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Improved Cotton and Hay Press.

A simple, economical, durable, and, at the same time, strictly practical cotton and hay press, has long been a desideratum in the Southern States. Though presses for baling hay have been constructed that answer that purpose admirably, when applied to cotton, they have not met the wants of cotton packers, as is evidenced by the fact that still the old-style wooden press is used to a greater extent than perhaps any other for packing cotton. Some of these presses have had their good points, which led planters to believe that at last *the* press they had been looking for was devised, but on trial they have manifested defects which offset their merits to such an extent, that they failed to fulfill their promise.

But in these times of progress, when wood has given way to iron and iron is yielding precedence to steel, and manual labor and horse-power are being superseded by the steam engine, it is scarcely to be expected that the old wood screw press, cumbersome and inconvenient, will be much longer tolerated.

One reason why the presses heretofore offered to the cotton planter have failed, is because many of them have been constructed with a view to simply compress readily and strongly without due regard to other necessary requirements. These presses have to be placed outside the ginning room. The cotton is carried to them in baskets from the gin, the baskets containing some two hundred pounds of cotton, picked up by hand, and stamped into them. When the press is reached this cotton has to be pulled out of the baskets, put into the press again, and again stamped with the feet. When the press stands wholly above the floor, as is the case with presses in which the pressure is applied to the upper platen, its weight has to be raised to the top of the press, a severe and exacting labor.

The press herewith illustrated is invented by an experienced cotton planter and ginner, who, perfectly familiar with the requirements of the case, has reversed the plan of applying pressure to the upper platen, applying it instead to the lower one, whereby he is enabled to sink his press through the floor of the cotton or lint room, thus avoiding exposure to weather and the labor of lifting the cotton. The latter saving is so great that the inventor has publicly challenged all presses to compete with his in packing, claiming that it will do materially more, in a given time and with the same number of hands, than any other press yet invented.

The press is a model of simplicity, is cheap and durable. As the engraving shows, it is expressly designed to be used inside of, or adjacent to the lint-room, and may be worked with equal facility in either the second or ground floor, thereby saving a portion of the labor of partially compressing the cotton in baskets or sacks preparatory to carrying it out and up to the mouth of the box of the press, as in all cases where presses are worked outside the lint-room and in which the bale is formed at the bottom of the box, and also saving the whole of the time and labor expended in carrying out the lint, besides preventing damage from wind, rain-storms, dropping upon the ground, etc. These advantages will be seen and duly appreciated by practical cotton packers.

Upon reference to Fig. 1, it will be seen that the upper part of the press box is formed of two hinged segments, A, which are thrown back into the position shown while sewing and banding the bale. At this time the lower platen, B, is raised and held slightly above the level of the floor by the screws, C. These screws are worked by nuts and levers, D, both nuts and screws being of iron and made very strong and durable.

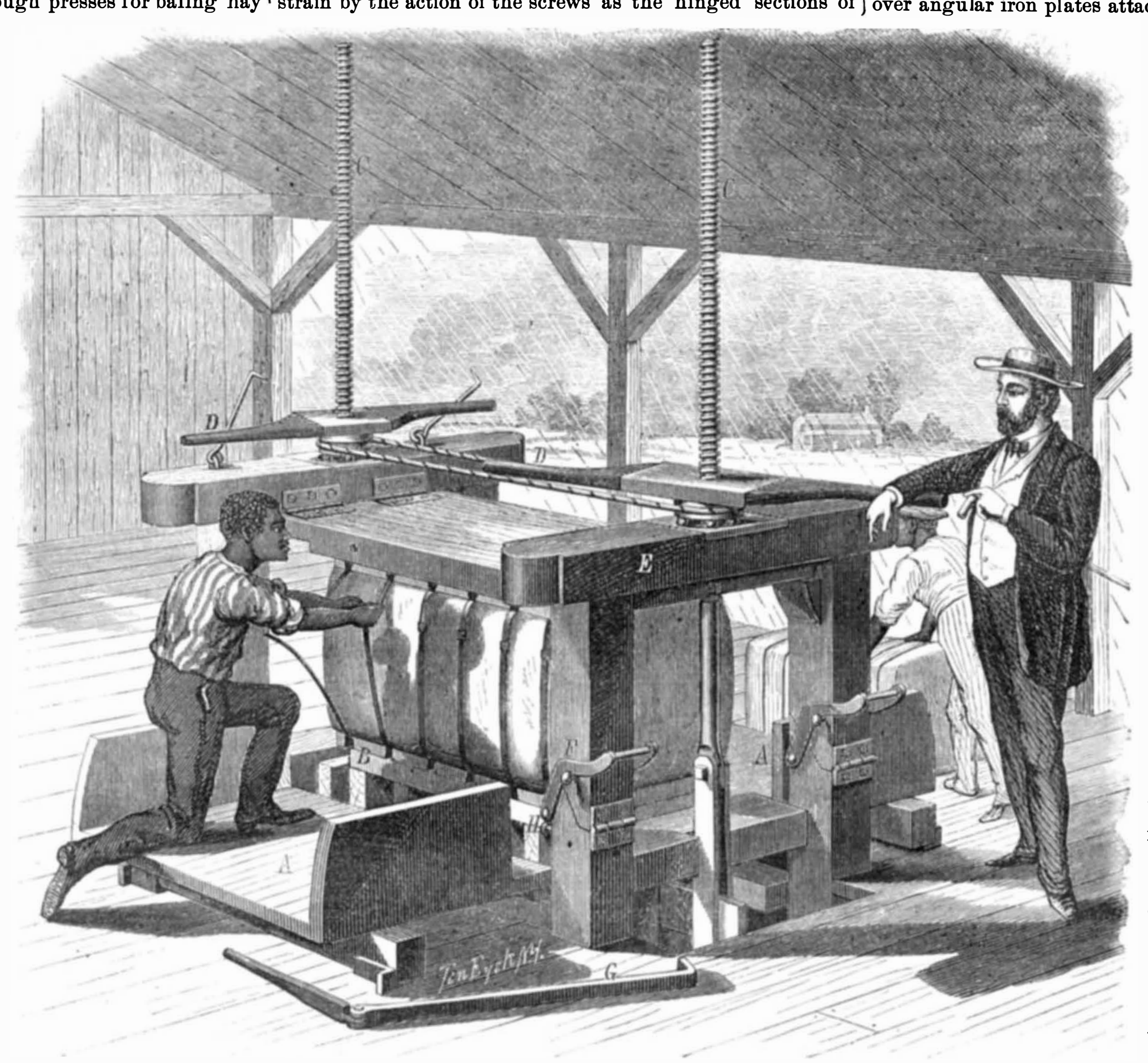
When it is desired to release the bale, the upper part, E, of one side of the press frame, which is also hinged, and which, when in the position shown, engages with the top of the upper platen, is thrown outward, releasing the upper platen, so that it is lifted back like the lid of a box, and held by hooks provided for that purpose. The part, E, of the press frame is held in place by strong turn-buckles, F, while the cotton is being compressed.

The hinges, however, are not submitted to any material strain by the action of the screws as the hinged sections of the upper part of the box are held in such a manner as to transfer the outward pressure to be transferred to other parts especially designed to receive and sustain it. These parts are shown in Fig. 2, which represents the hinged sections closed and ready to receive the pressure from the screws through the medium of the inclosed lint. In this position of the press, the hinged sections are held together by strong iron clamping bars, G, having pivoted levers which, when the sections are clamped, are held by stout pins, H. The ends of the bars opposite the levers are bent down at right angles, and hook over angular iron plates attached to stout pieces of timber which extend entirely across and are bolted to the hinged sections of the box. These clamping bars, together with the timbers described, serve to bind the hinged sections on all sides, and they receive the pressure when the press is in operation. They can be adjusted in a moment's time, but four or five movements being necessary to close the press and clamp it ready to receive the cotton. The upper and hinged platen or lid is left open while the cotton is put in the press, which does not take materially longer than to pack it in the baskets or sacks heretofore used to carry the cotton to the press. The top is then closed and fastened, and the screws are then run up by means of the nuts and levers, D, carrying up with them the lower platen, B, and compressing the bale. The clamping bars, G, being then taken off, the bale is stitched and banded.

A detachable cord belt works in grooves turned in the nuts, by which means the screws are rapidly run down when the bale is taken out.

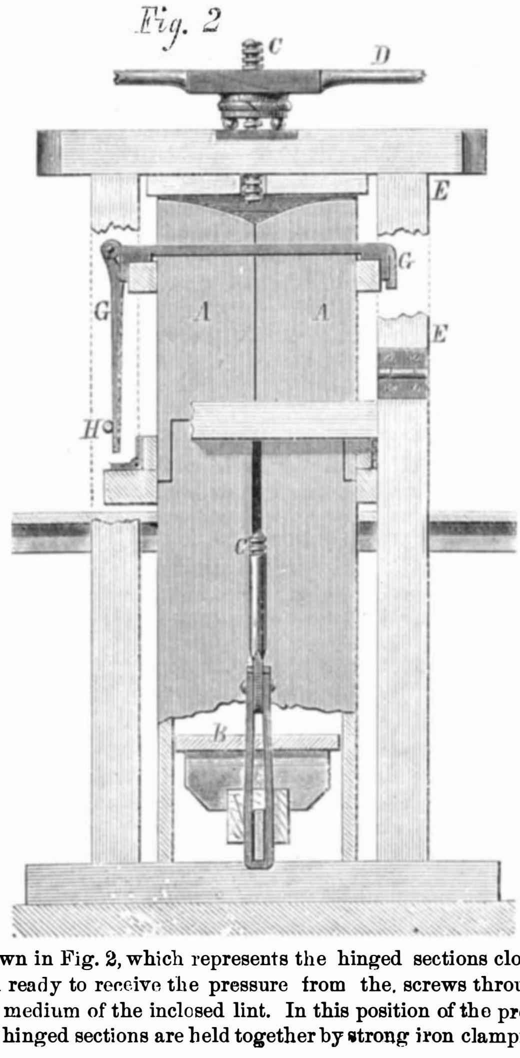
Altogether we regard this as one of the most simple and practical cotton presses we have seen, and as such well worthy the attention of cotton packers.

Patented, through the Scientific American Patent Agency, September 29, 1869 (and other improvements are pending before the Patent Office), by Joseph K. Davis, of Monticello, South Carolina, who may be addressed for further information or for territorial rights.



DAVIS' IMPROVED COTTON AND HAY PRESS.

Fig. 2



BELLS AND BELL METAL.

Every one has read about the enormous bells made in Russia and China; and nearly every one has some acquaintance with the troubles which at first beset the two bells cast successively for the Houses of Parliament at Westminster. But there are many interesting facts connected with the tones or sounds of bells which are not so familiar. Those sounds had formerly much more importance attached to them than they have now. A firm belief existed that the sound of church bells would drive away thunder and lightning, and repel demons and evil spirits; in fact, these were parts of the same superstition, seeing that the production of thunder and lightning was attributed to the malevolent agency of fiends. Times were, when bells were also rung during eclipses, to drive away the malevolent fiend who was supposed to hide the beautiful face of the sun or moon.

It was a very frequent custom to include a rhymed enumeration of these and other uses of church bells in the inscriptions they bore. One English form, frequently adopted, was this:

To call the folks to church in time—I chime
When mirth and joy are on the wing—I ring.
When from the body parts the soul—I toll.

The sound of a bell depends, of course, on many different circumstances or conditions. One of these is the metal of which the bell is composed. The mixed metals or alloys illustrate in an instructive way the differences of quality which result from differences in the proportion of ingredients. Copper and tin produce the metal bronze; in other proportions they yield speculum metal, for making the brilliantly white reflectors of telescopes; while in other proportions, again, they furnish bell metal. The Chinese in their gongs and the Europeans in their bells have seen reason to employ pretty nearly the same kind of metal. There is always much more copper than tin; but every bell founder has his favorite recipe in this matter. Some adopt simply four of copper to one of tin; some thirty-two copper to nine of tin. Big Ben has about twenty-two copper to seven of tin. Mr. Layard found at Nineveh bells which had as much as ten parts copper to one of tin. It is, therefore, evident that no very great amount of exactness is necessary in this matter. It is considered, in a general way, that an extra dose of tin improves the sound, but renders the alloy more brittle; the founder, therefore, establishes a balance of advantages according to his judgment and experience. When a large bell is annealed very slowly, the sonorous quality of the mass is improved.

Bell metal, though the most general, is not the only material for bells. Sometimes a little lead, arsenic, or zinc, is added to the copper and tin. It used to be a favorite idea that silver, thrown into the melting furnace, improves the tone of a bell. As for other metals besides copper, tin, and silver, it is known that steel and iron are occasionally used for church bells. Such bells have been cast at Westphalia, at Sheffield, and at Dundyvan, near Glasgow. Steel bells are lighter and cheaper than those of bell metal, and yield a rich and brilliant tone; but the sound is said to be unable to penetrate to a great distance. Cast iron with the addition of a little tin, has been tried; but the alloy was far too brittle. Glass bells, and wooden bells, are also talked about; but we do not see how the former could bear any hammering or clappering, nor how the latter could yield a sound worth hearing. One of the missionaries to Fiji, however, has described a bell or sounding instrument made from the hollowed trunk of a tree, like a trough, and placed on a coil of rope or some other elastic mass on the ground; when struck at one end with a mallet, it gives out a stifled roar which we are told could be heard twelve miles off.

The sound of a bell is further dependent on size, shape and proportion. The familiar "bell-shape" is not a mere random guess or fancy. It has been found by experiment, after comparing sounding bodies shaped like springs, spirals, hemispheres, tuning forks gongs, cylinders, flat plates, etc., that a bell of the ordinary shape, and of the same weight, will give out its sound to a greater distance than any of them; albeit, some of the others yield rich and deep tones. In describing the several parts and proportions of a bell, the founders speak of it almost as a living being, with its head, mouth, waist, and haunch. Some bells are made with very long waists, almost cylindrical; but this is not a general characteristic.

As to the actual tone, pitch, or musical note of a particular bell, it does not depend on any one of the dimensions singly, but on the relation between the diameter, hight, and thickness. The larger the diameter the deeper the tone, hight and thickness remaining unaltered; the thinner the metal the deeper the tone, diameter and hight remaining unaltered. The German bell founders adopt a kind of average rule, maintaining certain ratios between the diameter of the mouth, the diameter of the head or upper part, the hight, and the thickness of metal; and a certain ratio between the weight of the bell and the weight of the clapper. In this way they can make a pretty good guess beforehand at the tone which a bell will yield. English bell founders have ratios of their own, which they regard in some sense as trade secrets. In practice, however, there are often unforeseen and unexplained difficulties in the matter; the Royal Exchange bell, for instance, is said to have failed in yielding either the pitch or the quality of the tone intended. By filing or chipping away some of the metal at the thickest part, called the "sound-bow," where the hammer or clapper strikes, the tone is deepened; whereas by reducing the diameter of the lower edge it is raised. The Great Tom of Lincoln, though smaller than the great bell of St. Paul's, is heavier, on account of its greater thickness, and yields a higher tone. Connoisseurs in bell science aver that modern church bells do not throw out such rich penetrating sounds as the bells cast many centuries ago; and they attribute this to the pernicious craving for cheapness which is now besetting us. A thin large bell will yield a note of the same pitch as a smaller bell containing greater thickness of metal; but the tone is poor and meager. The monster bell at Moscow, which is estimated to weigh four to five hundred thousand pounds, never had the good fortune to be hung up, and therefore its exact pitch cannot be accurately stated. In fact it can only have a crazy pitch at best, seeing that there is a broken gap in it nearly as large as the side of a small room. When Dr. Clarke was in Russia, he asked permission to assay or analyze the metal of which the bell is composed, to ascertain whether silver is one of the components, in accordance with a popular theory; but his request was not complied with. About thirty years ago, however, the late Emperor Nicholas caused an analysis to be make; when it was found that the metal consists of about six copper to one tin, with scarcely any trace of other ingredients. The bell now forms a sort of roof or dome to a tiny chapel excavated underneath it, in the pit where it was originally cast. As to small bells, the makers are accredited with the observance of certain rules for shape, size, and thickness, according to the purpose to which each kind of bell is applied. In the days when the postman's bell, the dustman's bell, the muffin bell, and the crier's bell, made a greater clatter than they do now, each kind was said to have a uniform tone or pitch; and it may be that some such uniformity is observed in the railway bell, the dock bell, the ship bell, the ostler's bell, the sheep bell—though we cannot vouch for it.

As the sound of a bell may be made of any pitch that the maker pleases, it is obvious that all the notes for an octave, or for many octaves, may be produced; and a set of bells thus becomes a musical instrument. At Antwerp there is (or was) a set of thirty-three in the cathedral tower, well attuned, and giving forth brilliant sounds. Such sets of bells are called carillons in many parts of the Continent. They are played something like a pianoforte. The player thumps (for mere pressure will not do) on keys, pellets, or movable pegs; these keys are connected by bands or rods with hammers, and the hammers strike the bells. For the bass notes, the feet tread on pedals; but the treble notes are played by hand, the player protecting the edge of the palm with a leathern shield. Some of the carillons have as many as fifty bells; and some are played by clockwork, like the Apollonicon of former days. The name carillons is occasionally given to the tunes played, as well as to the instrument itself.

BRITISH RAILWAY SIGNALS.

Nearly a million persons travel every day on the railways of Great Britain. At nearly every station junctions are formed with other lines, branching hither and thither in every direction. It has thus become a matter of absolute necessity that railway points and signals should be so co-related that no contradiction can occur. In the SCIENTIFIC AMERICAN, July 16, our London correspondent referred to the method in use on the English Railways. We have since received from him the following particulars of Messrs. Saxby & Farmer's system, which is used in nearly every railway in the United Kingdom:

The lines from Cannon street terminus, near London Bridge, running to Charing Cross, take circular sweeps, forming a junction near the Borough Market. The lines so joined, as well as others parallel to them, run across an iron bridge, which connects the Surrey side of the Thames with Cannon street Station. Along the bridge run four main lines and one engine line; in all five pairs of rails.

Between and among these lines are numerous curves, cutting across and effecting junctions with the main lines in every direction, and so furnished with points that trains can be run from any one line to any other, as may be required.

