the crystals, leaving no undissolved portion.

3. After calcination, lime can be detected in the ash by its effervescing if a drop of any strong acid be allowed to fall on it.

4. Sulphureted hydrogen, sulphate of lime solution, or chloride of barium introduced into a solution of pure tartaric acid, will cause neither cloudiness, change of color, nor deposit.

The uses of tartaric acid are many, large quantities being annually consumed in the manufacture of lemonades, soda waters, and other sparkling drinks, where it replaces advantageously the more expensive "citric" acid. It is also much employed by calico dyers as a special mordant.

In conclusion we will only mention that tartaric acid combines with some other substances, forming what are called "tartrates" and "bi-tartrates," many of which are valuable in the arts or in the practice of medicine.

Tartaric acid itself, finds a place in the phamacopœia.

Citric acid is found in the juices of many plants, but in none is it more plentiful than in the fruit of the lemon and its allies.

In a pure state it forms transparent, scentless, rhombic crystals, which do not alter by exposure, and have a very acid flavor. The specific gravity is 1·617. It is soluble both in water and alcohol. Dry heat soon destroys it.

Citric acid is largely used in bleaching establishments and laundries for removing rust and ink stains, and by the dyer for intensifying many red colors. The best class of artificial lemonades and sparkling acidulated drinks and powders are made from it.

Accidental impurities are, sulphuric acid and salts of lead; they are not, however, of frequent occurrence.

The "trade" adulterations are with oxalic acid, tartaric acid, and occasionally sulphate of lime.

Tartaric acid and oxalic acid, from their low prices and somewhat similar aspect and flavor, are generally found mixed in proportions varying from 30 to 80 per cent with the commercial citric acid. For the detection of this adulteration, dissolve your sample in water and add gradually, stirring all the while, a solution of sulphate or carbonate of potash. If the citric acid be pure, no deposit whatever will show itself, but if it contain either tartaric or oxalic acids, a white crystalline precipitate of tartrate or oxalate of potash will fall to the bottom and tell the tale at once.

Citric acid is manufactured from the juice of lemons, limes, citrons, and other similar fruits. Lemon juice is frequently brought to market in barrels or in bottles from the warm countries where the tree prospers. It is used in its natural state for many domestic purposes, and also by the dyer in his profession.

Lemon juice must be carefully clarified, as by neglect of this operation it will be sure to undergo fermentation and to acquire a very unpleasant odor and disagreeable taste. It is often largely adulterated by the addition of water, besides which, vinegar, sour grape juice, citric acid, muriatic acid or tartaric acid, and sometimes several of these combined, are not unfrequently added to it.

The detection of these admixtures needs the practical science of the analytical chemist.—*New York Mercantile Journal.*

Hyacinth Culture.

Many of our readers just now will be thinking of growing that beautiful winter flower, the hyacinth. A few hints given by a correspondent of the *Journal of Horticulture* may prevent failure, and consequent disappointment, in not a few cases. He says:

"I annually grow about eighteen hyacinths in glasses, and invariably place them all in water at the same time. I have tried different times in the hope of insuring a succession of bloom, but it has happened that those placed latest in the glass were among the first to bloon. I have also ceased to put the bulbs in the water so early as I used, and now do not think of putting them in till the middle or end of October. Fresh rain water is to be preferred, and the glass should be so filled that the water only just touches the base of the bulb. Rain water should not be employed unless it is quite fresh, or otherwise it soon becomes putrid, and causes the roots of the bulbs to decay. If there is no alternative but to employ hard water, if it can be exposed to the action of the sun or external air for a time, so much the better.

"My experience has taught me that hard water used directly after it is taken from the well is apt to cause the roots to become a mass of pulp, highly offensive, and fatal in its effects. Two or three lumps of charcoal placed in the glasses about two or three days before they are occupied by the bulbs, in order to allow of the charcoal becoming saturated and sinking to the bottom, will keep the water from turning rank, and prevent the necessity for its being often changed. Some of my best flowers have been in glasses, the water of which was not once changed. Place the glasses in a dark and rather cool situation until the roots have nearly reached the bottoms of the glasses, when they can be brought to the light.

"A month or six weeks' imprisonment will bring the roots to this stage of development. The most airy and lightest part of a sitting room, but as far from the fire as possible, is the best position for them. When the bulbs have been in the water about a week or ten days, the base of each should be examined, and any decaying or slimy substance removed. As the shoot of growth increases in size, evaporation will take place, therefore the water should be replenished at intervals, care being taken that what is supplied is not lower in temperature than that in the glass. The foliage of the plants should be kept scrupulously free from any dust or dirt; a small piece of sponge will remove this with but very slight trouble. When the flower spikes begin to show themselves the glasses should be kept filled to the rim with water, as at the point of flowering the bulbs absorb a great quantity of moisture."

Monckhoven's New Artificial Light.

Dr. Desire van Monckhoven recently demonstrated satisfactorily its importance before a meeting of the Vienna Photographic Society, and delivered a lecture upon its mode of application.

One of the most intense lights to be obtained by oxidizing metals or metallic compounds at a high temperature, is that derived from chloride of titanium, or chloro-chromic acid, when exposed to the action of an oxy-hydrogen flame; the light thus produced is of high actinic power, and capable of blackening chloride of silver paper to an appreciable degree in thirty seconds, the formation of titanic acid or chromic acid being brought about at a very high temperature. It is this description of light that has been chosen by Dr. M.

Several kinds of oxy-hydrogen lights have been devised from time to time; the Drummond light, in which the flame acts against a cylinder of unslaked lime, but which requires the constant presence of carbonate of lime, and the surface of the cylinder to be continually changing; the Tessie du Motay light, in which the lime cylinder is replaced by means of a compressed magnesia or zirconia cylinder; and the Carlevaris light, consisting of small parallel pipes of hard charcoal moistened with chloride of magnesium. Of all these lights that of Drummond is the best, and by substituting for the lime cylinder another composed of titanic acid, magnesia, and carbonate of magnesia, a suitable illuminating power is obtained. A cylinder of this description, measuring three centimeters (1 inch) broad and nine long (3 inches) lasts for three hours, and may be produced for the sum of threepence. Instead of hydrogen, ordinary coal gas is employed; and for the supply of oxygen, M. Deville's method of obtaining it by heating a mixture of calcined peroxide of manganese and chlorate of potash is employed.

Hoosac Tunnel.

The new railroad bridge across the Deerfield river, at the east end of the Hoosac Tunnel, has been completed, and the rock from the tunnel is now deposited on the other side of the river. The work at the west end of the tunnel progresses rapidly. Last week forty-three feet were completed, being twenty feet more than during any week under the State management. Messrs. Shanly & Co., are the contractors. The Burleigh drills are used exclusively at this tunnel, but with compressed air as the motor. The air is condensed three atmospheres, by means of Burleigh's air compressors, operated by steam power, and the condensed air is carried nearly two miles in an iron pipe before it operates upon the drills. The air which exhausts from the drills gives perfect ventilation within the tunnel.

The progress made at the Hoosac Tunnel is nearly one third greater than at Mont Cenis, notwithstanding the supposed superior and the costly nature of the French machinery

THE FIRST MAN WHO HAD CHARGE OF A LOCOMOTIVE IN THE UNITED STATES, turns out to be, not Nicholas Darrell, as stated on page 326, current volume, in an article copied from the *Rural Carolinian*, but John Degnon, 48 First street, New York. We had the pleasure of a call from Mr. Degnon a few days since, and he explained to us that he was the man who took charge of the *Best Friend* on its way to Charleston, and that he ran this locomotive three months or thereabouts, meanwhile giving Mr. Darrell the necessary instructions to qualify him for the post. The following year he executed a similar commission with a second locomotive. In proof of his statement, Mr. Degnon referred us to Horatio Allen, and other prominent engineers and manufacturers of this city. "Honor to whom honor is due."

GERMAN TINDER.—Amadou, punk, or German tinder, is made from a kind of fungus or mushroom, that grows on the trunks of old oaks, ashes, beeches, etc. It should be gathered in August, or September, and is prepared by removing the outer bark with a knife, and separating carefully the spongy, yellowish mass that lies within it. This is cut into slices, and beaten with a mallet to soften it, till it can easily be pulled asunder between the fingers. It is then boiled in a strong solution of saltpeter.