The five principal lines, as they approach the station, spread out into various branches; so that altogether nine lines enter the station, one to each of its eight platforms, and the ninth for the accommodation of locomotives. These branches have also their points; and it results that on the bridge and at the station there are in all thirty-two pairs of points, which serve to guide locomotives to and from the several platforms and along the various routes which communicate with them. The existence of all these branches necessitates signals, the chief of which number sixteen for up-lines and eight for down-lines, besides five distant signals and six subsidiary signals, making a total of thirty-five signals.

The number of operations which these points and signals have to conduct may be understood from the fact that at the most crowded time of the day eighteen trains arrive and eighteen depart within the hour. The locomotive which brings a train in is at its head, and consequently at the inner end of the station. To bring the train out again, the first locomotive is detached from the inner end, and another locomotive is attached to its outer end, and when it has drawn out the train, the supplanted locomotive moves leisurely out from the platform and waits quietly by to supplant in its turn a brother locomotive, on the arrival of a succeeding train. In this way for every arrival and departure there are required two movements of locomotives; and thus in the crowded hour, no less than 108 operations of shifting points and signals have to be performed; or, on the average, one in every thirty-three seconds.

To sum up, we find that thirty-two pairs of points and thirty-five signals—some of them 200 yards distant—have to be worked, sometimes to the extent of 108 operations per hour, and generally from eighty to ninety.

Across the bridge, and some fifty yards in front of the station, a platform is erected spanning all the lines at a hight sufficient to clear the chimneys of the locomotives. On this platform stands a glass house surmounted by four tall poles, from either side of which project semaphore arms to the number of twenty-four. These arms generally remain in their horizontal attitude, to signify danger, and are only occasionally lowered, and that but for a few seconds, to signify that the passage is clear. With others at a distance, they command all the lines and sidings on the bridge and in the station, and every driver of a locomotive arriving, departing, or changing line, has to keep his eye steadily upon some of them, stopping without fail when their warning blocks his way, and moving without fear when they promise safety. He easily distinguishes which of the signals belongs to the line he occupies for the moment; for they are arranged to right and left, and in altitude, in the manner corresponding to the arrangement of the lines themselves. If, then, the engine-driver does his duty, and if the signals properly point it out, no accident can happen.

Climbing by an iron ladder to the signal platform, we enter the glass house, which is about fifty feet long and six feet wide. One half of the width is occupied by a row of strong iron levers standing nearly upright from the floor, and placed at equal distances along the one side of the apartment; the rest of the width forms a gangway or passage from end to end for two stalwart and serious-looking men, whose time is entirely occupied in looking through the glass side of their cell, and pulling this way or pushing that way some of the levers which are arranged before them. These levers work all the points and signals, and on counting them their number is found to be sixty-seven, viz.: thirty-two point and thirty-five signal levers, corresponding exactly with the number which we ascertained before ascending the platform. Every lever is numbered, and on the floor beside it there is fixed a brass plate engraved with its name and use. Sets of them are also distinguished in a way that readily catches the eye, by being painted in strong colors. Thus all the point levers are black, the up signals are red, the down signals are blue, and the distant signals are yellow. The row of levers thus presents a diversified pattern to the eye which is readily caught by the parti-colored groups, and, having once got the key, distinguishes quickly and correctly between their different classes.

On examining the levers somewhat more closely, it is remarked that many of them have numbers painted on their sides, not one number only, but in some cases half a dozen or more. These numbers involve the whole secret of the safety which is secured by the mechanism. The signal man cannot open the points to one line and at the same time give a safety signal to a line which crosses it. When he gives a clear signal for a main line, he cannot open a point crossing to it; when he gives a clear signal for a crossing, he must show danger for all the lines which it crosses. And this is the meaning of the numbers marked on the different levers: No. 10, let us suppose, has 5, 7, and 23 marked on its side. He may pull at No. 10 as long as he pleases, but he cannot move it till Nos. 5, 7, and 23 have first been moved; and so throughout the whole system. No signal lever can be moved to safety unless the point levers, corresponding to it, have first been moved; and no point lever can be moved while there stands at safety any signal lever that ought to stand at danger. Every lever is under lock and key, each being a part of the key which unlocks some of the others, and each forming a part of the lock which secures some of the others against possible movement, while each is at the same time subject to the control of all those which are related to it.

This result, complex and difficult as it seems, is achieved by mechanism of great simplicity and beauty. Immediately under the floor of the platform, and just in front of the levers, are arranged several series of vibrating and sliding bars, somewhat like the tumblers of a lock placed horizontally. These bars have projections here which stand in front of certain levers as obstacles to their motion, or notches there which permit certain levers to travel. Some of them have sloping faces such that, when a lever moves along them, it edges them to one side, and this transverse motion being communicated to others of the series, brings the proper projections or notches in front of those other levers to which the moving lever is related. Thus, by the movement of one lever, some others are stopped and some are left free; and this simple principle, carefully applied to all, works them into a system incapable of discord.

The locking apparatus of points and signals is not excepted from the general law of degradation. So skillfully, however, have Messrs. Saxby & Farmer worked out the system that the very wear of the material becomes an element of safety. The natural or normal position of all the signals, be it remembered, is that which indicates danger. If, then, through slackness of wear, the lever which works a signal should become partly inoperative, the worst that can happen is to leave the signal at danger. This may cause delay, because it may stop a train which might safely proceed, but it cannot involve danger; and throughout the whole mechanism this great principle is kept in view, to be safe under any circumstances—let cranks or slides wear, rods stretch or break, delay may ensue, but danger never.

We have stated above the number of operations that have to be performed in the crowded hour, a number exceeding one hundred; but the performance of these operations by no means tries the powers of the mechanism or oppresses the operators by excess of work, as may be understood from the fact that a train can be diverted from one extreme line to a platform on the opposite extreme—an operation requiring the movement of ten pairs of points and of all the signals belonging to them—in the incredibly brief period of twenty seconds. To do this on the old system, there would have been required one man at each pair of points, and several men at the signals, we need scarcely say at a large expense of time and money, and at an enormous risk to the passengers.

To railway companies a system which effects so great economy of time and labor is a benefit of no mean order; and to travelers by railroad, an apparatus which guides them with all but absolute safety to their destination, is a boon which entitles its inventors to be ranked as public benefactors.

New Developments in Adulteration.

In our last, says the Boston *Journal of Chemistry*, we referred to cream of tartar, without any cream of tartar in it, as one of the latest "dodges" of adulteration—if adulteration it could be called. We have since read of another sample of the same article which contained more than 90 per cent of sulphate of lime, and not one particle of bitartrate of potash. It would have been dear at five cents a pound, and was sold as "extra fine" at fifty-five cents.

There has also been a new development in the adulteration of coffee. People have flattered themselves that if they bought the coffee beans raw, and roasted and ground them at home, they were sure of having the genuine Mocha or Java; but artificial coffee beans are now made, like bricks, from a greenish clay, and the eye cannot distinguish them from the natural article. They are made in molds, a hundred at a time and cost about a cent a pound. When roasted they absorb the brown color from the genuine berries with which they are mixed, and the true and false are still indistinguishable. This admixture of clay is not injurious, as it settles to the bottom of the coffeepot, giving a literal significance to the term *grounds* as applied to that familiar sediment. The beverage is weaker, of course, but otherwise no worse; indeed, we suppose that some dietetists would say that it is all the better for the inert addition to what they consider an unwholesome decoction. The fraud may be detected by breaking open some of the raw berries and examining them closely, or by chewing them; or as some one has suggested, you can make a microscopic examination of the interior of each berry.

CEMENT FOR LEATHER.—A good water-proof cement or glue, for holding wood or leather, may be made by dissolving fine shreds of india-rubber in warm copal varnish. The material to be united should be made clean, and be perfectly dry at the time of applying the cement.

[From Chambers' Journal].

THE ARTISAN IN AUSTRIA, RUSSIA, AND SWEDEN

The industrial system of Austria is one of an antique type. Not very long ago, the only large manufactories in the country were in the hands of the large landed proprietors, or the Government itself; the latter not only holding the salt, tobacco, and powder monopolies, but possessing the largest mining properties in every province, and being at the same time the greatest manufacturer in paper, chemicals, and porcelain. Out of these conditions arose "that ancient hierarchy of labor," the Genossenschaft, or guild, to which every Austrian workman is bound to be affiliated. Every trade has its special guild, the members of which are divided into three ranks—the upper, of masters; the middle, of workmen; and the lower, of apprentices. Any one desirous of entering a trade can only do so by enrolling himself among the apprentices of the guild of the particular craft he selects, paying thereupon the fee of three florins (nearly $1·50), one third of which goes to the funds of the guild, the rest passing to the Chambers of Commerce and Industry for the weekly lectures and Sunday schools they provide for the instruction of apprentices. The apprentice is then assigned to a master, whom he has to serve without payment for two, three, or four years. If at the end of that term he obtains a certificate of proficiency from the schools he has attended, his master proclaims him a free member of the guild, and he is registered as a workman on its books—the registration costing him another three florins. In return for a quarterly payment of twenty-eight cents he becomes entitled to gratuitous board, lodging, and medical care at the hospital during sickness, or to receive the same at his own home, at a charge of eighty-seven cents a week. If the workman wishes to become a master, he pays twenty florins to the Master's Chest, six florins for a diploma, and a little less than half that amount to the town rates, and receives the coveted promotion, and becomes an elector of his guild.

The guild system, whatever be its faults, turns out good workmen, who command, according to the German standard, good pay; for example, shoemakers earn $6 a week; joiners, $7·50 to $15; tailors, $6 to $9; silversmiths, $3·50 to $5; compositors, $6; meerschaum carvers, $4 to $9; plumbers, $4; and smiths, $6 to $9—twelve hours being the average working day. As to the food and lodging of the Austrian artisan, little can be said, as the information at hand is very scanty. In Vienna, where house rent is very high, it is difficult to obtain a small room, with the use of a kitchen, for $48·00 per annum. About seventeen per cent of the industrial population are provided with lodging by their employers, some few of whom build houses, which their workmen buy gradually with the rent they pay. Thirteen per cent are wholly or partially boarded by their masters; some receive gardens rent free; and in some factories, the hands obtain food at wholesale prices. The owner of every large factory is bound by law to maintain, either with the co-operation of his work-people, in partnership with other manufacturers, or at his own expense, a permanent fund for the relief of those stricken down by accident or disease. Strikes, lock-outs, and all combinations for the restraint of trade being illegal in Austria, what we call trades' unions are non-existent there; but co-operative associations flourish, their number having quadrupled in the two years ending 1868. Of the 671 associations then in being, 418 were loan and discount banks, 237 co-operative stores societies, and 16 wholesale produce associations. Disputes respecting wages, work, contracts, and claims upon benefit funds are settled by Boards of Conciliation and Courts of Arbitration, consisting of twelve or twenty four members—one half employers elected by employers, the other half workmen elected by workmen; the latter being paid, while sitting in judgment, by the commune.

In 1869, national education was made compulsory in Austria. By this law, every child must attend school from the age of six to that of fourteen, and even beyond that age, unless it is certified that he has acquired the full minimum of education considered necessary for every citizen. The course consists of reading, writing, arithmetic, a sound knowledge of the native language and the native history, geography physical science, geometry, singing, and athletic exercises. Children employed in factories are exempt from attendance at the communal school, provided that they obtain the required amount of education at a special school of their employers; and wherever a special trade school exists, an employer is obliged to send all his apprentices to it. At the same time, every child is provided with religious instruction in the creed in which he or she is born, the local authorities of the religious community to which the child belongs being bound to provide competent certified teachers; upon their default, the state steps in, and undertakes the duty for them. This religious instruction is kept apart from the secular education, and is not permitted in any way to interfere with it. The future of the Austrian artisan promises well, for even without such advantages as the rising generation will enjoy, he is a credit to his country. Mr. Lytton was astonished by their culture and refinement. He says: "I have never yet met with any of the better class of Vienna workingmen unable to read and write correctly, or ignorant of at least the the masterpieces of the literary genius of Germany. . . . On subjects of political and economical science, the Austrian workingman is probably worse informed than the English. I must, however, bear witness to the fact, that at workingmen's meetings in this city I have frequently listened to speeches delivered by workingmen with an eloquence of utterance, a correctness of expression, and a dignity of gesture which would be effective in any public assembly. As the German race is not remarkable either for natural eloquence or natural grace of manner, I cannot but attribute this fact to a certain degree of culture. But to what must that culture be attributed? Where and how has it been acquired?

Mr. Lytton answers his own question in a way that may shock some good folks, but it is very suggestive. "The Austrian workman's daily life is subject to the incalculable influence of two great agents of refinement—the theater and the concert room, music and the drama. The stage is still an active educational agent throughout Germany. The drama is still regarded by German critics as the noblest province of poetry, and dramatic success is still valued by men of literary genius as the worthiest and widest on which they can rest their reputation. It consequently happens that the intellectual pabulum provided for the Austrian workingman by the theater, which he so passionately loves, and so faithfully frequents, is the master-work of all the great poets, thinkers, and men of letters from Goethe down to the present day.

"A curious illustration of the love of the lower orders in Austria for dramatic representation is afforded by the crowds, composed entirely of poorer classes, which may daily be seen waiting with great patience and good behavior about the doors of the best theaters in Vienna hours before those doors are opened. It is the same as regards the opera houses; good performances of the works of the best composers are abundant and accessible to all classes at a comparatively trifling expense. At the numerous places of recreation frequented by the Austrian workingman, the chief and most general source of recreation is music—never very bad, and often very good. There are very few Austrian workingmen who cannot either sing or play on some instrument, and who do not belong either to some amateur orchestra or singing club. A certain supply of *bonâ fide* amusement, and relaxation of mind as well as body, is regarded by most of them as a legitimate and necessary part of their annual expenditure. And it is to the humanizing influence of this view and habit of life, rather than to any innate peculiarity of temperament, that I am disposed to attribute the geniality and kindliness of disposition, as well as the refinement of manner, which have so greatly struck me in my occasional intercourse with the Viennese workingman." After this, we are not surprised to learn that intoxication is rare, habitual drunkenness very rare among Austrian artisans, and that their ideas of intimidation are confined to sending their obnoxious fellows to Coventry.

The condition of the Russian artisan is said to have materially improved of late years, but there is plenty of room for improvement still. Owing to the climate and the severity of the winter, employment is at the best precarious, and a goodly proportion of the working-classes pass their time alternately in the towns and the country, flocking into the former with the spring, and returning to their villages as autumn draws to an end. Wages vary according to locality and the season of the year, and are lowest in the districts where handloom weavers congregate. Good mill hands in the cotton, silk, linen, cloth, and carpet trades receive from $7·50 to $15 per month; ordinary mechanics, joiners, blacksmiths, etc., are paid from 75 cents to $1·50 a day; while skilled mechanics and engine drivers can earn $1·50 to $2·50, or even more Thirteen hours, with one for dinner, and a short rest for breakfast and an evening meal, is the averrge working day; that for children, of whom, however, very few are employed, being no shorter. All engagements are verbal, and cannot be broken off at less than two weeks' notice. No workman can be taken on at a factory or workshop unless he is able to produce a properly viséed passport.

Some of the mill hands live in huts like those used by the agricultural laborers, and constructed after the following fashion: Logs of red pine are cut into lengths of three, four or five fathoms, according to the size of the house. These are placed one above the other, and the ends dovetailed together. The doors and windows are then cut out, and the pieces care fully numbered by notches, and the box of logs taken to pieces preparatory to the actual building commencing. This operation consists in placing the lowermost tier on a foundation of wooden posts and boulder stones, adding tier after tier, filling up all the interstices with moss, or hemp and tow. The walls finished, floors and ceilings of red or white pine boards are added, both floor and ceiling being double, with a layer of earth between, and the whole crossed over with boards. The hut is roofed with wooden tiles In one corner of the room—there is seldom more than one—a large brick stove, like an English baking oven, is built, a chimney of wood, or of bricks put loosely together without mortar, is carried through the roof, and the house is ready for occupation. In large towns, however, the mill hand may lodge in large two or three storied houses, but comfort and cleanliness are out of the question. The rooms are small, low, and ill ventilated, and expected to accommodate as many as they will hold both for living and sleeping purposes—shelves and benches doing duty for beds. Except in the case of overseers and foremen, separate sleeping rooms are never thought of; and all are overcrowded. Some few manufacturers have erected large buildings, wherein the married, the single men, and the single women are separately provided for; a single man paying from 75 cents to $1·50, and the married man, from $1·50 to $2·00 per month as rent, the rent being deducted from his wages. Attached to these buildings there is usually a store, under the master's control, for the sale of good provisions at reasonable rates. In the poorer districts the food of the working classes is wretched in the extreme, costing about $1·13 a head per month, and quite enough too, since it consists of black bread, water, and a little tea occasionally. In the large towns it costs the artisan as much per week, but then his dietary is more extensive, consisting of black bread, fresh and salt fish, cabbage and meat soup, cucumbers, mushrooms, and potatoes; washed down with tea, quass, and corn brandy. In Moscow and St. Petersburg, beer is indulged in; but that beverage finds small favor elsewhere, the cheap corn brandy being the prime agent in liquoring-up among the workingmen who call the Czar father.

The sum of $4·25 is given as the average weekly wages of good workmen in good trades in Sweden, piece workers, however, making twenty-five per cent more. In Stockholm, where the wages are highest, the following are the ruling maximum rates: Goldsmiths, $7; watchmakers, $5·50. mathematical instrument makers, $7·50; pianoforte makers, $5·25; tanners, $4·13; paper makers, $4·50; while cotton weavers seldom make more than $1·75 a week—thirteen hours, less one for dinner, being reckoned a day's work. Miners and ore smelters, receive a large proportion of their wages in the shape of provisions, any fluctuations in the market prices of necessaries being equalized by a proportionate increase or decrease of wages; rye bread, vegetables, oatmeal cake, salt herrings, smoked pork, milk, and cheese, forming the principal portion of their dietary. In Stockholm, the artisan can get a decent dinner of meat, bread, and vegetables at a moderate price, and is able to indulge in spirits to a greater extent than is desirable. In the rural districts of Sweden, almost every mine, smelting house, or factory of any size has near it houses specially designed for the use of the workmen—neat little wooden cottages, with gardens and vegetable grounds; and many proprietors permit these to pass into the actual ownership of the occupiers, taking payment by installments—no very heavy tax upon the resources of the would-be houseowner, since any careful industrious man is held to be able to save at least one third of his income. In the large towns detached cottages are not possible, and the lodging house system is extensively adopted. At Nordköping, each house of this sort has a basement, first floor, and attics, providing lodgings for twenty-four married couples, each lodging comprising one good-sized room, a larger kitchen, a small spare room, and spacious cellars for wood and fuel; and so arranged, that only two sets of rooms have the same entrance door. The attics supply space for a reading-room, and four chambers for unmarried men; while in front of the building is a piece of ground divided into allotments for the cultivation of flowers. At Gothenberg, a town distinguished for its efforts to house its artisans comfortably, the commune has erected, at a cost of fifteen thousand dollars, ten one-storied houses, each containing seven sets of apartments of two rooms and a kitchen, twenty-one sets of one room and a kitchen, and fourteen single rooms; the rents of these varying from $1·25 to $3·13 per month; and in another building the authorities provide accommodation for thirty-two families and forty-eight single lodgers. In the same place, a local Peabody gave a sum of $90 000 towards the erection of a superior class of lodging houses, by which four hundred and thirty persons are housed— whose moveable property is insured for nearly $25,000. Such dwelling as these, of course are inhabited by the better class of workmen; second rate ones having to content themselves with sharing a room and kitchen in houses of a humbler description.

By the law of Sweden, every engagement must be made in the presence of witnesses, and a written agreement drawn up, defining both its conditions and duration; but the latter must not exceed three years. "Masters in trades or other industrial pursuits shall provide with fatherly care that the assistants or workmen in their employ (especially those who, being minors, board and lodge in their houses) be encouraged in habits of piety, regularity, and morality; and that such as have not acquired the minimum degree of knowledge prescribed by the national school regulations, receive instruction on such days and such hours as they shall determine; and further, that their assistants or workmen diligently attend the technical Sunday schools, where such are established, or other places of instruction intended for the improvement of the industrial classes." By another section, masters are bound to give due consideration to the health and capabilities for labor of those whom they employ. Workmen's societies for mutual aid in sickness have long existed, but what we know as trades' unions are of very recent date there; and such as exist are devoted rather to co-operative manufacture, or the intellectual improvement of the members, than to attempting to control the labor market. The Workmen's Association of Nordköping is the most prosperous among these useful organizations. In 1867, it numbered 1,519 members, and in seven years had spent $4,500 in assisting sick members, and $1,000 in defraying funeral expenses. It has a building of its own, built at a cost of $22,500, the plans being drawn, and the edifice constructed by members only. This Association boasts not only of a library, but a theater of its own, and has in connection with it a co-operative society for the supply of necessaries, and a society of production for manufacturing articles on the co-operative system.

Revenue Stamps.—According to the report of the Chief of the Stamp Division of the Internal Revenue Bureau, the number of document stamps printed in the fiscal year, ending June 30th, 1869, amounted to 118,011,244, and in the year ending June 30th, 1870, to 130,295,141. Notwithstanding the increase in the number of stamps the Government has realized $66,131 less in 1870 than in 1869. The falling off if attributed to the lessened demand for stamps of the higher denominations. The increase in the sale of stamps has been confined to the lower denominations ranging from two to fifty cents, as greater attention in late years is paid to stamping receipts and checks, and the increase in the sales of the lower denominations amounting to over nine millions of stamps. The stamps for proprietary medicines, cosmetics, etc., printed in the year ending June 30th 1869, amounted to 269,000,000, and in the year ending June 30th, 1870, to 298,000,000, yielding a gain of $433,171. The stamps imprinted on checks and documents give an increase of nearly $200,000 over the receipts in 1869.

Improved Brick Machine.

This machine, which was patented February 23, 1870, by the United States Brick Machine Co., of Chicago, Ill., has been brought to New York and is now on exhibition at the rear of 59 Ann street, between the hours of 9 A. M., and 4 P. M., each day.

We have never seen a brick machine equal in simplicity to this one. In it the inventor has accomplished what has hitherto been deemed an impossibility, the working of all the parts on the shaft of the ordinary pugmill. The machine can be driven by a lever sweep propelled by horses as well as by steam or water power, though when driven by horses it cannot, of course, be worked up to its full capacity, the latter being limited only by the practical speed of the machine and ability to supply it with clay.

It has been found that in practical working a speed that will turn out 60 to 70 bricks per minute, is about what can be done with two men to shovel in the clay, no attendance being required except to shovel the clay into the pugmill and hack up the bricks as they are carried away by an endless apron.

All the well-known principles of good brick making are observed in the operation of this machine. The pugmill operates precisely like the old pugmill, tempering the clay before pressing it in the molds. The pressure is adjustable to compress the bricks more or less, so that the proper density may be secured. The bricks may be pressed so as to be hacked up immediately. The commonest clay may be used, and it is claimed that as perfectly-formed bricks are made on it as can be done with the same quality of clay on a hand machine, that on subsequent baking the poorer sorts of clay will yield on the average enough perfectly-faced bricks for the fronts of ordinary buildings, while with the finer clays bricks of the finest finish may be made at the same rate as coarser ones.

The machine is driven by a powerful and heavy gear placed below and on the shaft of the pugmill. This gear is driven by a pinion on the pulley shaft, which takes its power from an engine or water wheel. If the mill is impelled by a lever sweep from the top of the shaft no toothed gears are necessary.

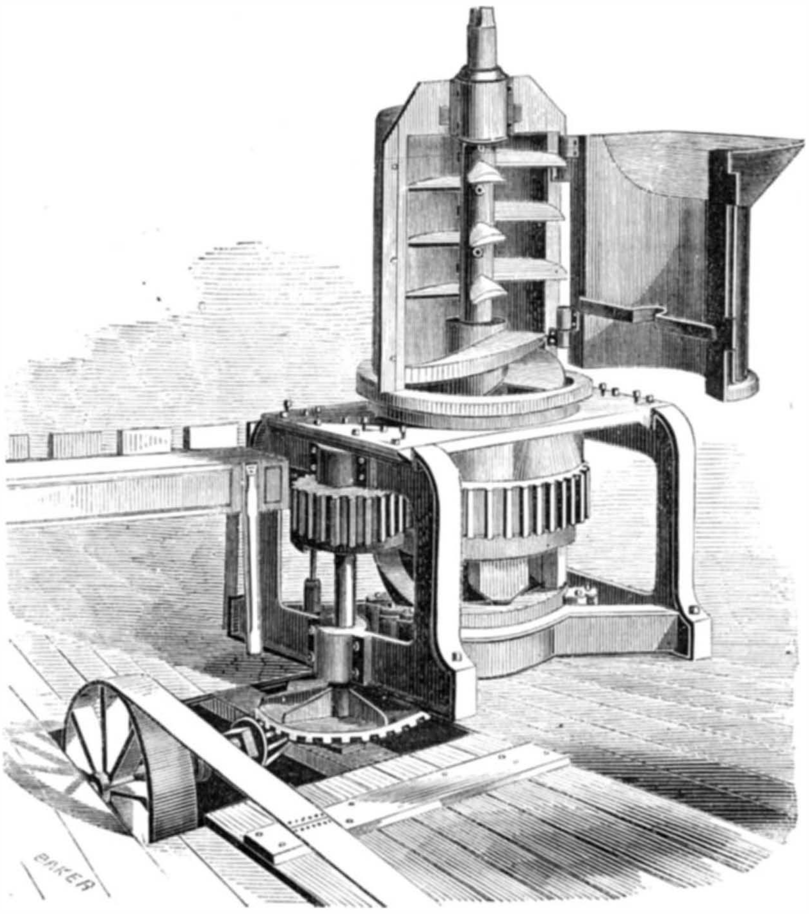
In the body of the large gear are formed, at proper intervals molds which receive the tempered clay from the pugmill as it is forced down into them by a powerful propeller screw fastened to the shafts below the knives, which do the grinding and mixing. In each of these molds—which are steel-faced—runs a steel or brass-faced follower, having at the bottom a roller wheel, which rolls up in a fixed track, elevated at the proper points, the action of which is to force the follower up, at the proper times, to compress the bricks, and also to thrust them out of the molds when they have arrived at the proper point of the revolution. As the bricks are thrust up out of the molds they pass on to an endless belt or apron, and are conveyed away to be hacked up.

There is nothing whatever about the machine which can get out of repair. Its parts are few in number and so constituted and arranged that they can be made of a weight and strength which insure their power of endurance, and no skilled attendance is required to run it. All the work can be done by boys except the shoveling of the clay.

Any complication liable to interfere with the perfect and permanent operation of the machine or to lessen durability is avoided.

We have seen it practically at work, and think it will do what is claimed for it. We certainly have never before seen bricks produced more rapidly, more perfect in shape, or more uniformly pressed than is done by this machine.

Machines can be seen practically at work, at the Company's yards in Chicago, at 59 Ann street, New York, and 120 Fulton street, Boston. Address F. C. Wells, President, U. S. Brick Machine Co., Chicago, Ill., for information.



THE UNITED STATES BRICK MACHINE.

Paper from Oat Husks.

W. Hay, of Glasgow, Scotland, has just patented the following process. He first immerses the oat husks in water in a tank or other convenient vessel, in order to float off mustard and other seeds with which they are generally more or less mixed, and which if not separated, materially deteriorate the quality of the paper. It is of advantage to have the water well stirred, as it facilitates the separation of the foreign seeds and allows them to float to the surface. The oat husks are then allowed to settle, and the surface scum and floating seeds are drawn off by an overflow pipe at the top of the tank, or skimmed off by a rake or other tool, or otherwise removed, after which the water is drained from the oat husks by a waste water pipe at the bottom of the tank, and beneath a perforated false bottom, or fitted with a strainer which retains the oat husks. The oat husks may be left to steep in the water for from five to ten hours after or during the removal of the scum, as this steeping, by softening them and helping to loosen the silica from the fiber, facilitates the subsequent boiling process. The remainder of the process does not differ materially from the ordinary one in making paper from straw.

Alum in the Printing Bath.

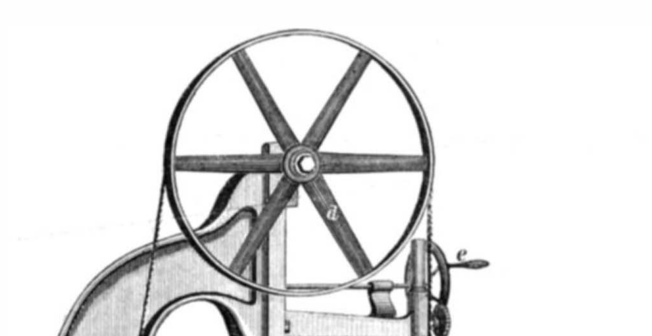
It having occurred to me, some two months ago, to try a combination of nitrate of silver and alum for a printing bath for albumenized paper, I made an experiment on a small scale, which was very satisfactory. I subsequently introduced it at our printing department, and for the last two months it has been used with good result. I cannot claim that the prints are any more brilliant, but there are other advantages of importance. Every photographer knows how invariably a scum forms upon the surface of a silver solution which is not constantly used. By the use of alum this scum is entirely prevented, the double solution appearing to have the quality of more perfectly and thoroughly coagulating the albumen. As a consequence of this the paper keeps its whiteness in hot weather much better than where the simple silver solution is used. The toning is effected with equal ease, and the whites (on the Steinbach paper) much better after fixing.

In preparing the silver solution, it is merely necessary to add as much powdered alum as it will dissolve. As we have not tried this solution on a variety of papers, it will probably be as well for experimenters to try it on a small scale at first. —*Anthony's Photographic Bulletin.*

GLEASON'S IMPROVED BAND SAW.

Our engraving represents Gleason's improved band saw, of which the following is a brief description:

The frame or stand is all iron, and is, by its peculiar design and great weight, necessarily very stiff and strong, a



feature very desirable in a band saw, not that it is required or expected to do heavy sawing, but because it has been found by experiment that a light and delicate frame in a band saw is one of the principal causes of the breaking of the saw.

As this class of machinery is generally placed on second or third floors, and sometimes higher, where the foundation is poor and shaky at the best, as a matter of course the frame will shake and tumble with the floor, and unless the frame is made heavy and substantial, the top part of the frame will move and tremble independent of the bottom. This will cause a constant jerking or irregular straining of the saw, under which no saw can run but a short time before breaking.

The arrangement, *c h b*, for holding the saw steady on the slack side, is considered much better than the plan usually adopted, as it not only keeps the saw steady, but by means of the spiral spring, O, it allows for contraction and takes up the expansion of the saw. It also, by means of wheel, *b*, answers the purpose of guiding or leading the saw on different parts of the wheel, which can be done by simply turning the guide wheel, *b*, up or down; a small part of a turn being sufficient to cause the saw to run to any part of the wheel desired. This arrangement obviates the necessity of stopping the machine and setting the top wheel out of level or plum with the bottom wheel, thereby twisting the saw more or less and increasing the liability to break.

It often occurs that a chip or block gets in between the saw and lower wheel, in which case the extra strain brought on the saw will be the means of breaking it, a thing impossible when the arrangement, *c h b*, is used.

The guide, *f*, is adjustable to different widths and thicknesses of saw, and will guide and hold the saw from twisting, when cutting on small circles. The guide is so arranged that it never interferes with the teeth or set of the saw. The wheel, *d*, is adjusted to different lengths of saws by the hand wheel, *e*, which is within convenient reach of the operator. The table is iron, and has two T-grooves, *a a*, by which a gage or fence can be attached for straight sawing. There can also be a radius sweep attached for cutting a regular circle without lines in sawing fellies, chair backs, rockers, etc. This table has a ball and socket seat (not found in other saws), which permits bevel sawing, or cutting a tenon on a leg for a frame that requires to be spread at the bottom.

Both the shafts have long and substantial journals, the top being 8 in. by 1 $\frac{7}{16}$, and 12 in. by 1 $\frac{9}{16}$, and then run in the Babbitt-lined boxes, that can be tightened up as they wear. With each machine is furnished one saw and a brazing apparatus. For further information address E. & F Gleason, No. 27 Haydock street, Philadelphia, Pa

Use of Metals as Fuel.

An English inventor proposes to substitute metals for coal as fuel for ocean steamers, and has taken out a patent for a method of carrying out his views, his object being to obtain a larger amount of steam from a given quantity of fuel.

When coal is burnt the solid coal is turned into gas, a large portion of heat becomes latent, and is wasted by volatilizing the solid. The oxygen of the atmosphere is a gas by reason of the large amount of heat combined with it. When zinc, iron, or manganese are burned, the resulting oxide is a dense solid; little or no heat is wasted, as it is not turned into vapor In addition to this, the inventor obtains the cosmical heat latent in the oxygen of the atmosphere, and the result is that one pound of zinc will evaporate more than four times as much water as one pound of coal, the advantage of which, on long sea voyages is obvious The zinc or other metal thus becomes a vehicle of power, much larger than can be obtained from the same weight or bulk of coal, and the oxide of the metal may subsequently be economically reduced at any convenient place where coal is accessible. The following is the manner in which it is preferred to carry out this invention: The furnace of the boiler is divided into two or more parts, first, the hearth or grate on which the metal is burned (in this description we will confine ourselves to the metal zinc); secondly, a chamber behind the hearth to collect the oxide. In the case of tubular boilers, the heated gas from this chamber is made to circulate through the tubes. The furnace has the bottom and sides, and sometimes the top also, of brick, fire-clay, or any other refractory substance. The air is admitted over the combustible metal, or by a blast through the same; in the latter case pipes or tweers are built in the bottom or sides of the furnace.

Whether this method prove practically successful or not, it is certainly based on sound principles. Every one knows what a small proportion of coal compared to the iron is used in the furnaces of iron founderies, and how the partial combustion of the iron itself increases the heat derived from the coal. If stoves could be built that would burn iron, it would doubtless be as cheap a fuel as coal, perhaps cheaper.

EFFECT OF HARD AND SOFT WATER ON HEALTH. —Neither hard nor soft water appears to exercise any perceptible influence on the tables of mortality. Both are apparently equally wholesome as far as the death-rate is concerned, though many painful diseases which are not fatal are with reason believed to be aggravated by the use of hard water. While it is most conclusively shown that soft water is not injurious to health, the economic benefits which attend its use are so striking and so great, that happy indeed those people may consider themselves who have the advantage of soft water. The softening of hard water for manufacturing purposes is not difficult.

Improvement in Millstone Picks.

This invention supplies a means whereby the steel bit of a millstone pick may be firmly secured in its position, readily detached when required, and adjusted as it is worn away.

Fig. 1 is a perspective view, and Fig. 2 a sectional view. A is a wedge-shaped plate which is attached to the handle by a screw shank, B is a piece of metal made so as to partly fold about A, as shown, but leaving a space between A and B, in which the steel bit, C, is held, by a lug being formed upon it, which fits into a corresponding recess in the plate, B, as shown in the section, Fig. 2.

It results from this arrangement that blows upon the bit, C, in dressing a stone, more firmly clamp and hold the parts together, while to loosen them, all that is necessary is to tap the plate, B, on the end opposite the cutting point or edge, which unwedges the two plates and releases the bit.

Two recesses are provided in the plate, B, so that when the bit is worn down, it can be set further out from between the plates, A and B. When one end of the bit becomes so worn as to be no longer available, the bit is reversed, and the other end applied to dressing the stone. Thus the bit may be used until it is almost entirely worn away. It is retained firmly, and yet is instantly detached for sharpening or for adjustment.

Patented, February 20, 1866, by Charles Crossley. For further information, address C. K. Bullock, 1,128 Market st., Philadelphia, Pa.

[For the Scientific American].

THE SCARABÆIDS--THE FLOWER BEETLES AND THEIR ALLIES.