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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

E. N. B., of Ottawa, Ca.—No method of trisecting an angle based upon principles of plane geometry has ever been discovered, though many attempts have been made. Believing the problem impossible, the prizes offered at one time by several learned societies for its solution have all been officially withdrawn, notwithstanding ambitious geometers are still busying themselves with the problem. An attempt at its solution, recently made by Patricio M. Del. Rio, ex-professor in the Peruvian Naval Academy, has been recently published, but it has since proved to be erroneous. You will find immortal fame sooner in other pursuits than in muddling your brains with this question.

J. M., of S. C.—No simple rule has ever been found for determining the size of a second pulley, only the distance between centers, length of belt, and diameter of first pulley being given. A solution has, however, been sought by eminent mathematicians. The problem is extremely difficult, and involves the higher mathematics for even an approximate solution. The practical and proper way to work is to fix the size of both pulleys and determine the length of belt accordingly; and actual measurement is the readiest way to determine the length of a belt when the diameter of the pulleys in which it is to run are given.

J. W. M., of Ind.—The best varnish we know for the preservation of a portable boiler liable to rust through exposure to out-door influences is asphaltum. This substance readily dissolves in turpentine, which forms a good vehicle for its application. We presume you can obtain it ready mixed.

J. W. M., of Pa.—Nails are made of any size ordered, provided the order is large enough. We do not know whether the size you mention is kept on hand or not by any dealers, but are inclined to think it is not.

W. B. L., of Vt.—There is no cheap metal that will withstand the action of salt water. You can obtain all kinds of rubber tubing from any dealer in rubber goods.

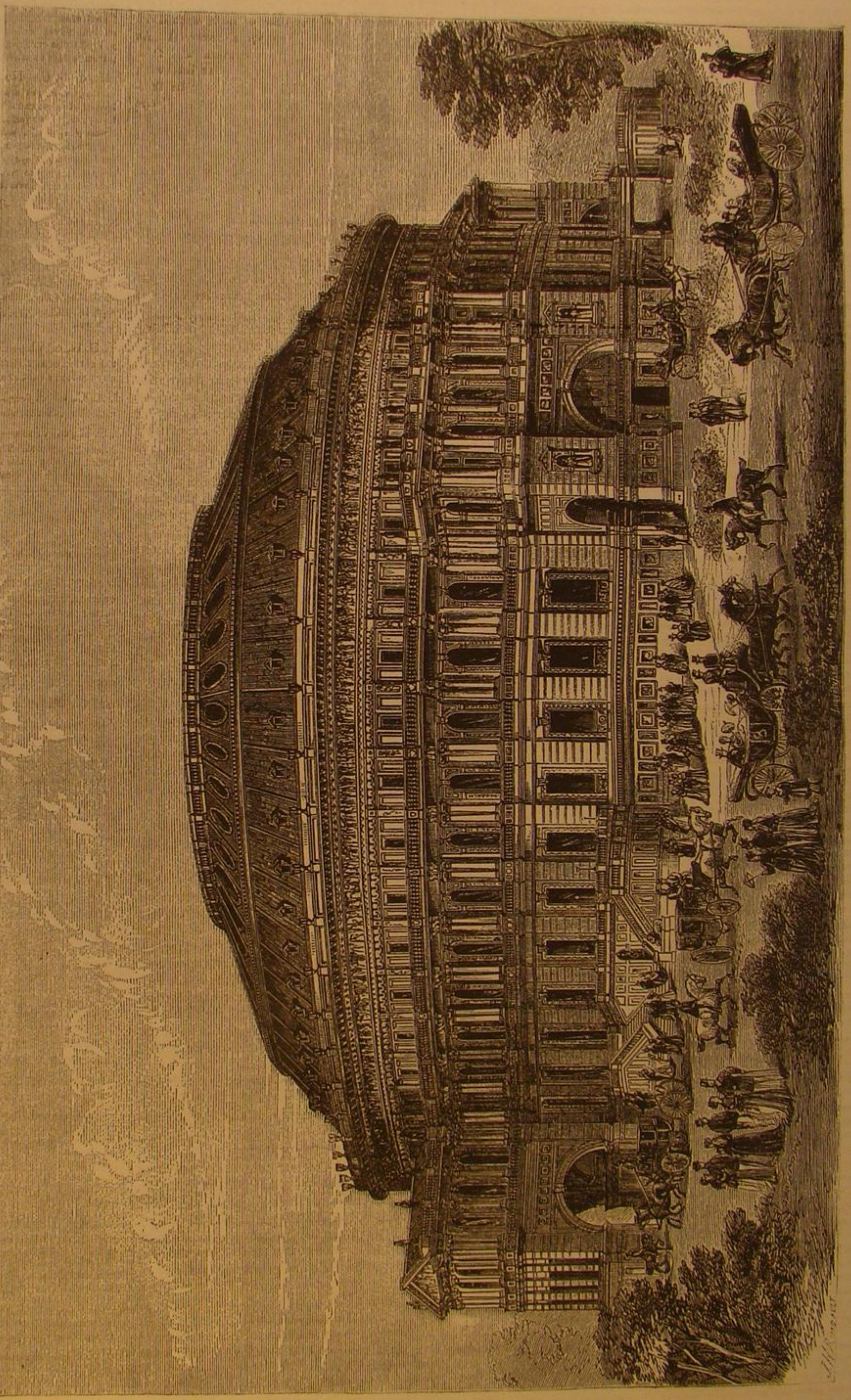
R. A. C., of Ky.—You can render brittle sheet brass tough by annealing, that is, heating it and plunging it in cold water.

G. S. R., of Mass.—There is no gain in using high steam for heating purposes. The total amount of heat in steam at any pressure is found by adding the latent heat to the sensible heat or temperature, and this is practically a constant sum for all pressures.

THE ROYAL ALBERT HALL OF ARTS AND SCIENCES.

On the 20th of May, 1867, the "first stone" of the Royal Albert Hall of Arts and Sciences, of which we present an illustration, was laid with all due solemnity and ceremonial by her Majesty the Queen; and now, at the end of little over two years, the vast building is nearly completed, and is only waiting to be covered in by its vast roof to allow of all its interior fittings and arrangements being set up. In form it bears some resemblance to a Roman amphitheater, although its material—namely, red brick faced with terra cotta—goes far to destroy the illusion. Still, it is only justice to the architect to admit that the general effect of his work is both pleasing and imposing. Its magnitude will be best indicated by giving the exact dimensions in figures. The long diameter of the outer wall is 272 feet, the shortest 238 feet, the length between the porches 338 feet, the breadth of the ellipse 332 feet, and the hight 135 feet. The interior is arranged to accommodate comfortably an audience of 8,000, to be divided as follows: In the arena, situate in the center of the building, 1,000 can be accommodated for the musical performances, and when the space is not occupied, by a flower show or an industrial exhibition. The amphitheater, which rises gradually all round the arena under the boxes, will hold 1,400, the boxes 1,100, the balcony 2,500, and the gallery 2,000. The boxes have already subscribed for it at $5,000 each, and a great number of the single seats at $500, but it is calculated that between 5,000 and 6,000 sittings will still be available as a source of revenue for carrying out the objects of the hall. The building is now complete both as to its outer and inner walls, between which, it should be mentioned, run vast and airy corridors for promenade as well as ingress and egress. The next great work will be the fixing in its place of the immense roof of iron and glass, for the purposes of which the whole interior of the building is at present filled with a perfect forest of scaffolding. This roof will be the greatest span of any work of the kind yet erected. Its long diameter will be 219 feet 4 inches; short, 185 feet 4 inches—an immense weight, it will be said, to be self-sustained. As, however, the calculations have all been made for lead, where glass is only to be used, there is every reason to calculate on its strength and durability.