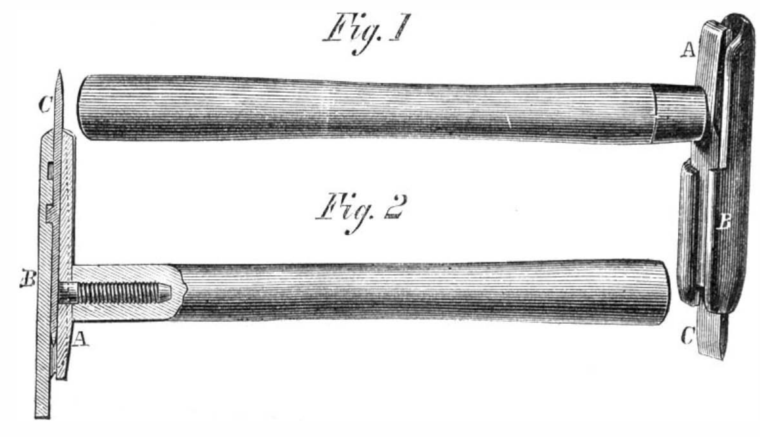
[By Edward C.H. Day, of the School of Mines, Columbia College].

The family of the Scarabæids is probably of very ancient extraction. We have no geological evidence to offer on this point but we infer the fact from the very great development of the group and from the variety of pursuits that different branches of the family have adopted. It is only one division, the Coprophagi, or dung beetles, that have taken to the scavenger business; another—the Melolonthians—are, as we have seen, notorious as marauders upon our vegetation; while a third group—the Cetonians and their nearest relatives—in their perfect state lead a life of luxurious idleness, feasting upon the delicate sweets of flowers and the rich juices of fruits, or upon the delicious saps that exude from the stems of plants. The various members of these subdivisions show strong family resemblances. A Scarabæid, whatever its mode of life, may be recognized "by its clubbed lamellate antennæ, the terminal joints being expanded into broad flat leaves, which, at the will of the insect, can be closely shut up into a compact club or loosely expanded fan-like."

From this form of antennæ (which were well shown in the engraving we lately gave, after Blanchard, of the cockchafer—*Melolontha fullo*) the family is sometimes known as the Lamellicornia. A Scarabæid is also generally recognizable "by its robust, thick, often square body, short fossorial legs, with large hooked claws for seizing leaves and stems."—(Packard). The Lamellicorns have attained to a great numerical development, and are widely distributed over the globe. In a catalogue, issued many years ago, of a single private collection, 2,300 species of this family were enumerated, and Packard tells us, in his recent work, that it now is known to contain some six thousand described species, arranged in about seven hundred genera. Among collectors of Coleopters, this is a favorite group, as it affords some of the largest insects that enrich their cabinets, while many of the tropical species are of extraordinary form, and many even of our northern ones are beautifully colored. Every one living in the country must be familiar with the bronze dung beetle (*Phanæus carnifex*), whose brilliant metallic tints green shot, with gold and purple, at once draw attention to it. The horn on the head of the male gives this species a still further attraction in the eyes of the curious. In warmer climates such horns occur on many of the large species, assuming much more extraordinary proportions and giving a very grotesque appearance to the insects.

The insect figured (from Blanchard's work) is a common European species, and is a good type of the Cetonians or flower beetles. Its scientific name (*Cetonia aurata*—gilded cetonia) is derived from its coloration—a rich emerald green with golden reflections. The perfect insect lives upon flowers, eating their petals and imbibing their nectar, and, as its popular name of rose-beetle implies, it is particularly partial to the queen of flowers. Its larva—like all those of the Lamellicorns—is a thick fleshy white grub, and lives in decayed wood at the roots of trees and in ant-hills; at the approach of winter it buries itself deep in the ground. Like the grubs of the Melolonthians, these larvæ do not attain their full growth for several years; they then make themselves cocoons of fragments of decayed wood, cemented together by a gummy secretion, and in them pass into the chrysalis stage.

The *Euryomia* (formerly *Cetonia*) *Inda* is perhaps the most typical, as well as the most common of the Cetonians occurring in this neighborhood; though it is not remarkable for its size, being but little more than half an inch in length, nor for its color, which is a variable shade of brown speckled with black. A metallic luster in certain lights, somewhat relieves its otherwise dull appearance. As Harris remarks, this is "one of our earliest visitors in the spring." We find its first



CROSSLEY'S IMPROVED MILLSTONE PICK.

appearance this year, recorded in our note book, on the 15th of April. Its short, thick form, its hairy body and legs, and its peculiar humming flight, give it, as Harris adds, a strong resemblance, when on the wing, to a humble-bee. This resemblance is probably caused partly by the fact that the wing cases of the Cetonians do not open in flight; as these cases do not overlap the sides of the abdomen, as do those of other beetles, the hind, or true, pair of wings, can be unfurled without the elytra being unclosed. It is probable that this resemblance to a bee may serve to protect this Cetonian from foes that would otherwise attack it when frequenting flowers. At the close of summer the Cetonians re-appear, not only visiting flowers for their sweets, but very objectionably eating into our most juicy fruits. On the 10th of August last we captured one fairly burying himself in a large blackberry, but it is of ripe luscious peaches that they have the good taste to be particularly fond, and Harris says that he has taken as many as a dozen of them from a single peach. That writer also supposes that the larvæ of this Cetonian live upon the roots of herbaceous plants. To the Cetonians of warmer climates belong some of the largest of beetles—the Goliath beetles of Western Africa—some species of these measuring from three to five inches in length and being of massive proportions. According to authority quoted by Packard, these giants "are found in the tops of trees, where they feed on flowers and on sap exuding from wounds in the bark . . . . the natives obtain them by jarring the trees." It is said that they are also sometimes shot, when on the wing, like humming-birds, with guns loaded with sand; nor need the reader turn up his nose at the results of such sporting, when he learns that from $150 to $250, gold, have been given in former times for single specimens of the rarer species! Owing to the more frequent visits of travelers to their haunts, specimens have become cheaper, but even now it is not within the means of poor students to have such interesting forms to study in their own cabinets.

METAMORPHOSES OF THE ROSE BEETLE—(*Cetonia Aurata*).

This leads us to remark that in New York there is no public museum to supply this deficiency—no collection worthy of the name, to exhibit the varied natural productions of the earth, and to assist the scientific man—in a city which derives all her immense wealth from the application of science to every portion of the vast field of Nature. Scientific men lay the blame of this want upon the rich men of the community or upon the city authorities, or upon any one else but themselves. We believe, however, that they are themselves most in fault; if they would for a few hours lay aside all thoughts of their own particular interests, cease to struggle for the supremacy of their respective half-alive societies, show themselves individually anxious for the general benefit, we might in three months inaugurate collections that in a few years would rival the oldest and most boasted collections of Europe. We should then be able to study objects even more expensive and more interesting, than the tropical Cetonians.

Sleep, Fainting, Apoplexy.

When a man is asleep, his pulse beats and his lungs play, but he is without sense, and you can easily wake him up.

If a person "faints," he too is without sense, but he has no pulse and does not breathe.

Apoplexy is between the two; the heart beats, the lungs play as in sleep, and there is no sense, as in fainting, but you can't shake the man back to life.

In sleep, the face is natural.

In a fainting fit, it has the pallor of death.

In apoplexy, it is swollen, turgid, and fairly livid.

If a man is asleep let him alone, nature will wake him up as soon as he has got sleep enough.

When a person faints, all that is needed is to lay him down flat on the floor and he will "come to" in double quick time. He fainted because the heart missed a beat, failed for an instant, failed for only once to send the proper amount of blood to the brain. If you place the patient in a horizontal position, lay him on his back, it does not require much force of the heart to send the blood on a level to the head; but if you set a man up, the blood has to be shot upward to the head, and this requires much more force; yet in nine cases out of ten if a person faints and falls to the floor, the first thing done is run to him and set him up, or place him on a chair.

In apoplexy, as there is too much blood in the head, every one can see that the best position is to set a man up, and the blood naturally tends downward, as much so as water will come out of a bottle when turned upside down, if the cork is out.

If, then, a man is merely asleep, let him alone, for the face is natural.

If a man has fainted, lay him flat on his back, for his face is deadly pale.

If a man is apoplectic, set him in a chair, because the face is turgid, swollen, livid, with its excess of blood.

What is apoplexy? From the suddenness of the attack and the apparent causelessness of it, the Greeks connected it in their own minds with the idea of a stroke of lightning as coming from the Almighty hand; it literally means, "A stroke from above." As instantaneous as the hurling of a thunderbolt in a clear sky, there comes a loss of sense, and feeling, and thought, and motion; the heart beats, the lungs play, but that is all, and soon they cease forever. The Romans considered the person to be "thunder struck" or "planet struck;" as if it were of an unearthly origin.

The essential nature of apoplexy is an unnatural amount of blood in the brain; whatever sends too much blood to the brain, may cause apoplexy; whatever keeps the blood coming from the brain, dams it up, may cause apoplexy; that is the kind of apoplexy which seems to come without any apparent adequate cause. Tying a cord tightly around the neck, or holding the head downwards too long, can bring on an attack of apoplexy, by damming up the blood in the brain, and keeping it from returning to the body.

A sudden mental emotion can send too much blood to the brain; or too great mental excitement does the same thing. It is the essential nature of all wines and spirits to send an increased amount of blood to the brain; hence alcohol is said to stimulate the brain.

The first effect of taking a glass of wine or stronger form of alcohol, is to send the blood there faster than common, hence it quickens the circulation; that gives the red face; it increases the activity of the brain, and it works faster, and so does the tongue. But as the blood goes to the brain faster than common, it returns faster, and no special permanent harm results. But suppose a man keeps on drinking, the blood is sent to the brain so much faster, in such larger quantities, that in order to make room for it, the arteries have to enlarge themselves; they increase in size, and in doing so, press against the more yielding flaccid veins, which carry the blood out of the brain, and thus diminish their size, their bores; the result being, that the blood is not only carried to the arteries of the brain faster than is natural or healthful, but it is prevented from leaving it as fast as usual; hence, a double set of causes of death are set in operation. Hence, a man may drink enough brandy or other spirits in a few hours or even minutes to bring on a fatal attack of apoplexy; this is literally being dead drunk.—*Hall's Journal of Health.*

Correspondence.

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

American and Chinese Vermilion.

MESSRS. EDITORS:—Probably no branch of American manufactures has increased so rapidly and attained so much perfection as that of the various paints and colors. But a few years ago all these articles—of any fine grade, at least—were imported; now increased home demand and the high tariff enable the manufacturer to experiment and expend, so as to bring them up to the highest standard, with a surety of a remuneration.

This improvement is especially noticeable in carmines and vermilions. For years all the quicksilver vermilion the world had, and it is by far the most brilliant and durable of reds, was brought from China. The English commenced its manufacture, but have never equaled that made by our neighbors of the almond eyes. It was left for American capital and energy, stirring up German brains, to accomplish this result.

A late number of the Boston *Journal of Chemistry* says: "The Chinese make from quicksilver that beautiful pigment, vermilion, which is so largely employed by painters and colorers in all parts of the world. It is singular that this half civilized people are able to prepare a chemical compound from quicksilver which is superior to, and which commands a higher price than the same salt produced in Europe and the United States, where the arts are carried to the highest perfection. English and American vermilions, as found in the market, are far inferior in brilliancy and quality to the Chinese."

The last sentence of this paragraph is what I would call attention to. The article from which the quotation is made has been extensively copied throughout the United States, and it is incorrect. Messrs. C. T. Raynolds & Co., of this city, some time ago sent to various practical and scientific men samples of a quicksilver vermilion made by a new process, or an improvement on the old. The result of tests side by side with the famed Chinese, is equal durability of color with as great brilliancy and strength. We are aware that the impression has been that no one could rival the Chinese, and that scientific books, papers, and men have so stated, but it has been and is constantly done. In justice to the cause of American manufactures I ask a place for this contradiction in your columns. The extensive circulation of the statement can only thus be refuted, for it is not likely the mere denial in the *Journal of Chemistry* would be so extensively copied as the article alluded to. H. E. COLTON.

Rubber as a Storehouse of Power.

MESSRS. EDITORS:—I was very much interested in reading the description of Mr. Jones' method of propelling street cars by means of rubber, on page 105, present volume, of the SCIENTIFIC AMERICAN. Rubber in its various forms is manufactured into so many articles of every-day use that there seems to be no limit to its adaptability to human wants.

Now that its propelling capacities are proved, the farmers want a light motive power for various laborious operations that are now performed by hand. Had we such a power to run the straw cutter, fanning mill, etc., on the farm, and churn, sewing machine, dish washer, and clothes washer in the house, it would be the neatest thing in the world. I doubt if it could be used where much power is required, for the winding up of the machine would be no boy's play.

I should think it might be applied conveniently to a light road vehicle.

Why cannot Messrs. Hanlon apply it to the bicycle? I think it would rejuvenate the worn-out steed into new and *permanent* life. With a motive power all laborious kickings with our pedal extremities would be avoided. The feet could be exercised occasionally to wind up the power, or the steering lever, or the momentum attained in going down hill could be used for the purpose.

A light, graceful tricycle, with a seat for a gentleman and lady, propelled easily and rapidly along the highway, up hill and down, with little or no labor from the occupants, and sold at a moderate price, would certainly be a desirable and popular invention. Can Mr. Jones or any of our numerous inventors give us this desirable necessity? Who will be the first to apply the rubber band to road vehicles, and set them whirling upon our highways all over our broad country? Who will solve the question? J. H. M.

Hartford, N. Y.

Crystal Coaches for Railways.

MESSRS. EDITORS:—Our railway coaches ought to be made with glass sides for several reasons. The peep-holes, so common now, ought to give place to windows 48×30 inches, consisting of the panes of glass 15×48 inches, in sashes arranged to slide by one another. One such window to a seat, with curtains of some comparatively inexpensive material for summer, while something warm and heavy might be provided for winter, would be far better than the clumsy shutters in use, besides being more homelike and tasty. Such a coach would be lighter in both senses. What a grand view would be afforded to the traveler from such coaches! How imperfect the perspective now—how perfect then. Now we must be content to gaze on panel, veneer, and daub, then we might gaze with unobstructed vision on all the light and beauty with which the Father has adorned this fair land of ours. All of the exhilarating effect of buggy riding is lost in these cages—cages, yes, cages of death in so many catastrophies. With the sides of glass few would be left in the wreck when it reached the bottom of some declivity, to scorch and burn as at Angola.

With the sides of glass, many would have escaped who sank beneath the surface of a river, to rise only in death, in cars transformed as quickly into capacious coffins.

With the sides of glass, how easily the elbows or the foot might open an avenue of escape in every case of danger. Many firemen and engineers have escaped death by jumping from their cabs, when to remain would have been a useless sacrifice of life. F. M. HORNING.

Corry, Pa.

Effect of Air Currents on Thermometers.

MESSRS. EDITORS:—In No. 7, current volume, of the SCIENTIFIC AMERICAN, is an article entitled, "Ninety Degrees in the Shade," in which it is stated that when the bulb of a thermometer is dry, wind blowing on that bulb will cause the mercury to rise.

Now, in all my experience of thermometers and changes of temperature of the air, I never saw it do so; unless the air blown on the thermometer was warmer than the air in which the thermometer was placed. On the contrary, I find it quite the reverse. Any one can try the experiment for himself. Place a thermometer in a close room, wait till the mercury has become settled in accordance with the temperature of the air in the room, then take a fan and fan the bulb of the thermometer briskly, when, in a few seconds, the mercury will begin to fall. I have seen it fall as much as four degrees; particularly if the temperature of the room was high.

I have often tried the experiment in the open air, and in different situations, and I find that, air blowing on the dry bulb of a thermometer, if the air is not hot, will cause the mercury to sink. W. T. L.

Cherrytree, Pa.

[We do not regard this experiment as at all satisfactory. The air of a room is always colder at the bottom than where a thermometer usually stands or hangs. It follows of course that disturbing or mixing the cold air with the warm, as would be done with a fan used in the way described, the temperature at the point where thermometers usually hang would fall. Let our correspondent place his thermometer close to the floor, then fan the bulb, and he will find the mercury will rise. But if he wishes to try an accurate experiment let him place his thermometer in a tube, and force air of uniform temperature over the bulb, the mercury will expand from the heat generated by the friction of the air on the bulb. We said, in the article referred to, that this expansion would be small, but the application of the thermopile and galvanometer will show there is a positive increase of heat from the friction of the air.—EDS.

Popular Errors Regarding the Watch---Setting the Hands.

MESSRS. EDITORS:—How the popular idea obtained that turning the hands of a watch backward was injurious, is difficult to determine; probably from the fact that the minute hand of a striking clock cannot be turned back past the figure 12. The obstruction to the backward motion of the clock hand is occasioned by the interference of the lifting pin, whose office is to set off the striking part at the hour figure. Many French and English clocks are so constructed as to allow the hands to be reversed without injury to any part; but in all watches, even those that strike or repeat the hours, and in all clocks which have no striking part, the hands can be turned backward or forward at pleasure.

The hollow pinion to which the hand is attached, technically called cannon pinion, slips on to a smooth round arbor prolonged through the dial from the center-wheel. It is crowded on the arbor with just sufficient *closeness* (friction) to carry the hand when the clock or watch is going, but yet with sufficient *looseness* to allow it to be turned in either direction without detriment.

If there be any possible injurious effect, it is when the hand is turned *forward*; for then the force necessary to overcome the friction of the pinion on the arbor is added to the force of the main spring (or weight) on the train of wheel work; but in reversing the hands, the force necessary to turn the pinion is taken from (diminishes) the force of the main spring on the train.

The danger of injury to the movement of either clock or watch by setting the hands in either direction is when the cannon pinion is driven on too tight by the watch-maker, or becomes rusted on by the use of a key *into* which the owner has blown a little salivia in attempting to blow *out* a little dust previous to using it. Whenever the hands move unpleasantly hard, take the watch at once to an honest, skillful watch-maker, and in ten minutes he can remedy the difficulty. "A stitch in time," etc. R. COWLE.

Cleveland, O.

How to Cure Mold in Carpets.

MESSRS. EDITORS:—A. B., of Pa., asks through the medium of the SCIENTIFIC AMERICAN how to remove the disagreeable musty smell from his Brussels carpet.