The only remarkable feature remaining to be noticed is the great organ in course of erection by Mr. Willis, the builder of the organ in St. George's Hall, Liverpool. Its dimensions will be 75 feet wide at the base, 44 feet in depth, 60 feet in width, and hight 100 feet. There are to be 112 steps, and the bellows is to be kept going by two steam engines of from 6 to 8-horse power each. The largest organ at present known is the great organ at the Crystal Palace, but in the Kensington instrument the smallest pipe in the front will be longer than the longest pipe in the interior of its Sydenham predecessor. It is expected that the whole work—building, organ, and approaches—will be finished so as to open simultaneously with the projected International Industrial Exhibition in 1871, and that one of the earliest uses to which it will be put will be the ceremonial distribution of the prizes which will arise out of these exhibitions. The entire programme of its contemplated uses comprehends congresses, national and international, of science and art, performances of music on the grandest scale, distributions of prizes by public bodies, art and science conversazioni, agricultural, horticultural, and industrial exhibitions, and the occasional display of pictures and sculpture. For this latter purpose there will be an immense top-lighted gallery running all round the hall. It is satisfactory to be able to add that, in a building which is intended to accommodate assemblages of 8,000 persons, due care has been taken to provide ample facilities for entrance and exit.—*London Artizan.*



ROYAL ALBERT HALL, SOUTH KENSINGTON, LONDON.

Substitute for Fire-Brick.

Improvements in the method of using and applying certain materials in an unmanufactured state, in order to form a substitute for fire-bricks or fire-goods hitherto employed in the construction of furnaces in which fire-bricks, tiles, and other various forms of fire-goods are usually applied, have, according to the *Mechanics' Magazine*, been patented in England. Instead of using fire-bricks, lumps, stones, tiles, or other forms of materials or compounds, in construction, burnt or unburnt, powdered ganister stone, quartz, sand, mica, sandstone, or other silicious material, plumbago, lime, baryta, steatite, and magnesia, are used, alone or separately, or in varied proportions with fire-clays, or with each other, or with silicious or other solutions, mixed or not with hair, fiber, sawdust, shavings, or pulverized coke, or with other analogous materials. In applying the materials in a plastic state, wire may be used as a supporter, or a skeleton or light framework may be used to support the materials while in course of application to the furnace until the material is dry enough. Thus the furnace is built entirely of such materials in their raw or plastic state in connection with brick or other walls, the object being the substitution for fire-goods, and their consequent cost of manufacture, fuel, carriage, and skilled labor, of unmanufactured materials that can be used and applied by cheap labor more speedily and economically. Thus time and expense will be saved in construction, and it will not be necessary to keep large stocks of varied shapes of bricks, the loss of material and labor in making joints will be saved, while, in case of actual wear, additions can be supplied internally or externally to the structure so that it may be easily and speedily repaired.

Death from the Bursting of a Soda Bottle.

The *Medical and Surgical Reporter* contains an account of a death caused by the bursting of a soda bottle, published to show the terrible nature of accidents incidental to the process of filling glass bottles with carbonic acid water, and with the hope that some additional security may be suggested for the better protection of those engaged in the business. The large French-glass soda bottles, five sixteenths of an inch thick, are at present filled with a patent French apparatus with a pressure of 125 pounds. The bottle is surmounted by a metallic cap that closes with a spring when full. The workmen have heretofore been accustomed to protect the face only with a delicate wire screen, having the entire body exposed to those terrible missiles, that are liable at any moment to be hurled with deadly violence against their persons.

Facts for the Ladies.

Mrs. Bartlett, of Black River Falls, Wis., has made, with one "Wheeler & Wilson" needle, six hundred pairs of heavy canvas pants, worn by loggers, earning, within two years, upward of six hundred dollars, besides doing the work for her own and other families.

Recent American and Foreign Patents.

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

LOCK AND LATCH.—Charles Godfrey Gumpel, Leicester Square, London England.—This invention consists in the application of pins or sliders, of any suitable section, passing through the bolt or bolts, or sliding piece or pieces, acting on the bolt or bolts, and a fixed piece or bolt guide, or pieces or guides, in or on which the bolt or bolts, or sliding piece or pieces, moves or move.

COTTON-SPINNING MACHINE.—E. M. Greeson, Americus, Ga.—This invention comprises an arrangement of a number of hoes or scrapers, at suitable intervals, in a row suspended from a beam or frame, provided with guiding handles and connected at right angles to another frame mounted adjustably on one wheel, to the front of which latter frame the animal is to be hitched for drawing the same across the rows of plants.

DITCHING MACHINE.—J. W. McGehee, Fayetteville, Texas.—This invention consists essentially of a boring or ditching auger, suspended from the frame of a truck, and having an enlarged head projecting in advance of the truck, and rotated so as to bore out a groove as the truck is moved along, securing the earth taken back through a trough to an elevator, which carries it up to a spout chuting it to one side.

COMBINED STOVE PIPE, SHELF, AND CLOTHES HORSE.—W. C. Burnham, Blooming Grove, N. Y.—This invention relates to an improved stove pipe attachment, for use as a stove pipe, shelf, and clothes horse, or frame, for holding clothes around the pipe for drying while serving as a shelf; also, for holding vessels containing food to be kept warm.

AX.—Ernest Quast, Freedom, Mo.—This invention consists in making the polls in two parts, divided in the plane of the cutting edge, and shaped so that when put together and joined by rivets, a groove will be formed dovetailed at the base, for holding the bits which are fitted to it, so that a part of the rivets will pass through the tongues fitted to the said grooves.

FILTER RACK.—E. C. Andrews, Seneca Falls, N. Y.—This invention relates to improvements in racks for chemists' use, in supporting the funnel-shaped paper filters used by them for filtering liquids, and it consists of a skeleton frame, made of wire or other suitable substance, and so arranged as to expose the greatest possible amount of the surface of the paper to the air while filtering, or to prevent the contact of the paper with the side of the common funnel when used for straining into a bottle, by placing the rack in the said funnel.

WATER WHEEL.—Denison Chase, Orange, Mass.—This invention consists in an improved form of the buckets and of the bottom of the wheel, calculated to facilitate the discharge of the water, and to obtain a greater per centage of power by the said discharge. The invention also comprises an improved arrangement of the gate, and the supports and adjusting devices of the bridge tree, which improvements are also applicable to other wheels.

COMBINED CANE, UMBRELLA, AND SEAT.—Gillespie Sweeney, New York city.—This invention relates to an improved cane, seat, and umbrella combined together in one article, in an arrangement capable of adjustment for use in the capacity of either one of the said articles, and consists of a sheath answering for the cane, divided into three parts, and inclosing in one part the umbrella from the point below the lower ends of the ribs when folded, the stock is enlarged at this point and provided with ribs, braces, and a web of canvas stitched across the ends of the ribs, which spread out similarly in some respects to the umbrella, and form a seat when the top is placed on the ground; this latter part is inclosed within the part of the sheath forming the handle, which is divided longitudinally from the top down and hinged to the aforesaid enlargement of the stock. These two parts fasten together with a strong cord.

WINDING AND SETTING ATTACHMENT FOR WATCHES.—Charles Spiro New York city.—This invention comprises the attachment to the fusee of a ratchet clutch permanently fixed to it, and a drum carrying a movable clutch and a gear wheel, to which a folding handle of peculiar construction is connected, whereby the movable clutch may be pressed down into gear with the fixed clutch, and the latter turned to wind the watch, or the movable clutch is moved up out of connection with the other, so as turn independently of it, at the same time bringing the toothed wheel into gear with a train of gears connecting with the hands for setting.

COOKING STOVE.—James Grimes, Portsmouth, Ohio.—This invention relates to new and useful improvements in cooking stoves, and consists in the arrangement of the flues beneath and back of the oven, and in the divided cross center and in air tubes.

CAR COUPLING.—John D. Kerrison, New York city.—This invention relates to a new and useful improvement in couplings for railroad cars, whereby many of the objections to ordinary car couplings are obviated.

WASHING MACHINE.—Herrmann Cramer, Sonora, Cal.—This invention relates to a new and useful improvement in machines for washing clothes, and consists in a hollow revolving cylinder with open rim, serrated on its inner surface, placed in a suitable tub with a heating furnace connected therewith.

THILL COUPLING.—W. H. Cox and Theophilus Larouche, Williamstown, Y.—This invention relates to a new and useful improvement in devices coupling thills to buggies or other vehicles.

UMBRELLAS AND PARASOLS.—Miss Maggie Clyde, Brady Post Office, Pa.—This invention consists in making the staff of the umbrella or parasol in sections jointed together, and in a gutter around the rim of the umbrella, for conducting the water to one point, with a single opening for its discharge.

SELF SUPPORTING GATE.—J. R. Davis, Covington, Ga.—This invention relates to a new and useful improvement in the method of hanging and supporting farm and other gates.

TUBE WELLS.—Asa Waters, Mobile, Ala.—This invention relates to a new and useful improvement in "Tube," or "Drive wells," and consists in covering the perforated well tube with wire cloth, and in protecting the wire cloth covering with a perforated metallic shield.

WATER ELEVATOR.—G. W. Dickerson, Prairietown, Ind.—This invention relates to new and useful improvements in the method of raising water from wells and cisterns.

COMBINATION ENVELOPE OPENER.—C. B. Stevens, Riverton, Conn.—This invention relates to a new and useful improvement in an instrument for opening the envelopes of letters, public documents, etc., and consists in a peculiarly formed cutting blade and handle, and combining these with an ink and lead eraser.

TURBINE WATER WHEEL.—Philip O. Palmer, Swoope's Depot, Va.—The object of this invention is to save the water, and to improve the construction of the gates so that they can be more easily operated and adjusted than heretofore.

COMPOSITION FOR DESTROYING INSECTS ON FLOWERS, PLANTS, ETC.—John Ahearn, Baltimore, Md.—This invention consists of a composition for destroying insects on flowers, plants, vines, and bushes. It is made in liquid form and applied by sprinkling, either with a wisp of hay or a watering pot.

THILL COUPLING.—Cyrus Fisher, Canton, Mass.—This invention has for its object the fastening of the thills of a carriage to its forward axle, so that they can be readily and easily detached, when desired, and it consists in a strap bolt attached to the rear end of each of the thills and fitting a hole in a trunnioned block, which is confined between clips on the axle, the said strap bolt having a screw-threaded end, by means of which and a nut, casual detachment of the thills is prevented.

FILE.—Albert Thompson, Norway, Maine.—This invention consists in making a file with two sets of teeth on opposite sides, one set inclined in a direction the reverse of the other, in order that when a stroke in one direction has been made, the file may be turned over, and a return cutting stroke be made with it, thus very much expediting the labor of filing a saw or other article.

SCROLL-SAWING MACHINE.—William Oller, Scenery Hill, Pa.—This invention consists in making a saw in a frame consisting of two pairs of metallic levers, one pair at each side of the saw, said levers having their fulcra at the top and bottom of vertical metallic bars, placed one at each side the saw, and said levers being connected with the lower pair at their outer ends by means of extensible rods, by which the frame may be tightened or loosened at pleasure, and is made at once strong, flexible, and elastic, so as to admit of all the necessary movements of the saw.

ELEVATED OVEN RANGE.—Philip Rollhaus, Portchester, N. Y.—This invention relates to a new manner of arranging the pipes between the water-back and the boiler, with an object of allowing them to be made with a short turn to enable the use of brass pipes.

CORN SHELLER.—Henry P. Watts, Lynchburg, Va.—This invention has for its object to furnish an improved machine for removing corn from the cob both when dry and when green, which machine shall be simple in construction, easily and conveniently operated, and effective in operation.

BEDSTEAD.—D. M. Estey, Brattleborough, Vt.—This invention has for its object to so improve the construction of bedsteads that the slats may be secured in place without the use of ledges or strips attached to the inner sides of the rails, and which shall, at the same time, allow the said slats to be conveniently taken out and put in when required.

COMBINED DOUBLE SHOVEL AND TWO-HORSE CULTIVATOR.—S. G. Rayl, Agency City, Iowa.—This invention has for its object to furnish a simple, convenient, and effective two-horse cultivator for cultivating plants planted in rows, and which shall be so constructed and arranged that the double shovel plows may be easily and quickly detached from the carriage and adjusted for use as single-horse cultivators.

BEAMS AND GIRDERS.—Richard J. Gatling, Indianapolis, Ind.—This invention has for its object to furnish improved girders and beams for fire-proof buildings and other uses, which shall be so constructed that the flooring and laths can be nailed directly to said beams and girders, and which may at the same time be constructed with less powerful machinery and at less expense than when made in the ordinary manner.

FORMING BITS AND AUGERS.—James Swan, Seymour, Conn.—This invention has for its object to furnish an improved method of upsetting and turning the lips and forming the screw points of double, curved-lipped bits and augurs from the pressed and crimped blanks by means of a pair of duplicate dies.

MACHINE FOR MAKING HORSE SHOES.—Frederick D. Althause, Morrisania, N. Y., and John F. Allen, Tremont, N. Y.—This invention has for its object to furnish an improved machine for forming horseshoes which shall be so constructed and arranged that the hot bars may be fed in at one end of the machine and come out at the other end in the form of perfect shoes.

CIRCLE, OR FIFTH WHEEL FOR VEHICLES.—C. St. James, Pittsfield, Mass. —This invention has for its object to furnish an improvement in the construction of the circle, or fifth wheel of vehicles, so as to avoid the use of a king-bolt, and which, at the same time, shall be so constructed as to allow the wear to be conveniently taken up to keep the parts always close and firm.

CAN OPENER.—H. C. Alexander, New York city.—This invention has for object to furnish a simple and convenient instrument for opening cans, sardine boxes, etc.

LETTER CARRIERS' ALARM.—Edward H. Ripley, Boston Highlands, Mass. —This invention has for its object to furnish an improved attachment for the doors of houses, offices, etc., which are kept constantly or occasionally locked or bolted, which shall be so constructed and arranged as to enable the letter carrier to pass letters and other small packages through said door, and at the same time will notify the inmates of their delivery.

WASHING MACHINE.—Isaac Erb, Bowmansville P. O., Lancaster, N. Y.—This invention has for its object to furnish an improved washing machine, which shall be so constructed and arranged that while washing the clothes quickly, thoroughly, and without injury to the fabrics, it will enable the cover and presser to be turned back out of the tub and out of the way while putting in and taking out the clothes, and which will, at the same time allow a steam-tight cover to be applied to the tub.

CORN CULTIVATORS.—A. J. Grush, Springfield, Ill.—The object of this invention is to provide a cultivator capable, by a slight adjustment, of adaptation for use and for guidance, either for the operator to ride upon it or walk behind it. It is also designed to provide certain adjusting devices for the plow beams for governing the depth of plowing and their distance apart; also an adjustable arrangement for the plow handles, and an arrangement of means for suspending the plows above the ground.

DRESS PROTECTOR.—Mrs. A. H. Graton, Lawrence, Kansas.—This invention consists of a short annular sack, preferably of water-proof substance, shaped and adapted for receiving the lower parts of the skirts, and to hold them up out of the water and mud, by being suspended at the outside by straps from a belt around the waist, and at the part inside the skirts, by straps hooking upon the hoop skirt or other under skirt.

FARM GATE.—George F. Bissell, Oneonta, N. Y.—The object in this invention is to improve and perfect the farm gate, various styles of which are in use, and the invention consists in the method of supporting and operating it.

APPARATUS FOR MEASURING WATER AND OTHER LIQUIDS.—John Winsborrow, Livermere Road, Dalston, England.—The object of this invention is to obtain uniformity in the pressure upon the several parts of a meter, and, consequently, greater accuracy, with a minimum of wear and tear in working, together with correct measurement of the liquid passed through.

FOLDING CHAIR.—Nicholas Collignon and Claudius O. Collignon, Closter, N. J.—This invention relates to chairs which fold up into a small space, whereby they are rendered much more convenient for transportation and storage than chairs of ordinary construction.

STUD AND BUTTON FASTENING.—C. L. Horack, Willimantic, Conn.—This invention relates to a new and useful improvement in a device for fastening studs and buttons to shirt bosoms and wristbands and for all similar uses.

CONVERTIBLE WRITING DESK.—Frederick Robbin, Hudson City, N. J.—This invention consists in so constructing and arranging the top and the case containing the drawers and pigeon holes, that a writing desk or a table may be formed at will.