We removed the disagreeable smell from our Brussels carpet as follows: The carpet was a new one, the room was also new. After living on the floor for about six months, the smell became so disagreeable that we could scarcely remain in the room (the room was well ventilated and used every day).

We took the carpet and spread it on the grass, wrong side up, where the sun shone upon it all day; in the evening we gave it a good beating, and carried it to the house; the next morning we carried it to the lawn and spread it as before; in the evening we gave it another beating, and swept both sides with a stiff broom, and placed it back on the floor.

It is now perfectly sweet. The smell is caused by the damp weather affecting the starch in the goods. Damp weather will cause all kinds of heavy goods that have starch in them to smell badly, also felt hats, paper, etc.

Manchester, Ohio. C. C. COOLEY.

Buzzing Up.

MESSRS. EDITORS:—Some time since a communication appeared in your columns in regard to the process of "Buzzing Up," describing somewhat the nature of the experiment, and the method of performing it. While it would seem that the instructions given were sufficiently explicit, it still appears as if some important item were omitted, for recently a party, of which the writer of this was a member, made a long and faithful trial, without the least apparent success. While it did require some effort at first to comply with all the conditions, nevertheless, after a faithful and persevering effort, the party was obliged to abandon the attempt without the pleasure of having the subject "feel that the gravitation was out of him."

Cannot your correspondent give us more full instructions in regard to the method of performing this interesting experiment? L. U. CHAPIN.

A Dryer for Coal Tar.

MESSRS. EDITORS:—I see in your paper of August 20th that D. C. L., of ——, wishes to learn of some cheap ingredient which added to coal tar will add to its drying properties on iron. You can inform him and the public generally that gasoline is the best and cheapest article, and will dry as soon as applied leaving a fine, glossy surface similar to varnish. I have used this with a great deal of satisfaction on iron; and it is also a good and durable paint for tin roofs, and most durable when applied in the heat of the day.

Helena, Ark. G. W. HOLIBAUGH.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of July, 1870:

During the month, 575 visits of inspection have been made, and 1,092 boilers examined, 1,006 externally and 330 internally, while 97 have been tested by hydraulic pressure. Number of defects in all discovered, 549; number of dangerous defects, 59. These defects in detail are as follows:

Furnaces out of shape, 23; fractures, 50—10 dangerous; burned plates, 52—8 dangerous; blistered plates, 56—3 dangerous; cases of sediment and deposit, 54; cases of incrustation and scale, 80—5 dangerous; cases of external corrosion, 35—7 dangerous; cases of internal corrosion, 9—2 dangerous; cases of internal grooving, 2—1 dangerous; water gages out of order, 33—2 dangerous; blow-out apparatus out of order, 4; safety valves overloaded, 26—4 dangerous; pressure gages out of order, 80—5 dangerous; boilers without gages, 5; cases of deficiency of water, 3—3 dangerous; broken braces and stays, 18—6 dangerous; mud pipes and drums badly corroded and condemned, 1; boilers condemned as unsafe to use and beyond repair, 1.

Attention is called to 18 cases of broken braces and stays. True, it is a small number as compared with the whole number of boilers examined internally, but six of these were regarded in dangerous condition, and if one disaster has been prevented the importance of internal examinations is demonstrated. Stays become weakened by long use. When boilers are kept under high pressure day after day, the stay and braces have a heavy duty to perform, and they become "fatigued." We have had reported to us instances where he braces and stays "were as brittle as pipe stems." If there are such instances, or if the long use of boilers will cause this condition of things, it is all-important that they be internally examined at least once a year. A boiler, apparently well stayed, but actually in a weak condition, is little better than an infernal machine.

Some Characteristics of Modern Fire-arms.

As events thicken on the area of passing strife, many theories in respect to military fire-arms are tested by inexorable practice. Speculations as to the relative superiority or inferiority of fire-arms are narrowing themselves into the category of proven facts. At the commencement of this war both artillery and small arms had entered upon new phases, but it was in respect to military small arms chiefly that the greatest difference of opinion existed, or was assumed to exist.

Speaking for ourselves, we never were of opinion that any slight shade of difference in the purely mechanical superiority of the Chassepot over the needle gun, or the latter over the Chassepot, would count for so much as zealous advocates and partisans on either side expected. We have been in the habit of thinking little of the fact that the effective range of the French small arm is greater than that of the Prussians, or that the wounds inflicted by the Chassepot are more ragged and deadly in character. At any period before the breaking out of this war we should have been perfectly willing to concede that the Zündnadelgewehr is—taken all in all—a more imperfect mechanical instrument than the Chassepot, which latter, however, has many defective points. Conceding all this, there was no time at which we should have been averse to credit the Prussians by anticipation with much of the success as marksmen that they have since achieved; our reasons for this belief mainly hinging on the fact, too often forgotten, that, in a mechanical point of view an arm and its ammunition are not all in all. The physique and temperament of the shooter are items in the mechanical account—the soldier being to all practical intents an integral part of the machine.

This view has been amply borne out in all the contests which have occurred between the French and Prussians up to the time when these remarks are made. It has been proved that the French temperament, by its impetuosity, its mobility, its desire to be doing something, has proved itself very much at a disadvantage in all that concerns the successful management of a military breech-loading small arm. Even in the old days of muzzle-loading,the great difficulty in action was to supply cartridges with due rapidity, many instances having occurred in which soldiers have had to elect between injudicious bayonet charges or absolute retreat, merely because their ammunition had given out. This being the fact, it always seemed to us that two of the very advantages claimed by the French for the Chassepot over the needle-gun,namely, its longer range and its greater rapidity of delivering fire, might turn out absolute disadvantages in the field. So far as events have gone, and can be accurately taken count of, this has absolutely seemed to have been the case. At the battle of Forbach groups of French infantry were seen making their way in disorder to the rear, merely because their ammunition had been all fired away; and subsequently, at Wörth, McMahon complained that his infantry had not been able to keep themselves supplied with ammunition in the contest.

Coming next to the mitrailleuse, it does seem wholly inexplicable, and not more inexplicable than ridiculous, that the French should have affected so much mystery in respect to a weapon that, whether good, bad, or indifferent, presents such obvious indications of constructive points to be carried out into practice and which could have been executed in many different ways. The French Emperor, as most of us know, once wrote a folio book on artillery and fire-arms generally. His Majesty has ever since manifested a certain amateur predilection for this branch of the service; but if, as would appear from published accounts,he has had anything to do with placing the mitrailleuse in the rank of an artillery instead of an infantry weapon, then we think his inspirations have led him very much astray. In some respects an instrument on the principle of the mitrailleuse has important functions and capabilities—perhaps we should rather say it is a machine that makes important promises,but we should have imagined that some of the most obvious considerations of what modern field artillery is expected to do would have led mitrailleuse constructors to determine its place as an infantry weapon from the first. By infantry weapon we mean that, although necessitating a service of its own, the mitrailleuse, its genius and construction regarded,should emulate small arms rather than artillery if it would hope to give a good account of itself. In the present day field artillery is not worthy the name if it does not embrace, or has not the faculty of embracing, shell practice. Obviously no mitrailleuse, light enough to take part in field evolutions, could be endowed with that faculty to any but a limited extent. Weight and cumbrousness would be against it if made large enough for shell practice,and even were increased weight no longer a consideration, it would still be undesirable to project shell in such a salvo from such a machine. We English have, no doubt, placed the mitrailleuse in its true prospective rank. Recent experiments at Shoeburyness have proved that it can advance no pretensions to rank as an artillery weapon; that it is specially an infantry weapon; and, further, that to be effective the mitrailleuse should be able to employ the ordinary small-arm service cartridge, of whatever description that may be. Here we must observe that the ordinary compound cartridge of the British service—the Boxer cartridge—does not appear to answer well for mitrailleuse purposes.

Relative to the barrel construction of the mitrailleuse, we have heard even mechanicians wonder why the expedient of aggregating thirty seven hexagonal barrels in a circumscribing case of wrought iron is resorted to, when, as seems to them, the much more simple expedient of boring thirty-seven barrels out of a block of steel is at hand. If a mechanician, clever as he may be, would only try his hand at making a mitrailleuse in such fashion, his eyes might, perhaps, be opened and his opinion might alter. Some years ago Sir Joseph Whitworth, relying on accurate machinery, thought he could make double-barreled fowling pieces by boring two holes out of an elongated steel block. He found himself mistaken, as anybody would find himself mistaken who should make a similar attempt.—*The Engineer.*

THE TRAINING OF PRUSSIAN AND FRENCH SOLDIERS.

BY ARCHIBALD MACLAREN, OF THE OXFORD GYMNASIUM.

The Prussian soldier's period of service is so short (three years) that every agent to hasten his efficiency must be seized; and it has been found necessary to provide means, in the shape of large buildings resembling riding-schools, in which drill may be carried on throughout the year. And as this gymnastic system is viewed but as drill, aims but in being drill, it is, in winter, carried on in these buildings; the few articles of apparatus employed, for the sake of the advantages which they specially offer to the soldier, being erected in a corner of them. And this continuity of practice increases manifold whatever good it can yield; and thus, meager and inadequate as it is, its fruits are valuable. It is found that no other form of drill so rapidly converts the recruit into the trained soldier, and the greatest importance is attached to its extension throughout the army.

There is a general impression that this system forms the basis of the French. It would be difficult to make a greater mistake; for not only have they, either in principle or practice, nothing in common, but in many respects they are the very antitheses of each other. So far from the boasted "simplicity" of the Prussian system, and the desire to limit it to "a few exercises to be executed with great precision," being adopted by the French, they have elaborated their system to such an extent that it is difficult to say where it begins or where it ends, or to tell what it does, but what it does not embrace. For quite apart, and in addition to an extended range of exercises with and without apparatus. it embraces all defensive exercises, with bayonet and sword, stick, foil, fist,and foot, swimming, dancing, and singing, reading, writing, and arithmetic, if not the use of the globes. The soldier is taught to throw bullets and bars of iron; he is taught to walk on stilts and on pegs of wood driven into the ground; he is taught to push, to pull, and to wrestle; and although the boxing which he is taught will never enable him to hit an adversary, he is taught manfully to hit himself, first on the right breast, then on the left, and then on both together, with both hands at once; and last, but not least, he is taught to kick himself behind, of which performance I have seen Monsieur as proud as if he were ignominiously expelling an invader from the *sol sacré* of La Belle France. Now I know no particular reason why a soldier should not be taught all these acquirements; and I know many important reasons why he should be taught some of them; but it would be difficult to assign any reason, either important or particular, why they should be called gymnastics, or be included in a system of bodily training.

The fundamental idea of the French system is sound, for it embodies that of preparation and application; it is primarily divided into two parts—*Exercices Elémentaires and Exercices d'application.* The first of these, designed to be a preparation and prelude to the instruction and practice on the fixed apparatus, begin with a long series of exercises of movement and position, *propres à l'assouplissement.* What is this all-important process of *assouplissement*—this idea, shared at home as well as abroad, by civilian as well as soldier, of the necessity of suppling a man before strengthening him? What is it to supple a man? What parts of him are affected by the process and what change do they undergo? It would be very desirable to have these questions answered, because want of suppleness is a common subject of complaint, and though often caused by apparently different processes has really but one origin.

To ascertain the full meaning of a word or phrase, it is sometimes useful first to ascertain its opposite or antithesis; and the opposite of to be *supple* is, I think, to be *stiff.* If any one is in doubt as to what that means, let him take a day's ride on a hired hack along a country road, or, for the space of a working day, perch himself upon an office stool, and the results will be identical and indubitable—stiffness in the column of the body and in the lower limbs. And why? Because each and every part so affected has been employed in a manner out of accordance with its natural laws. The joints, which are made for motion, which retain their power of motion only by frequent motion, have been held motionless. The muscles, which move the joints by the contraction and relaxation of their fibers, have been subjected to an unvaried preservation of the one state or the other—the muscles of the trunk in unremitting contraction, those of the limbs in effortless relaxation. Now, one of the most important of the laws which govern muscular action is, that it shall be exerted but for a limited continuous space, and that, unless the relaxation of the muscles shortly follows upon their contraction, fatigue will arise as readily, and to as great an extent, from want of this necessary interruption to contraction as from extent of effort. And, strictly speaking, this stiffness, both in trunk and limbs, although arising from two opposite states of muscular employment. results from the same cause, *i.e.*, exhaustion; each has had one only of the two essential conditions of muscular action, that one being therefore in excess. The stiffness in the trunk of the body is caused by the ceaseless contraction of the muscles, and this state is not conducive to the rapid local circulation indispensable to the reproduction of the force expended. The opposite phase of stiffness, arising from continuous muscular relaxation, is the immediate result of causes which may be called negative—the non-requirement of nervous stimulus, the non-employment of muscular effort, entailing subdued local circulation.

The second cause of this stiffness in the trunk of the body and limbs is, that the joints have been held motionless. Viewing the joints in the familiar light of hinges, we know that when these are left unused and unoiled for any length of time, they grate, and crack, and move stiffly; and the hinges of the human body do just the same thing, and from the same cause; and they not only require frequent oiling to enable them to move easily; but they *are* foiled every time they are put in motion, and when they are put in motion only; the membrane which secretes this oil, and pours it forth over the opposing surfaces of the bones and the overlying ligaments, is stimulated to activity only by the motion of the joint itself.

But, it may be argued, stiffness may arise from extreme physical exertion, which has embraced both conditions of muscular action, with frequent motion of the joints, stiffness such as a man may experience after a day of unwonted exercise. The stiffness in this case, also, is simply temporary local exhaustion of power from extreme effort; the demand suddenly made has been greater than the power to supply—the waste greater than the renewal.

Stiffness, therefore, appears to be, first, a want of contractile power in the muscles which move the joints; and, secondly, a want of power in the joints to be moved. It may be temporary stiffness, arising from exhaustion of the parts by extreme or unnatural action, as in the illustrations just given; or it may be permanent stiffness, arising from weakness of the parts, caused by insufficient or unsuitable exercise; but the nature of both is identical. It is lack of functional ability in the parts affected.

To supple a man therefore is, first, to increase the contractile power of his muscles; and secondly, to increase the mobility of his joints. And as the latter are moved by the former—can only be moved by the former—all application for this purpose is made through them.

Now, even although mere movements and positions were altogether adequate materially to develop the muscular system—materially to add to its contractile power, there is a still greater drawback than mere insufficiency in their effect upon the joints; and that is, in the danger of straining, and otherwise weakening the inelastic ligamentary bindings. For every effort of mere position has the simple and sole effect of stretching that which, from its organic structure, object, and place in the human body, is not stretchable—is not intended to yield.

To recapitulate: All exercises of mere position act directly on the joints, instead of acting on them through the muscles. Such exercise is, therefore, addressed to the wrong part of the body; it is addressed to the joint, when it should be addressed to that which moves the joint. It is the old and exploded treatment of an abnormal physical condition—subduing the symptoms instead of waging war with the cause.

The other exercises in this first division of the French system—even if they were valuable, even if they were capable of being classified under any distinct head, or arranged in any progressive order, or admitted of graduated instruction and practice—are entirely out of place here, because from their nature they court and incite to inordinate effort. It needs no argument to prove the inconsistency of directing that men, sitting or standing, hand to hand, or foot to foot, singly or in batches, shall strain and strive against men, lift cannon-shot and hold them out at arm's length "as long as possible," or sling them to their feet to cast them to a distance "as far as possible," before they are allowed to put hand or foot on an ordinary ladder inclined against a wall, or to walk along a plank raised a foot or two from the ground. It needs no argument to show that this is reversing the order of exercise when measured by the amount of effort required for its performance.

The second division of the system, consisting of applied or practical exercises (*Exercices d'Application*), embraces a very extended series, to be executed on a wide range of apparatus; and it may be broadly stated that all these exercises are valuable in either an elementary or a practical aspect—that is, either as they are calculated to cultivate the physical resources of the man, or as they may be applied to the professional duties of the soldier. I repeat, that the exercises of this division of the system are intrinsically valuable in one or other of these aspects; but it must ever be viewed as a grave error, that, so far from the special aspect of each being designated, so far from their being separated and grouped, each under its proper head, they are all retained under one head, under the single designation of "Practical Gymnastics."

The evil which naturally and inevitably springs from this want of arrangement, is the undue importance which it gives to all exercises of a merely practically useful character above those whose object is the training and strengthening of the body. This is emphatically the case in the earlier stages of the practice, where the whole attention of the instructor should be devoted to the giving, and the whole effort of the learner should be devoted to the acquiring of bodily power. Increase the physical resources first, and the useful application will follow as a matter of course. A pair of strong limbs will walk north as well as south, up hill as well as down dale—the point is to get the strong limbs.

Let not this principle of classification be undervalued. The question of "What's the good of it when I've done it?" is one not unheard in the gymnasium, and one not always easy to answer; and even could you be at all times ready with a physiological explanation of motive, process, and result, your questioner is not always a man who could understand it, and the difficulty is increased manifold when the exercise questioned has place among others of the practical value of which there can be no question. But such classification gives at once the answer: "It is of no use at all as a thing acquired; but if you should never do it or see it done again in all your life to come, it has served its purpose; for *you* are altered, *you* are improved, *you* are strengthened, by the act and effort of learning it."

But men, so intelligent as those who are intrusted with the administration of the French system, have perceived the propriety of a special application of the exercises practiced at the close of the course of instruction. And, therefore, to the *bonâ fide* exercises of the system are added certain practices in which the men are employed in "storming works, and in undergoing an examination of their general proficiency."—*Herald of Health.*

CANADIAN INVENTORS IN THE UNITED STATES.—We, says the *Canadian Pharmaceutical Journal*, notice that under the recently amended Patent Law of the United States, Canadian inventors, in common with other foreigners, are allowed to apply for patents on the same terms as citizens of the United States. The SCIENTIFIC AMERICAN thinks the example worthy to be followed by the Government of the Dominion. We heartily agree with our cotemporary, and hope that our law givers will fall in with reciprocity—at least as far as genius is concerned.

IN 1866, Prussia conquered Austria in six weeks. It is almost incredible that she should have repeated the same thing on France in 1870—the latter supposed to be the strongest military power in Europe.

THE production of Lake Superior copper ore this year is estimated at one million tuns, which is twice as much as was produced in the entire United States in 1843.