FIELD PRESS.—E. J. Marsters, Shaw's Flat, Cal.—This invention relates to a new hay or cotton press, which is arranged so that it can be readily transported from one place to another, to press the material directly on the field or wherever it may be desired. The invention consists in the general construction of the apparatus, which is mounted upon a wagon, and which is so got up by the application of toggle levers and other devices, that a powerful press is obtained.

EARTH CLOSETS AND URINALS.—Augustus Fraser Baird, Pimlico, London, England.—This invention consists in constructing an earth closet which is provided with a receptacle beneath the seat for receiving the deposits with which the earth is to be mixed, and with a shoot or passage opening into the said receptacle for conveying the earth into the same, and at the other end to that opening above mentioned, another opening by which the earth is supplied from a hopper to the said shoot.

FOUNDERY MOLDING.—Thomas G. Lucas, Middletown, Conn.—This invention relates to a new and useful improvement in the manner of molding patterns for making castings of iron or other metal, and consists in the use of draft plates (one or more) in combination with the pattern.

COMPOSITION FOR DESTROYING INSECTS ON FRUIT TREES.—John Ahearn, Baltimore, Md.—This invention consists of a composition of six simple and inexpensive ingredients for application to the roots, trunks, and limbs of trees, to destroying grubs and worms, and to prevent the ravages of in seqts. It is also said to be an excellent fertilizer.

Official List of Patents.

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FOR THE WEEK ENDING NOV. 16, 1869.

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96,761.—CAN OPENER.—H. C. Alexander, New York city.
96,762.—HORSESHOE MACHINE.—Frederick D. Althause, Morrisania, and John F. Allen, Tremont, N. Y.
96,763.—REVERSIBLE DIE-BOX FOR NUT MACHINES.—Wesley Anderson, Pittsburgh, Pa.
96,764.—MACHINE FOR MAKING MATCH BLOCKS.—Emery Andrews, Portland, Me., and Wm. Tucker, Philadelphia, Pa.
96,765.—FILTER RACK.—E. C. Andrews, Seneca Falls, N. Y.
96,766.—TUBING CLUTCH.—Joel N. Angier, Titusville, Pa.
96,767.—EARTH CLOSET.—Augustus Fraser Baird, Pimlico, England.
96,768.—Antonio Barli.—Suspended.
96,769.—RAILWAY-RAIL SPLICE.—Jason T. Bartlett (assignor to himself and Edward E. Batman), Boston, Mass.
96,770.—POTATO DIGGER.—Joseph Belknap, Adrain, Mich.
96,771.—FARM GATE.—Geo. F. Bissell, Oneonta, N. Y.
96,772.—LANTERN.—Wm. H. Bonnell, Buffalo, N. Y.
96,773.—STOVE-PIPE SHELF AND CLOTHES DRYER.—W. C. Burnham, Blooming Grove, N. Y.
96,774.—COMBINED SEED PLANTER AND CULTIVATOR.—Geo. W. Carpender, Butler, Ind.
96,775.—WATER WHEEL.—Denison Chase, Orange, Mass.
96,776.—COMBINED SCREW AND PIPE WRENCH.—J. W. Close, Buffalo, N. Y.
96,777.—UMBRELLA.—Maggie Clyde, Brady Post Office, Pa.
96,778.—FOLDING CHAIR.—Nicholas Collignon and Claudius O. Collignon, Closter, N. J.
96,779.—APPARATUS FOR TYING FLEECES.—Solon Cooley (assignor to himself and Ceylon M. Kelly), Caro, Mich.
96,780.—WASHING MACHINE.—Herrmann Cramer, Sonora, Cal.
96,781.—APPARATUS FOR UNLOADING CARS.—John Dable, Chicago, Ill. Antedated November 5, 1869.
96,782.—MACHINE FOR ROLLING CAR COUPLING PINS.—Frederick W. Davidson, Cleveland, Ohio.
96,783.—GATE.—John R. Davis, Covington, Ga.
96,784.—TRACK-CLEARING CAR.—Augustus Day, Detroit, Mich.
96,785.—WATER ELEVATOR.—G. W. Dickerson, Prairietown, Ind.
96,786.—WASHING MACHINE.—Isaac Erb, Lancaster, N. Y.
96,787.—BEDSTEAD.—D. M. Estey, Brattleborough, Vt.
96,788.—CABINET FOR LADIES.—Alexander J. Forbes, San Francisco, Cal.
96,789.—RIGGING SHIPS.—Robert B. Forbes, Boston, Mass.
96,790.—PROCESS FOR REDUCING REBELLIOUS ORES OF THE PRECIOUS METALS.—Alfred I. Frick and Jean Baptiste Le Clerc, San Francisco, Cal.
96,791.—MACHINE FOR CUTTING PASTEBOARD.—H. A. Gage, Manchester, N. H.
96,792.—CALENDAR CLOCK.—Daniel J. Gale, Sheboygan Falls, Wis.
96,793.—BEAM.—Richard J. Gatling, Indianapolis, Ind.
96,794.—GAVEL FORK.—Thos. R. George, West Dryden, N. Y.
96,795.—SEWING MACHINE FAN.—D. W. Glassie, Nashville, Tenn.
96,796.—WIND WHEEL.—Luman M. Godfrey, Colon, Mich., assignor to himself and George S. Sheffield.
96,797.—DRESS AND SKIRT PROTECTOR.—A. H. Graton, Lawrence, Kansas.
96,798.—GRATE BAR.—C. A. Greenleaf, Indianapolis, Ind.
96,799.—COOKING STOVE.—James Grimes, Portsmouth, Ohio.
96,800.—MACHINE FOR TENONING SPOKES.—Milburn Gunn, Jeffersontown, Ky.
96,801.—CORN CULTIVATOR.—A. J. Grush, Springfield, Ill.
96,802.—DOOR LOCK.—Charles Godfrey Gumpel, Leicester Square, England.
96,803.—MACHINE FOR BENDING THILLS.—James S. Hamlet, Portsmouth, Ohio.
96,804.—BREAD MACHINE.—John E. Hawkins, Lansingburg, N. Y.
96,805.—PORTABLE FENCE.—Lewis Hazlett and Samuel D. Hazlett, Winfield township, Pa.
96,806.—HEATING STOVE.—Chas. Hempel and Joseph Schaum, Detroit, Mich.
96,807.—CARPET SWEEPER.—R. C. Higgins and Abraham Fuller, Boston, Mass.
96,808.—BUTTON.—C. L. Horack, Willimantic, Conn.
96,809.—HEMMER FOR SEWING MACHINES.—E. Howell, Ashtabula, Ohio.
96,810.—HORSE HAY FORK.—Amos B. Hunt, Matteson, Mich.
96,811.—LATH MILL.—John S Hyde, Pentwater, Mich.
96,812.—APPARATUS FOR PREVENTING HORSES FROM KICKING IN THE STABLE.—Werner Itschner, Philadelphia, Pa.
96,813.—RAILWAY CAR COUPLING.—John D. Kerrison, New York city.
96,814.—FENCE.—Andrew Kull, Jr., Bloomfield, Wis.
96,815.—MANUFACTURE OF PLASTIC VENEER.—Chas. Kuttler, West Hoboken, N. J.
96,816.—RAILWAY CAR COUPLING.—Leo Laley, Goshen, Ind.
96,817.—HEEL-CUTTING MACHINE.—Richard C. Lambart, Raynham, assignor to David Whittemore, North Bridgewater, Mass.
96,818.—MACHINE FOR CUTTING FELLIES.—Wm. A. Lewis, and Geo. W. Butler, Joliet, Ill.
96,819.—FLASK FOR MOLDING.—Thos. G. Lucas, Middletown, Conn.
96,820.—FLUTING MACHINE.—Hannah Luchs, Washington, D. C.
96,821.—ANIMAL TRAP.—Wm. Luker, Kalamazoo, Mich.
96,822.—FIELD PRESS.—E. J. Marsters, Shaw's Flat, Cal.
96,823.—SODA WATER DRAFT APPARATUS.—John Matthews, Jr., New York city.
96,824.—DITCHING MACHINE.—James W. McGehee, Fayetteville, Texas.
96,825.—GRAIN DRILL.—Wm. H. Moore, Jr., Blooming Grove, Ind.
96,826.—COOKING STOVE.—W. N. Moore, Neenah, Wis.
96,827.—MANUFACTURE OF PIG IRON.—Charles Motier Nes York, Pa.
96,828.—BEVERAGE.—Constantine Nessi, San Francisco, Cal.
96,829.—DRAG.—John W. Newton, Geneva, Wis. Antedated November 1, 1869.
96,830.—SAMPLE CARD FOR LIQUIDS.—Henry Nustedt, New York city.