L. I. Trueg's Heliorama.

The instrument herewith illustrated has been appropriately styled the "*Heliorama.*" We shall confine our description to giving, as well as we may, the scope and uses of the instrument without going into the minute details of its construction, or discussing at length the rationale of its operation. The latter will be sufficiently apparent to those familiar with astronomy and the construction of astronomical instruments; while to those unfamiliar with the science it would be hardly possible to give, in the limited space to which we are confined, a complete exposition of the principles upon which the instrument is based.

Its name signifies the spectacle of the sun, the application of which to this instrument implies that by its use the apparent relations of the positions of the sun and earth to each other may be determined, and the latitude of any given point upon the earth, and its true time by sun, or its true time by clock, may be deduced from these relations.

It may be considered as compounded of two distinct instruments, one called the "*Helioclasis,*" by which latitude is determined, and the "*Hemerophora,*" by which the time is determined.

It is well known that the instruments hitherto used for the determination of latitude from solar observations by seamen and astronomers can only be used to advantage at mid-day. Observations made before or after this time only approximate the true latitude. The helioclasis does this however at any time the sun is visible between the hours of 6 o'clock in the morning and 6 o'clock in the evening; a very slight adjustment only being necessary, so that, given one minute of sunshine between these hours, the mariner may determine the latitude with precision.

A basement bed, A, Fig. 1, carries two side pieces, B, which support a revolving plate, C, on which two arcs, the one a semicircular brass plate, D, called the "*Equatorial Gnomon,*" the other, E, an arc of fifty degrees called the "*Cliseologet,*" are so adjusted that the center of each touches the periphery of the other from within, their radii being equal. The equatorial gnomon stands perpendicular on the plate, its diameter touching the surface of it, and bisecting the cliseologet at right angles. The point of bisection is degree 0, from which, on both sides, degrees are counted up to 25. The plate bears a list of the declination of the sun for every tenth day throughout the whole year. When the instrument is set up the basement bed must be level, and the front directed towards the south, which purpose the compass, F, in the basement is intended to serve; then the list on the plate must be consulted. If we have, for instance, April 1st, the list tells us that on that day the sun's declination is four and four tenths degrees, the plate must be then turned until the shadow of the sun, cast by the gnomon, falls on that degree. Look at the degree of latitude marked on the side pieces, facing the west. A hand attached to the pivot of the plate, B, and moving with it, indicates that degree of latitude on which the place of observation is actually situated. At sea, the instrument will be most serviceable if kept in its proper direction (with regard to north and south) by a large magnet.

In order to make the correction for refraction, the graduation on the arc, on the side piece, C, is so made that in the distribution of degrees, thirty-three minutes of arc are lost, so that on the place where 89° 27′ would come, 90° would appear. The refraction of the sun's rays corresponds to this marking, as it is at twenty degrees, twenty-one seconds; at thirty degrees, thirty-three seconds; and at ninety degrees, thirty-three minutes.

Another correction for the radius of the sun's disk, 16′ may be made, if deemed necessary, by subtracting that number of minutes in the graduation of the arc, on C, so that ninety degrees are marked at a real distance from 0° of 89° 11′.

The second instrument of the heliorama is the hemerophora, which is an improved sun-dial. It shows not only the correct sun time but also the mean time—that is, the time which a correct clock shows.

In construction (Fig. 2) it is an inverted helioclisis, for that arc which there casts the shadow is here inverted in order to receive it, while that arc which there receives the shadow, being inverted, is here made to cast the shadow. The deviation of the sun time from the clock time, is corrected by an apparatus which moves the arc that receives the shadow, called *Horologet,* and sets it so as to show the time of a correct clock. A movable hand, G, points to the different dates of the year. No sun-dial until this has been able to show the exact sun time at every hour of the day, and at any season of the year. At any moment, when the sun shines, the hemerophora or heliorama shows what former sun-dials could only accomplish with accuracy at one moment of the day, and it indicates the mean time besides the sun time.

The arc, H, which is called the "*Horologet,*" is divided regarding the hours as follows: From 6 o'clock A.M. to 6 o'clock P.M. is 180°. The intervening space is divided into 15° divisions for hours, and these divisions are subdivided into quarters. The horologet, H, is more than a semicircle, so as to gain space for the inscription of at least one hour more for the morning and one more for the evening, in order to mark time for longer than twelve hours in the summer season. This arc may moreover be shifted about its center by moving the pointer, G, so as to adjust the horologet to the time of a correct clock.

The arcs, I K, over which the pointer, G, moves, have marked thereon days of the year, to which if the pointer be placed, the horologet, H, will be shifted to correspond with the time of a correct clock for that day to which the pointer is moved.

L is the gnomon, placed permanently at right angles with the horologet, as shown, and made to give correction for refraction by making the radius of its arc one thirty-second greater than that of the horologet. The effect of this is to cast the shadow backward at morning, and forward at evening, so that the shadow shall fall on the 6 o'clock mark on the horologet at precisely when the sun rises and sets at the equinoxes.

On the side piece, C, Fig. 2, is an arc which shows by the pointer, M, the hight of the celestial equator at the same time that the opposite hand or pointer, Fig. 1, shows the latitude.

It will be observed that the construction of this instrument is very simple, and those familiar with the instruments heretofore used to effect the same purposes, will understand its adaptation to the ends proposed.

The inventor wishes to dispose of a part or the whole of his patent, which was patented, through the Scientific American Patent Agency, December 28, 1869, and March 8, 1870 Address Ludwig Ignatius Trueg, St. Vincents, Westmoreland county, Pa., or publishers of the "Patent Star," 119 Milk street, Boston, Mass.

Fig. 1

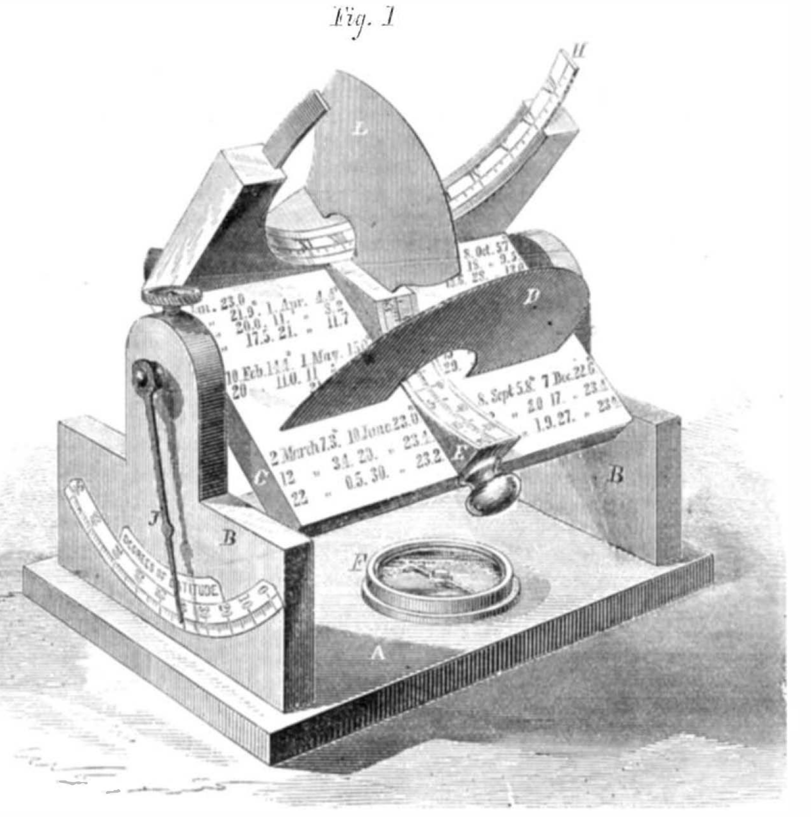
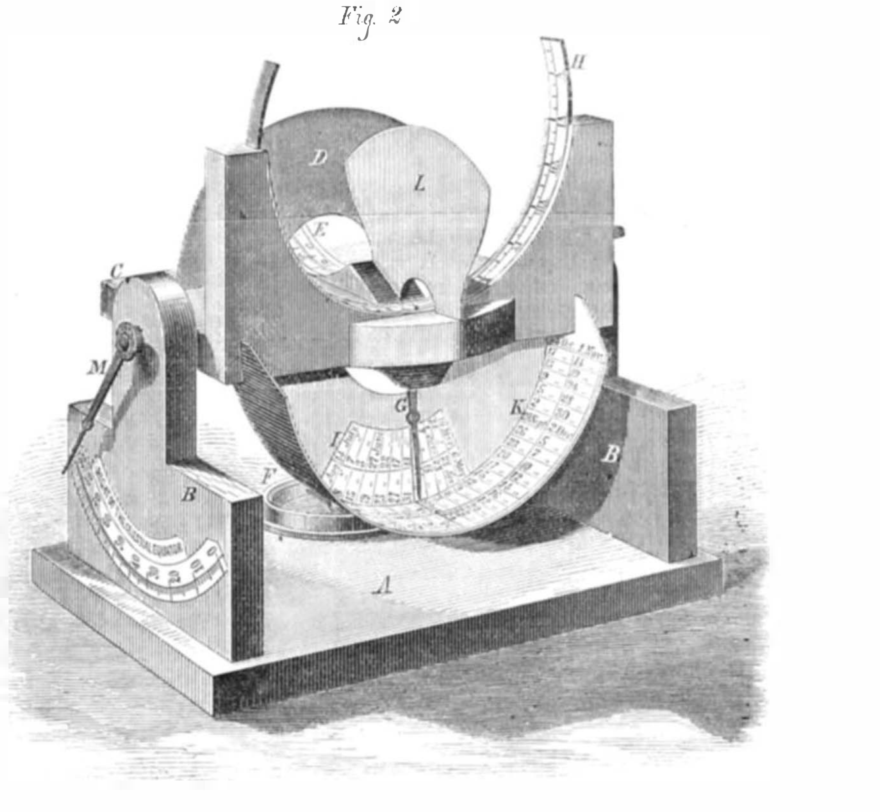


Fig. 2



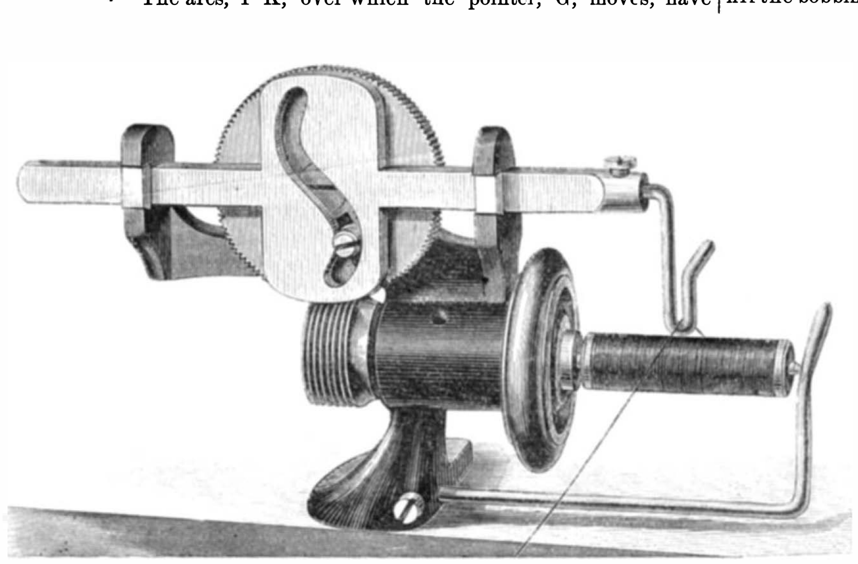
TRUEG'S HELIORAMA.

A Mystery in Lawrence, Mass.

A correspondent from Lawrence, Mass., sends us an account of a singular thing which is exciting the curiosity and the superstition of the good people of that thriving town. It is no less than the image of the head and a portion of a fe male figure lately discovered upon two adjoining panes of glass in the window of a house, and supposed by some to be the portrait of a lady who recently died in the same building We regard the whole affair to be another hoax intended ulti mately to put money in somebody's pocket. There is no doubt of the existence of the image, and the question is, How was it formed? Similar questions were put in reference to the Cardiff giant, which were satisfactorily answered in time as this perhaps will be.

Automatic Bobbin Winder for Sewing Machines.

One of the chief arguments used by the chain-stitch sewing machine interest against the double-thread machines is the trouble experienced in winding bobbins. The chain-stitch machines using thread direct from the spool do not involve this difficulty. It is the object of the invention we herewith illustrate to provide an automatic bobbin winder that shall fill the bobbins while the machine is in operation, so that all the operator has to do when a new bobbin is required is to place it in the shuttle. Each bobbin is similar to all the others when filled and the apparatus may be so adjusted that long or short bobbins may be wound with equal facility and certainty.



AUTOMATIC BOBBIN WINDER FOR SEWING MACHINES.

The simplicity of this ingenious addition to the sewing machine is such that it will be at once understood, on reference to the engraving.

The stock of the bobbin winder is screwed to the clothplate of the machine. The bobbin is placed upon a spindle, the shaft of which has upon it a small grooved pulley which rests against, and is driven by the band from the fly wheel. A worm on this spindle works in a toothed wheel. This wheel has projecting from its side a pin which works in a cam attached to the thread guide. This arrangement gives a traverse motion to the thread guide from end to end of the bobbin as the spindle revolves, thus distributing the thread evenly along its surface, and filling it much more uniformly than can be done by hand.

The cam slot is S-shaped, and the pin working therein is adjustable to and from the center of the toothed wheel, by which the traverse motion is shortened or lengthened to wind bobbins of different lengths.

These bobbin winders are made in different styles for the various shuttle machines in use, and appear to us very desirable and useful additions to such machines.

Patented, through the Scientific American Patent Agency, April 19, 1870, by Thomas Shanks, cor. Lombard and Sharp streets, Baltimore, Md., who will negotiate with manufacturers desiring to manufacture on royalty, and who may be addressed for State rights or the entire right.

WORDS are the tools with which the mind works.

Scientific American,

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Contents:

(Illustrated articles are marked with an asterisk.)

THE INCREASING USE OF GLYCERIN.

A few years ago all the glycerin that was casually made in the soap, candle, and lard industry was thrown away. At the present time it is carefully saved, and its applications have been so much extended that it has become a prime article of manufacture, and one that could not easily be dispensed with. Some of the uses are not popularly known, and it may be well to recapitulate them for the benefit of our readers.

The presence of glycerin in fermented liquors was proved by Pasteur ten years ago, and on this discovery was founded an artificial manufacture of wine which has since become a regular business. We have occasionally published paragraphs on the use of glycerin in sweetening wine, and have reason to suspect that much of the champagne of commerce owes its peculiar flavor to the presence of this foreign liquid. As it is not particularly deleterious to the system its use is a decided improvement on the custom of adding sugar of lead to wines and champagne practiced in ancient times. After the discovery of glycerin in wine, attention was turned to other liquors, and it was found to exist in the best German beer in minute quantities as the result of a natural fermentation. This fact showed that in the fermentation of wort, besides the transformation of sugar into alcohol and carbonic acid, a secondary modification took place called succinic fermentation, that is, the change of a part of the glucose into succinic acid and glycerin. We have never heard of the employment of succinic acid to improve the taste of beer, and are not likely to be troubled in this way on account of the great cost of the material; but the use of glycerin by brewers has now become an every-day fact in Europe, and it is said to add to the keeping qualities as well as to the taste of beer. The quantity taken is small, amounting to from one half to one measure of glycerin to 100 measures of wort. A pound of glycerin costs at wholesale in Germany twenty cents, and it is said to go as far as two pounds of extract of malt. It is probable that for home-made beer and domestic brews of all kinds glycerin could be advantageously employed if the proportions could be popularly explained.

Another property of glycerin upon which many uses are now founded is the facility with which it dissolves a large class of bodies, and at the same time preserves them from alteration or decay. It dissolves aniline violet better than alcohol or acetic acid, and could be employed in dyeing with this color.

Gum-arabic is soluble in glycerin, and the solution does not readily turn sour or become covered with mold. A somewhat similar action is shown towards albumen which it readily dissolves and keeps from decomposition. In both of these cases the solutions are useful in photography.

Another application in photography is to add a small quantity of glycerin to collodion to prevent too rapid drying. Such collodion is less sensitive, but admits of a longer exposure than the ordinary wet collodion, and is valuable in taking landscape pictures.

An addition of glycerin to paper in the manufacture of wall paper adds to the absorbing property of the surface, and prevents the spreading of the colored patterns, without interfering with the drying qualities of the pigments. When mixed with litharge to a paste, glycerin forms an excellent cement for iron and stone, which becomes very hard and resists the action of most agents.

The much prized madder colors, alizaine and garancine, are soluble in glycerin and can be applied cold. The addition of water does not precipitate the colors, and boiling with alum and cream of tartar fixes them to woolen goods. The glycerin appears to extract the colors, and it is probable that in the case of wood and other dyes it is capable of a similar application.

In the manufacture of paper, when it is desirable to impart greater softness and elasticity, the glycerin can be mixed with the stock in the mill in the proportion of ten pounds of glycerin to two hundred pounds of stock. For copying and taking impressions the paper can also be immersed in a bath of seven parts glue to one part of glycerin.

Perhaps one of the most important applications of glycerin is in the preservation of meat from decay. For this purpose the sweet liquid ought to be thoroughly purified, so as not to impart any flavor to the flesh. As the pure glycerin requires a lower temperature to freeze it than mercury, the vessels containing the meat can be kept in very cold places. The same property of glycerin has been taken advantage of in collections of objects of natural history which are now immersed in it instead of in alcohol. The same preservative property is employed to keep medicines and many chemical compounds from premature dissolution.

Sculptors have found considerable difficulty in keeping their modeling clay moist, and to attain this object must generally have recourse to water. The admixture of glycerin has been found to be of great assistance, as it does not readily evaporate and holds the moisture a long time.

There are some articles of food that require to be kept in moist condition, and this could be accomplished by the use of a small quantity of glycerin. It is also probable that bread could be kept from drying up or molding in the same way. It has long been customary to mix molasses, sugar, and extracts of roots with tobacco, and also to wrap up the packages in tin foil to keep the tobacco moist. Glycerin would serve a better purpose than any of the old substances without imparting any bad flavor to the tobacco.