96,831.—Propelling Apparatus for Vessels.—Amos D. Owen, Thorntown, Ind., and John D. Sherman, Paw Paw, Mich.

96,832.—Rubber Hose.—Edward Livingston Perry (assignor to Combination Rubber Company), New York city.

96,833.—Barrel-filling Apparatus with Whistling Indicator.—Hiram S. Phillips, Sewickley, Pa.

96,834.—Edgar M. Potter.—Suspended.

96,835.—Mechanism for Raising Top Roller Weights in Spinning Machines.—Geo. W. Prentice, Whitinsville, Mass.

96,836.—Harrow.—Elijah J. Preston, Eureka, Mo.

96,837.—Ax.—Ernest Quast, Freedom, Mo.

96,838.—Combined Double Shovel and Two-horse Cultivator.—S. G. Rayl, Agency City, Iowa.

96,839.—Cooking Range.—Philip Rollhaus, Port Chester, N. Y.

96,840.—Stable Hook.—Geo. W. Sanderson, Shirley, Mass.

96,841.—Detachable Buoyant Ship's Deck.—Jos. Sawyer, Sebewaing, Mich.

96,842.—Apparatus for Carbureting Air.—Ira W. Shaler, Brooklyn, N. Y.

96,843.—Trunk Tie and Clasp.—A. D. Smith, Grafton, assignor to David Rose, Rawsonville, Ohio.

96,844.—Watch-winding and Setting Attachment.—Charles Spiro, New York city.

96,845.—Envelope Opener.—Charles B. Stephens, Riverton, Conn.

96,846.—Fifth-wheel for Carriages.—Clement St. James, Pittsfield, Mass.

96,847.—Die for Forming Bits and Augers.—James Swan, Seymour, Conn.

96,848.—Combined Umbrella, Cane, and Seat.—Gillespie Sweeney, New York city.

96,849.—Wood Pavement.—A. Van Camp, Washington, D.C., and M. M. Hodgman, St. Louis, Mo.

96,850.—Concrete for Pavement and for other Purposes.—A. Van Camp, Washington, D. C., and M. M. Hodgman, St. Louis, Mo.

96,851.—Holdback for Carriage Thills.—Peter Spohn Van Wagner, Saltfleet township, Canada.

96,852.—Adjustable Trace Fastening.—Peter Spohn Van Wagner (assignor to himself and Alfred E. Carpenter), Stony Creek, Saltfleet township, Canada.

96,853.—Water Wheel.—Alonzo Warren, Boston, Mass.

96,854.—Tube Well.—Asa Waters, Mobile, Ala.

96,855.—Cooking Stove.—George Wellhouse, Akron, Ohio.

96,856.—Fruit Box Crate.—James White, Cleveland, Ohio.

96,857.—Wash Boiler.—George W. Wilson, Freeport, Ill.

96,858.—Liquid Meter.—John Winsborrow, Livermere Road, Dalston, England.

96,859.—Fence.—Stephen A. Wood, Cardington, Ohio.

96,860.—Harness Pad Block.—J. Zimmer, Jr., Haltday, Ill.

96,861.—Composition for Destroying Insects on Flowers, Plants, and Bushes.—John Ahern, Baltimore, Md.

96,862.—Hose Pipe Nozzle.—Albert F. Allen, Providence, R. I.

96,863.—Hose Ladder Strap.—Albert F. Allen, Providence, R. I.

96,864.—Washing Machine.—William Arnold, Pawtucket, R. I.

99,865.—Reversible Safety Pinion for Watches.—Benjamin Bacon, Morrison, Ill., assignor, by mesne assignments, to National Watch Company.

96,866.—Chain Elevator and Bucket.—John Augustus Ball, Grass Valley, Cal.

99,867.—Seaming Machine.—Charles E. Bancroft, Montpelier, Vt.

96,868.—Saw Mill.—Simon Barnhart, Chillicothe, Ohio.

96,869.—Fruit Jar.—Edwin Bennett, Baltimore, Md.

96,870.—Wood Pavement.—Albert Betteley, Boston, Mass.

96,871.—Preserving Fruits, Meats, and other Substances.—V. W. Blanchard, Bridport, Vt.

96,872.—Furnace and Process for Treating and Reducing Ores, etc.—V. W. Blanchard, Bridport, Vt. Antedated November 6, 1869.

96,873.—Fastening for Fruit Jars.—Eliam Boorse, Philadelphia, Pa.

96,874.—Process and Apparatus for Annealing Metals.—J. M. Bottum, New York city.

96,875.—Gang Plow.—W. J. Boyce and G. W. Haines, Maine Prairie, Cal.

96,876.—Fire Extinguisher.—John F. Boynton, Syracuse, N. Y.

96,877.—Washing Machine.—Charles B. Bristol, New Haven, Conn.

96,878.—Grain Meter.—Thomas Brocket and J. J. Brown, Davenport, Iowa.

96,879.—Snow Shovel.—G. W. Brown, Providence, R. I. Antedated Nov. 10, 1869.

96,880.—Carriage Jack.—Daniel Bull, Amboy, Ill.

96,881.—Bit Brace.—C. L. Butler, Greenfield, Mass.

96,882.—Drying Car.—J. K. Caldwell, Allegheny City, Pa.

96,883.—Corn Planter. — Joseph Patten Campbell, Danville, Pa.

96,884.—Stripper for Carding Machines.—L. M. Capron, (assignor to Alexander Bigelow and George Barber), Worcester, Mass.

96,885.—Steam Boiler.—Geo. Clark, Buffalo, N. Y.

96,886.—Sewing Machine.—P. J. Clever, Goliad, Texas.

96,887.—Carriage.—I. A. Clippinger, Newton, Iowa. Antedated Nov. 8, 1869.

96,888.—Washing Machine.—Geo. Combs, Utica, N. Y.

96,889.—Bail or Handle for Pails, etc.—E. T. Covell, Brooklyn, N. Y. Antedated Nov. 10, 1869.

96,890.—Manufacture of Nozzle and Screw Caps for Oil Cans, etc.—E. T. Covell, Brooklyn, N. Y.

96,891.—Thill Coupling.—W. H. Cox and Theophilus Larouche, Williamstown, N. Y.

96,892.—Hay Tedder.—T. C. Craven, Albany, N. Y., assignor to W. L. and H. K. Boyer.

96,893.—Steam Cloth Press.—John J. Crawford, Glasgow, Scotland.

96,894.—Horse Hay Fork.—Jeptha Cummins and C. E. Cummins, Perry, Mich.

96,895.—Water Governor. — Henry Curtner (assignor to himself and Eli Ragon), Anna, Ohio.

96,896.—Combined Harvester and Thrasher.—W. G. Davis and L. T. Davis, McMinnville, Oregon, assignors to Daniel McCreary, J. B. Davis, and L. T. Davis.

96,897—Lantern.—Cyrus Dean, Buffalo, N. Y., assignor to J. A. Blake, Port Robinson, Canada.

96,898.—Carriage Fifth Wheel.—D. D. Decker, Saugerties, N. Y., assignor to himself and W. B. Dubois.

96,899.—Kiln for Revivifying Bone Black.—J. O. Donner, Jersey City, N. J.

96,900.—Vacuum Pan and Similar Apparatus.—J. O. Donner, Jersey City, N. J.

96,901.—Hemmer for Sewing Machine.—T. H. Eulass, Mason City, Ill.

96,902.—Base-burning Stove.—M. G. Fagan (assignor to himself and J. B. Wilkinson), Troy, N. Y.

96,903.—Link-motion Device for Steam Engines. — E. Faron (assignor to Reaney, Son & Co.), Chester, Pa.

96,904.—Carriage Thill Coupling.—Cyrus Fisher, Canton, Mass., assignor to himself and A. G. Fisher, New York city.

96,905.—Manufacture of Iron and Steel.—F. P. Fletcher and V. W. Blanchard, Bridport, Vt.

96,906.—Churn Dasher.—J. M. Fletcher, Sidney, Ohio.

96,907.—Plow.—Asahel Franklin, Springfield, Ohio.

96,908.—Sash Holder.—J. G. Garretson and O. S. Garretson, Buffalo, N. Y.

96,909.—Lamp-shade Holder.—E. P. Gleason, New York city.

96,910.—Machine for Cutting Threads on Bolts.—J. J. Grant (assignor to Charles H. Stockbridge), Northampton, Mass. Antedated Nov. 6, 1869.

96,911.—Casting Copper Tubes.—James F. Guthrie, Somerville, Mass.

96,912.—Tube-cutting Machine.—Samuel Halliwell, New Haven, Conn.

96,913—Friction Clutch.—Moses Hawkins (assignor to himself, R. M. Bassett, and T. S. Bassett), Birmingham, Conn.

96,914.—Pipe Coupling.—Rowland Hill, East Boston, Mass.

96 915.—Carpet.—David Hirschberg, Baltimore, Md.

96,916.—Method of Lining Rings, Buckles, etc.—John P. Hisley (assignor to himself and Henry L. Duguid), Syracuse, N. Y.

96,917.—Horse Rake.—H. W. Holcomb (assignor to himself and W. F. Hughes), Northville, Mich.

96,918.—Wooden Pavement.—Phinehas Howard (assignor to J. S. Josselyn, W. B. Lake, and B. F. Josselyn), San Francisco, Cal. Antedated Nov. 3, 1865.

96,919.—Cotton Seed Planter.—O. P. Humber, Greenville, N. C.

96,920.—Brick Machine.—D. J. Hunter, Exeter, N. H.

96,921.—Facing for Buildings—Thomas A. Hunter and John Blewitt, New York city.

96,922.—Iron Front for Buildings.—P. H. Jackson, New York city.

96,923.—Water Filter.—J. C. Jewett, Buffalo, N. Y.

96,924.—Door Check.—W. H. Johnson, Sr., Clayton, Ind.

96,925.—Mechanism for Operating the Jacks in Looms.—C. H. Knowlton, Camden, N. J.

96,926.—Grain Drill.—Benj. Kuhns, Dayton, Ohio.

96,927.—Raising and Moving Coal, etc.—Alfred Lawton, Philadelphia, Pa.

96,928.—Horse Shoers' Hoof Parer. — Franz Lehmann, Riverside, Ill.

96,929.—Galley Rest.—M. T. Lincoln (assignor to himself and Wm. Robinson), Washington, D. C.

96,930.—Broiler.—G. H. Link and C. D. Curtis, Syracuse, N. Y.

96,931.—Needle Polisher, Sharpener, and Lubricator.—H. W. Little, Muncie, Ind.

96,932.—Railway-car Coupling.—Frank B. Lord, Cincinnati, Ohio.

96,933.—Grain Binder.—J. W. Loveless and C. H. Shaffer, Clark's Hill, Ind. Antedated Nov. 3, 1869.

96,934.—Fence.—Clovis Lowe, Randolph, N. H.

96,935.—Thill Shackle.—John Madden and Upson Bushnell, Cleveland, Ohio.

96,936.—Composition for Preventing Oxidation of Metallic Water or Gas Pipes.—George Albert Mariner and Folsom Dorsett, Chicago, Ill.

96,937.—Hand Spinning Machine. — Chelton, Matheny, Greensburg, Ind.

96,938.—Corn Sheller.—W. M. Mayall, Gray, Me., assignor to himself and J. C. Mayall, Boston, Mass.

96,939.—Brewing Ale, Beer, etc.—Jas. McCormick, Boston, Mass.

96,940.—Vapor Bath Apparatus.—John McNeven, New York city.

96, 941.—Bag Holder.—Jas. McPhail, Charles City, Iowa.

96,942.—Cheese Hoop.—H. W. Millar, Utica, N. Y.

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96,944.—Sewing Machine for Boots and Shoes.—Daniel Mills, New York city, assignor to Charles Goodyear, Jr., New Rochelle, N. Y.

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96,949.—Seam for Tin Cans.—C. R. Otis, Chicago, Ill.

96,950.—Blind Slat Operator.—Oscar Paddock, Watertown, N. Y.

96,951.—Corset.—L. A. Palmer (assignor to himself and F. E. Hibbard), Boston, Mass.

96,952.—Water Wheel.—Philip O. Palmer, Swoope's Depot, Va.

96,953.—Lip Shield.—E. C. Philbrick, Bath, Me.

96,954.—Fabric for Shirt Collars.—C. F. Pidgin, Boston, Mass. Antedated Nov. 3, 1869.

96,955.—Weighing Scale.—William P. Pierce, New York city.

96,956.—Hanging Lower Topsail Yards.—E. J. Pinkham, Portland, Me.

96,957.—Pipe Wrench.—Charles Pomeroy, Mattoon, Ill.

96,958.—Oil Can.—Charles Pratt, New York city.

96,959.—Hydrant.—Washburn Race and S. R. C. Mathews Lockport, N. Y., assignors to S. R. C. Mathews.

96,960.—Machine for Shearing Angle Iron.—Thomas Reaney, Chester, Pa.

96,961.—Stand for Exhibiting Photographs, etc.—J. S. Reid, Orange, Ind.

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96,967.—Churn.—F. L. Roberts, Jacksonville, assignor to J. M. McPherson, Ripley, Ill.

96,968.—Hasp Lock.—C. W. A. Romer, Newark, N. J.

96,969.—Sash Pulley.—Benoit Roux (assignor to himself and George Haupt), Cincinnati, Ohio.

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96,971.—Clamp.—Wm. Sailer, Philadelphia, Pa.

96,972.—Toy.—Ernest Santin, New York city.

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96,974.—Platform Ladder.—Jacob Sheetz, Sunbury, Pa.

96,975.—Machine for Rolling Tubes.—G. H. Sellers, Wilmington, Del.

96,976.—Railway Car Coupling.—G. Shatswell, Waukegan, Ill.

96,977.—Hanging Basket.—Daniel Sherwood (assignor to Woods, Sherwood & Co.), Lowell, Mass.

96,978.—Apparatus for Curing Meat.—M. B. Sherwood, Jr., Buffalo, N. Y.

96,979.—Cultivator.—James Simpson, Cordova, Ill.

96,980.—Blind Rack.—C. E. Smith, Goffstown, N. H.

96,981—Buckle for Clothing.—E. A. Smith, Waterbury, Conn.

96,982.—Jointed Pipe Connection.—Hiram Smith, Norwalk, Ohio.

96,983.—Spring.—J. M. Schmidt, New Albany, Ind.

96,984.—Concrete Compound for Pavements, etc.—J. W. Smith, Washington, D. C., assignor to J. C. Pedrick and Benj. Fenner, for five eighths interest.

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96,986.—Lamp.—R. H. Smith (assignor to J. S. and T. B. Atterbury), Pittsburgh, Pa.

96,987.—Top for Sirup Pitchers.—Thomas Smith, Jr., Boston, Mass.

96,988.—Composition for Pavements.—H. F. Snow and J. H. Davis, Dover, N. H.

96,989.—Means for Ventilating, Cooling, and Warming Beds.—D. E. Somes, Washington, D. C.

96,990.—Paging Machine.—Samuel W. Soule, Milwaukee, Wis.

96,991.—Coal Screen.—William Sparks, New York city. Antedated Nov. 5, 1869.

96,992.—Telegraph Sounder.—Henry Splitdorf, New York city.

96,993.—Packing for Pistons and Valves.—W. M. Stevenson and Austin Pearce, Harmony, Pa., assignors to themselves and G. E. Handy, Boston, Mass.

96,994.—Baking Powder. — John Stowell, Charlestown, Mass.

96,995.—Brick Machine.—R. Stuckwisch, Terre Haute, Ind.

96,996.—Hay Elevator.—Hirom C. Stouffer, East Lewiston, assignor to George Smith, Lowellville, Ohio. Antedated May 17, 1869.