The wet gas meter is a perpetual source of trouble in the winter on account of the freezing of the water. This is remedied by mixing glycerin with the water, and thus reducing its freezing point to near zero.

As a lubricator for delicate instruments, such as watches, clocks, chronometers, etc., especially if they are likely to be exposed to sudden changes of temperature, there is nothing so good as glycerin. The best oils oxidize and become thick and require constant watching.

In the manufacture of copying ink glycerin has for some time been employed as a substitute for sugar and sirups; it also keeps the ink from molding and decomposition.

A remarkable discovery was recently made that under certain circumstances glycerin could be fermented into alcohol. As the experiment was originally performed chalk and cheese (casein) were mixed with the glycerin at a temperature of 86° to 104° Fah., and left to react upon each other. It would be difficult to explain the reaction that took place, but there was no doubt about the formation of alcohol. A feasible way for making alcohol out of the sweet principle of oil would be an important discovery, and the further investigation of the subject is worthy the attention of chemists.

Mousseline weavers were for a long time compelled to carry on their work in damp cellars and unhealthy, ill-ventilated apartments; this evil is now overcome by the employment of a wash prepared out of dextrine, glycerin, sulphate of alumina, and water, and the workmen can drive their trade in the upper rooms of the house. The use of glycerin in the manufacture of a blasting oil is too well known to require anything more than a passing notice. Nitro-glycerin has become such an important article that to obtain it special works for the manufacture of glycerin would be constructed rather than to dispense with its use.

The difficulty of observing the compass on board of screw steamers is increased by the agitation constantly produced by the machinery, and this has been obviated to a considerable extent by the employment of compasses swimming in a liquid prepared of glycerin and water. A capsule of crystal glass is substituted for the old copper basin, and in this way, as the liquid is transparent, observations can be made at night.

It has been found that leather bands for machinery are much less likely to crack and break if they are soaked for a short time in glycerin after leaving the tanning vats.

Where quicksilver is employed in the manometers of steam engines it is liable to oxidize and clog the tube. This evil is remedied by putting in a few drops of glycerin on the top of the column of mercury and thus preventing the contact of the steam and moisture with the metal. Glycerin is now employed as a substitute for oil and fat in extracting delicate perfumes from leaves and flowers, and in the preparation of perfumery and cosmetics as well as for hair oils.

Glycerin soap is an article that within a few years has been introduced into market in a liquid and solid form. The liquid soap is prepared by heating 100 parts oleic acid, and 314 parts by weight of glycerin (sp. gr. 1·12) to 106° Fah., and adding 56 parts concentrated potash lye (sp. gr. 1·34) under constant stirring. This is an admirable soap for chapped hands and for cutaneous diseases and flesh wounds. The cost of the materials must prevent a large consumption of this article.

The addition of glycerin to glue has been highly recommended to prevent brittleness, and where gelatin is employed in the manufacture of artificial ivory, parchment paper, book-binders' stock, and the like. A paste composed of starch, glycerin, and gypsum retains its plasticity and adhesiveness, and can be recommended for luting chemical apparatus and in making plasters for pharmaceutical purposes. India-rubber for removing pencil marks is improved by the addition of glycerin-glue.

Wood impregnated or washed with glycerin does not warp and dry up, and advantage is taken of this fact to keep butter tubs, water pails, barrels, and tanks from shrinking and leaking. Wood work exposed to the sun or heat of summer can be greatly benefited by occasional coats of glycerin. Molds in which plaster casts are taken are now moistened with glycerin. A mixture of glycerin and a few drops of ammonia is used as a valuable remedy in the case of bites of venomous insects, and in medicine generally the employment of glycerin has become very extensive.

We have thus enumerated the chief applications of glycerin, enough to show that it has become one of our most valuable articles of manufacture. We are not in possession of the exact statistics, but from the rate of consumption it is easy to infer that the amount annually made must be very large, and it is probable as its properties become more generally known that the demand for it will go on increasing to meet the new applications that will be discovered for it. There are few articles of chemical manufacture of more value than glycerin.

THE GOVERNMENT STORM SIGNALS.

Some two or more years since we urged the importance of the establishment of a series of storm signals to warn people at a distance of the approach of storms; the information to be conveyed by telegraph to prominent points, and distributed to the surrounding country by means of artillery discharges, striking of church bells, or other means not difficult to devise.

We do not claim to have originated this idea, and have now forgotten who made the suggestion. We saw, however, that it was a good one, and accordingly advocated it.

Our readers have probably most of them been apprised through the dailies that the Government is about to establish a storm signal service.

The corps of observers will be composed of non-commissioned officers in the army, under the direction of the chief of the signal corps, and its duty will be the observation and reporting of storms by telegraph and signals, to prevent loss to commerce upon the great lakes and the seaboard.

So far as this goes it is well, but we hope to see the system extended so as to take in the agricultural districts, at least through the season of harvest. Great loss is often sustained through damage to crops which the farmer is forced to leave out through long storms of rain when, if duly informed of the approach of such storms, he might easily provide against them.

This system of observation will, however, subserve other important ends besides the saving of life and property on the sea and lakes, and the protection of crops. It will give immense aid in the solution of many important meteorological problems of the highest interest. If the system should be sufficiently extended, the observations may throw great light upon the extent, rate of progress, change of intensity during the progress of storms, and many other interesting matters connected with the theory of storm generation and subsidence.

A similar system has been employed in Europe with great success in warning mariners of danger. In England, especially, it is said these warnings are now so systematically distributed that a very marked decrease of damage has resulted to the marine interests.

Thus the electric telegraph adds to the benefits it has already conferred upon mankind, by giving him notice of approaching dangers in the elements, and enabling him to prepare in good time to avoid them.

The fact that the great storms which nearly always come from some point in the west, in this zone, originate in the great plain lying east of the Rocky Mountains has already been quite definitely settled by meteorologists. Traveling at the most rapid rate yet observed they would be two or more days in reaching the Atlantic coast, while the wires can send the information almost instantly. It needs no argument to convince all intelligent minds that this storm-signal service may be one of the most useful established by the Government, provided the appointments be judiciously made, and the duties of the observers be conscientiously executed.

MECHANICAL DRAWING.

We have lately had quite a number of inquiries from young mechanics relative to mechanical drawing, asking whether it can be learned from books without a living teacher, and if so what books are to be recommended.

In the first place we will say in answer to such inquiries that drawing requires considerable practice on the part of any who would excel in rapidity and delicacy of execution. To those who are willing to give time to it mechanical drawing offers no serious difficulties. Its principles are easily understood and applied from books without a living teacher, and many a young man, the writer among the number, has succeeded in this way sufficiently to execute creditably any work of this kind ordinarily met with in machine shops.

The best text-books are "Appleton's Cyclopedia of Drawing" and Johnson's "Practical Draftsman's Book of Industrial Design." These works, of which the latter is the most complete, are, however, expensive, and may seem beyond the reach of many young mechanics. Those, however, who cannot save out of the money they spend for unnecessary things and amusements enough to buy such a work, would hardly be benefited by it if they had it.

The necessary instruments and materials will also cost something. These ought to be good ones, as in mec anical drawing no fine work can be done with poor tools. It will cost for a good outfit, including instruments, about fifty dollars. The whole of this money, however, need not be at once expended. For some months all the instruments and materials needed will be a dividers, a protractor, pen and pencil compasses, one of medium size and one small, a bow pen, some pencils, a T-square triangle, ruler drawing board, a triangular boxwood scale, a cake of fine india-ink and a saucer in which to prepare it, and some sheets of buff drawing paper, such as is commonly used in shops for working drawings.

It is best to buy these instruments singly and add to the kit when others are needed. Many of the instruments put up in fancy cases and sold at the bookstores are such as no expert draftsman would tolerate. If possible in the selection of these instruments the advice of an expert should be obtained, but if this is not practicable the treatises above named give directions which, read carefully, will not permit the purchaser to go far astray.

Our young would-be draftsmen are thus confronted with two sacrifices, one of time, and the other of money, but these sacrifices must be made if they would make such progress as is possible to any young man of ordinary intelligence and rather more than the ordinary share of perseverance. If they will make these sacrifices, however, they may rest fully assured that the superior skill they will acquire in the actual performance of work at the planer, lathe, bench, or vise, the increased chance of advancement to places of responsibility, the increased knowledge attained in all departments of mechanical engineering, the high satisfaction derived from the power of expressing one's ideas in this way on paper, and the greater facility with which mechanical problems, either in new or old fields, can be worked out, will repay them a hundred fold for all the time and money expended.

We would be glad to recommend cheaper books than the ones we have named, but we know of none cheaper that will meet the requirements of the draftsman as a book of reference, or which give a sufficient variety of exercises and directions to guide the student to high excellence in this delightful art.

FEMALE INVENTIVE TALENT.

The question of what women can do and what they cannot do well, is one which has been much debated of late, and it is safe to say that facts and arguments laid before the public in the course of the discussion have done much to shake the belief, once so universal, that women are adapted to do nothing well but the domestic duties of the household.

The characteristics of women in their most perfect, and, to men, most attractive development, tend more and more from the rude, coarse types of women as found in savage life, and in the lowest class of civilized races. Among these characteristics gentleness, both in disposition and manner, is a thing indispensable to a refined masculine taste. Any occupation which is likely to decrease this feminine quality, will be repugnant to men in general.

One shrinks in disgust at the idea of female soldiers and coal heavers, and the average American farmer feels indisposed to see his wife and daughters at work in the harvest field, as was common in days of yore. We do not like to think of women in connection with dirt and the sweat of physical toil, and the desire if not the tendency of modern civilization has been to remove women as far as possible from all that is coarse, from all that gives hard, stern outlines to body or mind, and to cultivate in her a delicacy of form and feeling corresponding to the masculine ideal. It is true that the cultivation of delicacy in woman has been so injudiciously directed as in many cases to engender debility and disease. A certain amount of physical labor is as necessary to the health of women as of men; and the neglect of proper exercise, and errors in diet and dress, are chargeable with having weakened the physical constitution of women to a degree far beyond the limits of that refinement which men demand in the ideal woman.

Men also shrink from seeing women in positions and occupations which in their nature call for the exercise of courage, intrepidity, the faculty of combativeness, or the exercise of keen satire, as at the bar or in the forum. Such occupations call into active play a great variety of qualities, which are summed up in the meaning of the slang word "cheek," and which engrave lines of character on the faces of women, and develop peculiarities of mind and manner, which are little ad mired by most men.

But there is a great variety of occupations which women have begun to claim as fields for individual effort from which no intelligent, refined man, who views things as they really are, would seek to exclude them. These occupations in no way injuriously affect the qualities admired by the other sex They may and ought to be made as remunerative to women as to men now engaged in them; and their effect upon men is to cultivate effeminacy rather than that superb masculinity, which should be the pride of man as it is the admiration of woman.

Then there is a middle ground on which they both may meet, and work with equal benefit, so far as the cultivation of those qualities which each admire in the other is concerned. This middle ground comprises all the finer creative or imitative arts which call into play the faculties of constructiveness and ideality, and give scope to the imagination. Among the creative arts must be classed mechanical invention; and it may not prove uninteresting, as bearing upon the question of woman's natural capacity, to give the results of our experience of woman as an inventor.

In our practice as patent solicitors we have frequently been called upon to prepare applications for female inventors, and to correspond with them in relation to various inventions; and we can say to those who are unbelievers in regard to the power of women to achieve, as a class, anything higher than a pound-cake or a piece of embroidery, that the inventions made by women, and for which they solicit patents through our agency, are generally found to be in their practical character, and in their adaptation and selection of means to effect a definite purpose, fully equal to the same number of inventions selected at random from among those made by men.

Only last week we illustrated an improvement in sewing machine needles, and the method of securing them in the needle arm, invented by a woman, which certainly would not do discredit to the most experienced and ingenious male inventor.

This is no isolated case. Every now and then a woman comes into our office and modestly prefers her claims, evidently shrinking from the idea that she will be thought stepping out of her sphere, but, believing fully in the merits of her invention, desiring to secure some pecuniary benefit by patenting it.

Our experience teaches us that women have as much natural inventive talent as men, and that the circumstances under which most of them pass their lives only prevent an equal manifestation of this talent on their part.

AMERICAN MAGAZINE LITERATURE.

The list of American Magazines is constantly increasing and this kind of literature has become an immense force in molding public opinion and morals. The demand for it increases with every month, and, though many periodicals are born to a brief existence, there are quite a number which give evidence of permanent vitality. Among these are some which have already been established for years, yet which are fully rivalled both in merits and defects by far younger competitors.

Without pausing to discuss the peculiarities of each, it may not be amiss to consider briefly such characteristics as are common to most of them, and to inquire what is likely to be their influence upon the minds, morals, and tastes of their readers in the future.

A most prominent feature of American magazines as a class, is the prominence given to fiction. We do not object to fiction, provided it is good of its kind. In the hands of its masters it has done and is still doing much good. It may be made the vehicle of instruction. It may cultivate taste and the finer emotions of the human heart, which in this utilitarian, practical age need a good deal of cultivation to keep us from degenerating into cold and selfish disregard of the miseries and troubles of others. It may teach us human nature, and open our eyes to the follies and inconsistencies of our social system. It may bring our minds and hearts into immediate contact with the pure and the beautiful, teaching us to love all that is true and lovely, and stimulating in us a wholesome disgust for all that is coarse, vicious, unlovely, and degrading.

In the hands of its masters, fiction does all this, but, unfortunately, all are not masters of fiction who write the stories for our magazines. We much doubt whether such short stories as those which make up the main stock of fiction mostly relied upon by publishers, could be made, even in the hands of masters, to reach the true end for which all fiction should be written and read. At best, they can serve only the same purpose as the imperfect sketches of the painter, useful, perhaps, as minor studies, and so useful only when produced by a master hand.

One looks, however, vainly to gather many such gems from the American novelettes of the period. Most of them deal in sickly sentiment, painting it in false, and, at times, even prurient colors. Even the attempt to delineate the higher phases of human thought and feeling often ends in what, to the critical observer, must appear as a miserable caricature of true nobility in mind and heart. As for instruction in anything that the readers of such stories need to be taught, they are lamentably deficient. We can, therefore—judging of American magazine fiction as a whole, and not from the exceptions occasionally found in the serial novels, and rarely in the novelettes—come to no other conclusion, than that it fails utterly of all the true purposes of fiction.

The department of essays is much better sustained. Topics of the highest moment to the race, and to the future prosperity of the nation are discussed with much boldness, and often with great ability. It is getting to be understood that if the thinking minds wish to reach the intellect and command the attention of the masses, false delicacy and fear to discuss social problems with plainness of speech must be discarded. The world has discovered that the principal obstacle to social progress has been too great reverence for things which have only custom to recommend them, and is now calling science to its aid to correct the evils which have thus grown to such dimensions as to threaten all good. Perhaps there is danger that, in the loss of reverence for such things as have no basis but custom and superstition, things essentially good may be underrated. Men seldom pass from one extreme without oscillating by the mean toward the opposite extreme; but we have hope that in all the struggle now going on to adjust human affairs upon a sounder and more rational basis, that the mean will at last be struck and rested upon.

In this struggle American magazine literature is taking a prominent place, though many of its essays upon social topics give little evidence of that cool and dispassionate thought which is the only way of arriving at truth. Many also show a sectional bias, and are flavored with prejudices, of early education and local circumstances. But with all these drawbacks, nothing but good can come of the fact that the public is brought to face squarely questions which it has for a long time shirked, and the settlement of which cannot be postponed more than one or two generations.

The labor question will, we predict, never be again allowed to rest until both labor and capital meet upon some common plane, satisfactory to employers and employed. There may be disasters to both, hard words, and even blows, before this desirable result shall be reached; but the world is too thoroughly aroused to the importance of a permanent settlement of this question to let it drop again without a final conclusion. What will be the basis of settlement it is impossible yet to predict, but that it will, when reached, distinctly define the rights of capital and labor, and recognize these rights as, in many respects, mutual and common, instead of antagonistic, we fully believe.

The social evil, with its long train of disease and misery, is also now to be in some way settled. The future of civilization demands that, on this subject, all lovers of mankind, should shirk neither thought nor utterance through regard to a foolish and false delicacy, which has hitherto prevented the general knowledge and appreciation of the magnitude of this disease of society. We are learning, and the magazines are helping us to learn that boldness of speech, is not begotten of impure thought, but that prurience begets shame-facedness.

We see, then, that the magazine literature of this country has two prominent features, the one essentially weak, the other essentially strong. The first is like the operatic music in our churches, performed to attract the unconverted and to fill the contribution boxes. Publishers cannot afford to risk success by filling their pages with essays alone, but we think they might afford to pay something more, and secure a better class of fiction, if fiction must be had to keep up the extent of their circulation.

THE FRANCO-PRUSSIAN WAR.

The war which for seven weeks has been waged between France and Prussia with such terrible destruction of life and property is virtually ended by one of the most brilliant and, on the part of the Prussians, the most successful campaigns of modern history. The French, though fighting with indescribable bravery and desperation, have not succeeded in making the least headway against their stern antagonists, and have not won a single victory worthy the name. Recent events, culminating in the surrender of McMahon's army and the capture of Napoleon, practically terminate the contest. It is impossible that the French nation can much longer hold out against superior skill and numbers. Shorn of its military *prestige*, it must now be content to rank for a long time as one of the inferior powers among the nations of Europe.

The war was worse than a blunder; it was a crime against civilization. The French inaugurated it, and civilization now rejoices at the just punishment they have received. To-day William of Prussia stands at the head of a victorious army with his territory unmolested, and all avocations of peace progressing as usual within its borders. France to-day not only weeps over thousands of brave hearts which have bitten the dust, but finds herself without a ruler, threatened with revolution and anarchy, with cities destroyed and fair fields ravaged, with commerce and manufactures almost suspended, and with an enormous increase of the public debt.