96,997.—Still for Distilling Naphtha and Petroleum.—A. H. Tait, Jersey City, N. J.

96,998.—Process of Preparing Grain for Distillation.—Henry Tauszky, New York city, assignor to Eli D. Bannister and Rudolph Tauszky.

96,999.—Safety Valve.—Henry Taylor and J. M. Coale, Baltimore, Md.

97,000.—Machine for Grinding the Cutters of Mowing Machines.—A. P. Thayer, Syracuse, N. Y.

97,001.—Mode of Collecting and Storing Carbonic Acid for Extinguishing Fires.—Eli Thayer, Worcester Mass., assignor to himself and M. Covling, New York city.

97,002.—File.—Albert Thompson, Norway, Me., assignor to himself and G. T. Wheeler, Ridgway, Pa.

97,003.—Book Rack.—J. P. Tibbits, New York city.

97,004.—Artificial Marble. — Christian Volckmann (assignor to Otto Dresel, John Seltzer, and P. A. Schlapp), Columbus, Ohio.

97,005.—School Desk.—A. S. Vorse, Des Moines, Iowa.

97,006.—Dryer.—J. M. Ward (assignor to himself and T. B. White), Oxford, Ohio.

97,007.—Compound Soap.—Alexander Warfield, Alexandria, Va.

97,008.—Corn Sheller.—H. P. Watts, Lynchburg, Va., assignor to himself and J. A. Cooley.

97,009.—Vehicle for Transporting Machines.—Geo. W. Wheeler, 2d, New Ipswich, N. H.

97,010.—Bit-Stock Fastening.—C. P. Whitman, Charlemont, Mass., assignor to himself and W. C. Dodge, Washington, D. C.

97,011.—Water Elevator.—T. P. Wilcox, Hebron, Ind.

97,012.—Handle for Brushes, Cards, etc.—Daniel Witt and Aaron Walt, Hubbardston, Mass.

97,013.—Mode of Attaching Seats to Wagons.—D. J. Wilcoxson (assignor to himself and A. J. Mowry), Milan, Ohio.

97,014.—Sewing Machine for Button Holes.—George B Woodruff and George Browning, London, England, assignors to "The Singer Manufacturing Co.," New York city.

97,015.—Die for Making Shears.—S. H. Woods, Berlin, assignor for one half to R. S. Gladwin, West Meriden, Conn.

97,016.—Signal Light for Railroad Cars.—H. A. Wright Logansport, Ind.

97,017.—Process of Manufacturing Steel.—James Johnston (assignor to himself, Alexander Postley, S. H. Nesbit, J. C. Pershing, Lewis Peterson, and Thomas Fawcett), Allegheny, Pa., and John Hunter, Alliance, Ohio.

97,018.—Washing Machine.—G. L. Witsil, Philadelphia, Pa., assignor to himself and Charles Merrill, Detroit, Mich.

97,019.—Device for Grating Green Corn from the Cob, etc.—G. L. Witsil (assignor to himself and R. D. L. S. Gutgesell), Philadelphia, Pa.

97,020.—Street Railway.—A. Van Camp, Washington, D.C., and M. M. Hodgman, St. Louis, Mo.

REISSUES.

78,569.—Composition for Destroying Insects on Fruit Trees.—Dated June 2, 1868; reissue 3,728.—John Ahearn, Baltimore, Md., assignee of B. Best.

71,706.—Safety Pocket.—Dated Dec. 3, 1867; reissue 3,729. Joseph Colton, New York city.

34,182.—Skeleton Skirt.—Dated January 14, 1862; reissue 3,730.—Division A.—Marks Fishel, Adolph Opper, and Leo Popper, New York city, assignees of Marks Fishel.

34,182.—Sheleton Skirt.—Dated Jan. 14, 1862; reissue 3,731.—Division B.—M. Fishel, Adolph Opper, and Leo Popper, New York city, assignees of Marks Fishel.

12,780.—Shuttle for Looms.—Dated May 1, 1855; reissue 3,355; dated March 30, 1869; extended seven years; reissue 3,732.—Liberty Ditchfield, F. C. Litchfield, and L. M. Litchfield, Southbridge, Mass., assignees of Lydia W. Litchfield, administratrix of the estate of Laroy Litchfield, deceased.

20,192.—Expansive Bit.—Dated May 11, 1858; reissue 3,516, dated June 22, 1869; reissue 3,733.—William A. Clark, Woodbridge Conn.

29,690.—Machine for Dressing and Finishing Thread—Dated Aug. 21, 1860; reissue 3,734.—Origin Hall, Willimantic, Conn., and T. Merrick, Holyoke, Mass.

92,050.—Printing Press.—Dated June 29, 1869; reissue 3,735.—R. M. Hoe and S. D. Tucker, New York city.

94,005.—Washing Machine.—Dated Aug. 24, 1869; reissue 3,736.—Alex. King and G. H. King, Painesville, Ohio.

94,428.—Compound for Curing Cholera in Hogs and Chickens.—Dated Aug. 31, 1869; reissue 3,737.—A. C. McMahon, Lincoln, Ill.

72,561.—Machine for Folding Tinned Plates.—Dated Dec. 24, 1867; reissue 3,738.—O. W. Stow, Plantsville, Conn.

DESIGNS.

3,750.—Sign.—Emil Ney, New York city.

3,751.—Trade Mark.—W. F. Sayles and F. C. Sayles, North Providence, R. I.

3,752.—Cotton Knife.—G. A. Seaver, New York city.

3,753.—Floor Oil Cloth.—C. W. Strout, Hallowell, Me.

3,754.—Tea Service.—H. Vasseur (assignor to Simpson, Hall, Miller & Co.), Wallingford, Conn.

3,755.—Perforated Banner.—Wm. S. Worthington, Newtown, N. Y.

EXTENSIONS.

Machine for Manufacturing Corks.—Mary F. Crocker, of West Winsted, Conn., administratrix de bonis non of W. R. Crocker, deceased.—Letters Patent No. 13,714, dated Oct. 30, 1855.

Process for Making Zinc White.—Samuel Wetherill, of Baltimore, Md.—Letters Patent No. 13,806, dated Nov. 13, 1855.

Planing Machine.—Jas. A. Woodbury, of Boston, Mass.—Letters Patent No. 13,808, dated Nov. 13, 1855.

Lathe Chuck.—Eli Horton, of Windsor Locks, Conn.—Letters Patent No. 13,787, dated Nov. 13, 1855.

Tobacco Presses.—R. Kingsley, of Springfield, Mass.—Letters Patent No. 13,790, dated Nov. 13, 1855.

NEW PUBLICATIONS.

Our Home Physician. By George M. Beard, M. D.

We are indebted to the publishers, Messrs. E. B. Treat & Co., 654 Broadway, for a copy of this work, which we noticed in the Scientific American, August 28th, in advance of its publication. The volume is a very large one, with numerous illustrations, and treats of the structure and functions of the body, the influence of occupation on health and longevity; the laws of inheritance with new and original chapters on diet, stimulants, and narcotics, air, sunlight, exercise, climate, electricity, and nervous diseases of modern times; and full directions for the care of the sick, and the management of infants and children; with a general description of recent medical discoveries and improvements; plain suggestions for the treatment of diseases, adapted to the wants of the household, and for those who, like miners, sailors, planters, and dwellers in remote districts, are beyond the ready call of a physician. We have carefully examined this volume, and we do not hesitate to pronounce it one of great value to every family in the land.

APPLICATIONS FOR EXTENSION OF PATENTS.

Cultivator Teeth.—Charles H. Sayre and George Klinck, Utica, N. Y. have applied for an extension of the above patent. Day of hearing Jan. 26, 1870.

Manufacture of Iron and Steel.—Henry Bessemer, of London, England, has petitioned for the extension of the above patent. Day of hearing, Jan. 26, 1870.

Gearing for Feed Rollers of Planing Machines.—Charles Burleigh, Georgtown, Colorado Territory, has applied for an extension of the above patent. Day of hearing, January 26, 1870.

Refining Iron.—Christian Shunk, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Jan. 26, 1870.

Sealing Preserve Cans.—R. H. Lewis, Sacramento, Cal., has petitioned for an extension of the above patent. Day of hearing Jan. 26, 1870.

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