Why has Prussia won victory and France suffered defeat? Because the former had justice in her cause, superior numbers of the best soldiers in the world, armed with the best weapons ever yet supplied to so large an army, with superior generals in command, a complete commissariat, and one great head, Von Moltke, to direct. Her soldiers are intelligent, educated men, thoroughly drilled, and animated by a martial and patriotic spirit, which renders them probably the most reliable in action of any that ever advanced to meet a foe.

The French soldier is comparatively ignorant, and admitted by able French military authority—Trochu—to be impatient of discipline, and, although brave, more or less unmanageable in action. The over-cautious interference of Napoleon has embarrassed the generals of the French army; and the inefficiency of their commissariat, has been greatly aggravated by a succession of defeats which are not paralleled in modern times.

The Prussian soldier has the moral courage that comes through good education, as well as physical strength and courage, and the world is beginning to see, that, with the improved arms employed in modern warfare, something more than animal strength and courage is necessary to make good fighters.

The facts seem almost incredible. On the 15th of July—supported by his Government—the Emperor of France declared war against Prussia. On the 2d of August the first gun was fired by the French at Saarbruck, thence followed in rapid succession the sanguinary battles of Wörth, Haguenau, Gravelotte, Beaumont, and Sedan. On the 2d of September, the French armies had either surrendered or were closely besieged in their fortified places. The Emperor gave up his sword to his royal antagonist, King William, and became a prisoner. The Empire fell, a republic was speedily proclaimed; and France is humiliated in the eyes of all nations.

THE Family Knitting machine, manufactured at New Haven, Conn., is said to be an excellent thing. We hear good reports respecting it.

A WOMAN locksmith, near Canal street, in this city, is said to do her work as well as a man.

THE SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE.

The programme of this school for the college year beginning September 14, 1870, has recently been issued, and it is a much more interesting document than such announcements are apt to be. While it sets forth the peculiar advantages of the school, it also exhibits an example to the professors and directors of similar institutions that could be copied with advantage. The study of science has been attended with great unpopularity among men of letters for the reason that no provision was made in a majority of our schools for a systematic education. Classically educated men complained that the graduates of schools of science did not receive proper training in the use of language, and as a rule were not good writers. It is the aim of the Yale School to do away with all these objections, and to provide as good mental discipline as can be obtained in college. The Sheffield School is in fact a college, just as much as the acdemical department.

It has its separate corps of professors, although under the same board of trustees. We quote the language of the circular:

"While scientific and technical studies are made predominant, all candidates for the Bachelor's degree (of science) are also required to pay attention to linguistic studies; some knowledge of Latin being required for admission, and the study of German, French, and English being continued through the course. In other words, the school aims to make good scholars by modern methods for modern vocations."

The Yale School is a college for modern times, and by adhering to the programme above explained, the professors will relieve it entirely of unfavorable criticism.

The number of instructors in the Sheffield school is 23, a majority of whom are men of the highest rank in science and letters. We need only mention such names as Whitney, Brush, Johnson, Lyman, Trowbridge, Brewer, Gilman, Verrill, Marsh, Norton, and Lounsbury, to convince everybody that studying at the Yale School means earnest work, while the reputation of these men conveys the assurance of a thorough education.

In the combinations of the different classes, students are received who desire to qualify themselves for professions and occupations.

HARVARD SCHOOL OF DENTISTRY.

In addition to the regular Collegiate schools and those for Law, Theology, Medicine, Chemistry, Engineering, and other professions, the faculty of Harvard University, Cambridge, Mass., has established a Dental School, where those of the Harvard students who desire it, may attain thorough education in the science and practice of dentistry.

This school offers superior advantages, in that, while the instruction is no less thorough in those departments peculiar to dentistry, it gives the student unusual facilities for instruction in anatomy and physiology, surgery and chemistry, as the dental student pursues the same course in these branches as is required of the medical student, and, in common with him, has free access to the hospitals of the city, to the dissecting-rooms, and to the library and museum of the Medical College; and also to all the courses of the University lectures. These are special courses, delivered by men eminent in their departments; and they embrace a wide range of medical and collateral branches.

It is the object of the faculty to present a thorough course of instruction in the theory and practice of dentistry. For this purpose, a well-appointed laboratory and an infirmary are needed, and such arrangements as will insure a large number of patients.

The professors teach at clinics; and, under the direction of demonstrators, patients are assigned to the students, who thus have an opportunity of operating at the chair, and by actual practice become familiar with all operations demanded of the dental practitioner.

The infirmary which has been established in connection with the Massachusetts General Hospital remains open throughout the year, and offers to students unsurpassed facilities for acquiring practical knowledge and dexterity. During a period of sixteen months, the students attended to nearly *three thousand* patients, under the supervision of the faculty, whereby the patients were greatly benefited, and the students largely profited.

Dr. N. C. Keep, is the Dean of the Faculty, and may be addressed at No. 74 Boylston street, Boston, Mass.

The need of such institutions as the Dental School of Harvard, is greatly felt in this city. We have a few first rate honest and conscientious practitioners; but the number of dental quacks and mountebanks is quite large. There is always plenty of room here for good, intelligent, educated dentists, and they may be sure of liberal support. First class dentists, and some quacks who pass themselves off as such, earn from $25 to $200 a day in New York.

SCIENTIFIC INTELLIGENCE.

FIXING COLORS WITH SILICA.

Our some time correspondent, Dr. M. Reimann, describes in *Dingler's Journal* a series of experiments undertaken with the view to apply amorphous silica for absorbing coloring matter, such as fuchsine, aniline blue, and to use the dry powder thus prepared as a pigment, very much as smalt or ground cobalt glass has long been employed. The silica is prepared by precipitating a solution of water-glass (soluble quartz) with an acid, collecting, washing, and drying in the ordinary way. He states that glass can be stained by first etching its surface with hydrofluoric acid, then mordanting it in the same way as is done with cotton goods, and plunging it in a dye. The amorphous silica of the etched glass fixes the colors in the same manner as the loose powder. It is evident that this method opens up a way for the manufacture of pigments suited to wall paper, also for painting on wood. The silicified colors would also act as a protection to wood and cotton fabrics and render them uninflammable. The author does not state whether soluble glass if precipitated from colored solutions would produce lakes in the same way as alum solutions, from which we infer that it is not feasible, as this method would be more convenient for the manufacture of silica pigments then the one he proposes. This new process adds a further use for soluble glass, a notice of which valuable article we gave on page 104 of the current volume.

PURE HYDROFLUORIC ACID.

It is not an easy thing to prepare pure hydrofluoric acid. Here is what G. Gore says on the subject: Pass sulphureted hydrogen gas through the commercial article; neutralize sulphuric and other acids with carbonate of potash, decant, remove excess of sulphureted hydrogen gas with carbonate of silver, filter, distill from lead retorts with platinum condensers, and, if necessary, re-distill. The acid is then nearly chemically pure, and would have to be kept in platinum vessels. It can be diluted with distilled water to any extent, and is rarely required in a highly concentrated form. Of late years the use of the acid has been superseded by the employment of fluorides in etching and for other purposes.

SEPARATION OF SALTPETER AND NITRATE OF SODA.

The two nitrates of potash and soda are sometimes found mixed together, and it is desirable to have a convenient method for their separation; this is accomplished, according to Schultz, by taking advantage of the difference in the solubilities of the two salts in nitric acid. One part of saltpeter requires 1·4 parts nitric acid to accomplish its solution, while the Chili nitrate of soda takes 66 parts of nitric acid to dissolve it. The solubility of the soda salt does not appear to be materially modified by the presence of a larger or smaller quantity of saltpeter, nor is its solution much affected by temperature. In a small way, and for commercial tests, this method is said to work very well.

The Relative Merits of Bronze Steel and Iron for Field Artillery.

A correspondent of *Engineering* gives his views upon this subject through the medium of that journal, from which we condense the following:

Mere strength of material is not the only quality necessary in a metal to make a good cannon. Wrought iron is very much dearer, although very little stronger than cast iron, and yet cast-iron guns are being discarded, and built-up wrought-iron guns are being made instead. Steel is more than twice as strong (weight for weight) as wrought iron; nevertheless guns are not made of steel, because it has not been found suitable except as a mere lining.

As to bronze and its liability to burst, is there any use in shutting our eyes to actual experiments? Now the Prussians have made experiments as to the bursting of bronze guns; and the result of these experiments is to prove satisfactorily that if you have 1,000 guns of bronze of the ordinary weight and pattern, not one of them will ever burst. Here is what the Prussians did: "They turned down the gun of 6 cwt. (which throws a 9 lb. projectile), a small quantity at a time, until it weighed only 2 cwt., the thickness at the breech being reduced from 2·4 to 0·8 in., and at the muzzle from 1 to ½ in. With this gun they made (step by step as they reduced its thickness) a series of experiments, firing a 9 lb. shell with a charge of rather more than 1 lb. of powder. When this gun was reduced to less than ½ in., small cracks were observed through which powder gas escaped; nevertheless the gun was still fired with safety."

Facts are stubborn things. Here was this weak metal bronze, turned down to a thickness of only ½ in. (far below what is absolutely necessary for another purpose that has nothing to do with strength, and which I will allude to further on), and yet it still fires a 9 lb. shot with a 1 lb. charge of powder, and does not burst. And not only that, but it actually gives (by incipient cracks), warning to the men that the minimum limit has been reached, and that prudence bids them cease firing.

And now one word as to weight. It is a sort of axiom that a gun ought to weight about 100 times as much as the projectile which it throws, and the gun and carriage together should weigh about 200 times the projectile, so as not to have too violent a recoil. But the lighter we can make the carriage, with due regard to strength, and the heavier the gun, the smaller will be the damage done by the recoil. Now, if a field gun has to throw a 9 lb. shot, it ought to weigh (exclusive of the carriage), about 900 lbs., and that weight is so great that a bronze gun, properly proportioned, will never burst. It is plainly, then, no object whatever to find for field artillery a material which is stronger than bronze in proportion to its weight. No doubt a bronze rifle to be fired from a man's shoulder, would strike most men as a little out of date; but the reason why is very plain. The rifle has to be carried long distances by a man (often a very little one), and to be held by him in a horizontal position when fired. Weight, therefore, is a serious matter. Yet, even here you will find the weight considerable in proportion to the projectile. A Snider rifle weighs 9 lb. 4 oz., or 64,750 grains, and it fires a bullet weighing 480 grains; so that the rifle is about 135 times the weight of its projectile. What wonder, then, that military men get rifles made of the lightest material consistent with strength and efficiency. I think I have said enough to show that bronze being a metal of only 17 tons strength to the square inch, is not, therefore, unsuited for use in field artillery. This being so, there are very good reasons for preferring it either to iron or steel; and the chief reason is the slowness with which it oxidizes. When the film of oxidation on bronze once forms to a trifling depth, it goes no further. Of this there is ample proof in bronze statues exposed to all weathers, and which, although centuries old, are still sound and perfect. But with iron and steel this is not so; for when once rust has set in, that rust continues to eat away at the metal until the whole is destroyed. We have often heard of honey-combed iron guns, but who ever heard of honey-combed bronze guns?

The patent laws are still in being, and if Sir Joseph Whitworth has a secret worth a penny, what a fool he is not to patent it, instead of running the risk of having his secret betrayed by some of his workmen. But Sir Joseph is a very wide-awake gentlemen; and as he does not patent it, the simple conclusion to be drawn is that he has no secret worth a patent fee, and his so called "yellow metal," like his proposed 35-ton gun, is a dream of the future.

Sir William Armstrong is not a military man, and yet the whole artillery of England has been revolutionized by him, under the auspices of "Government," and now it seems *we are retracing our steps* a little. His breech-loading system has long since been given up for heavy guns, and even for small guns it is now getting out of favor; so that in a few years in all probability the only trace of him will be found in the coil system for building up heavy guns, because we are quietly coming back again to bronze muzzle-loaders for field pieces.

As his great rival, Sir William, goes down, Sir Joseph Whitworth seems to think his opportunity is near, and so he is making great efforts just now in the hope of working a fresh revolution in English artillery, with much benefit no doubt to his own pocket, but with much detriment to poor John Bull, who pays the piper.

We may rest awhile on this Indian bronze field gun, which, although a muzzle-loader, can be fired 50 times in 7 minutes, or rather more than 7 shots per minute, or one shot in 8½ seconds! And considering that when firing case shot it scatters 108 bullets each shot, or 756 bullets per minute, it would not be a pleasant customer for either cavalry or infantry to charge up to. And seeing that a long range, say 2,665 yards, or 1½ miles, it will land a shrapnell shell (containing 63 bullets), somewhere within a strip 37 yards long and only 1½ *yards wide*, it is not a pleasant customer to have in front of you, even as a distance of one mile and a half. And seeing, too, that this is done without the aid of either Sir William Armstrong or Sir Joseph Whitworth, or of any of their inventions, our artillery officers or our Woolwich artificers, by whom this gun has been made, are not to be sneezed at.

The National Taxes.

The following statement of the provisions of the law of July 14th, in regard to sources of revenue, is compiled from official sources, and should be kept for reference:

Special taxes, including those on bankers, will cease May 1, 1871, excepting those connected with fermented liquors, spirits, and tobacco.

Taxes on gross receipts will cease October 1. 1870.

Taxes on sales will cease October 1, 1870, except those on sales of tobacco, spirits, wines, and those paid by stamps.

Taxes on income, including salaries, will be 2½ per cent on incomes over $2,000, instead of 5 per cent on incomes over $1,000.

Taxes on legacies will cease October 1, 1870.

Taxes on passports will cease October 1, 1870.

The use of stamps will cease October 1, 1870, for promissory notes for less than $100, for receipts, and for canned and preserved fish.

The receipts from these sources in the fiscal year 1870 were estimated at $83,016 000. The reductions have been officially estimated at at $55,000,000.

Fat People.---What Dr. Hall, in his Journal says of them.

Not long ago, a gentleman of threescore, who had scarcely ever been sick in his life, thought he was too fleshy, and began to Bantamize. He succeeded famously, and boasted to his friends that he had got rid of ten pounds in a few weeks. A little later he was attacked with a painful and dangerous malady, from which he has been suffering more than a year.

If a man can sleep soundly, has a good appetite, with no unpleasant reminders after meals, the bodily habits being regular every day, he had better let himself alone whether he is as big as a hogshead or as thin and dry as a fence rail.

Several cases of Bright's disease have been reported by medical men of reputation as a direct result of practicing Bantam's plan for getting lean. The very best and safest way to get rid of fat is to work it off; this may be aided by eating food which contains a large amount of nitrogen and a small amount of carbon. Nitrogenous food is that which gives strength power to work, as lean meats; carbonaceous foods are those which make fat, such as cheese, potatoes rice, corn, peas, beans, tapioca, arrow root, corn starch, milk, sugar, sirup, and all oily and fat food. Raw fruits and berries largely eaten are great aids to reducing weight. But after all, the great reliance should be on exercise and work in the open air. Barclay, the great English pedestrian, who performed greater feats than Weston, lost ten pounds in two or three days' walking, and was never the worse for it.

PLATINUM IN LAPLAND.—It appears that gold having been found some years ago in the neighborhood of the Ivalo river (Northerly Sweden), a more recent search there has given rise to the discovery also of some platinum, which, has also recently been found near Ibbenbühren, Westphalia.

The Storm Signal Service.

Under the direction of General Myers arrangements are rapidly being perfected for the commencement of operations by the storm signal corps, in every section of the country in which posts are to be established, for the purpose of noting the progress and direction of storms, and signaling the fact to distant points for the information of agricultural communities, and for other purposes. The greater number of the appointments of civilians to positions in the corps has already been made, and much care has been exercised in the selection of persons competent, both physically and mentally, to perform the somewhat onerous duties of the service. Quite a number of military officers, stationed with troops at posts in the West and North, have voluntarily put themselves under instruction in the prescribed duties, and will be a valuable addition to the regular force authorized by Congress, inasmuch as observations can be taken at a greater number of places. Four civilian appointees, who have become familiarized with the duties, have already been assigned to positions along the valley of the Upper Potomac in Maryland and Virginia. Several scientific institutions offer their hearty cooperation, and when the telegraphic arrangements are completed, and the entire force on duty, the beneficial effects of a practical operation of the system will be evident.

A Sad Disaster---Death of Capt. Cowper P. Coles.

News comes by telegraph across the water that the British iron-plated steamer *Captain* recently foundered off the coast of France. All on board, five hundred in number, perished. Among those who went down with the ill-fated steamer was Capt. Cowper Phipps Coles, of the Royal Navy. He was born in 1819, entered the navy in 1831, and rose rapidly in the service, displaying on various occasions a coolness and daring which surprised his superiors in years and experience. A plan devised by him for the construction of shot-proof rafts, guns, and mortars was subjected to an examination by a board appointed by the Commander-in-chief in 1855, and their report was so favorable that he was ordered to England, that his knowledge might be of use at the dock-yards of Portsmouth. The idea of protecting guns by shields was originated by him in 1855, and improved upon in 1859. In 1862 he adopted the turret system in the *Royal Sovereign* and other vessels in the British navy. His plans have been very extensively adopted in iron-clad vessels, and further improvements in naval engineering might well have been expected of him if his career had not been cut short by this terrible disaster.

Fair of the Maryland Institute.

The twenty-third annual exhibition of American Manufactures and Mechanic Arts, under the auspices of the Maryland Institute, will be held in the spacious hall of the Institute in Baltimore, commencing September 26, 1870, and continuing to Tuesday, October 25.

The fairs held by this Institute are among the most important and best managed of those held in this country.

FAIR OF THE AMERICAN INSTITUTE.—According to an nouncement this fair opened at the Empire Skating Rink in this city on the 7th inst. Considerable confusion yet prevails, and everything is in such disorder that it is impossible to notice the articles on exhibition as yet. In our next issue we shall probably be able to say something as to the merits of this exhibition.

AUGUSTA COUNTY (VA.) FAIR.—The third annual exhibition of the Augusta County (Va.) Fair Association will be held on the Fair Grounds, Staunton, Va., October 18th, 19th and 20th, 1870. The exhibition is open to all competitors, and a large list of premiums is offered. All sorts of agricultural implements and machinery, as well as miscellaneous machinery will be admitted. Mr. Jed Hotchkiss is the secretary and treasurer.

FAIR OF THE HARRISON COUNTY (TEXAS) AGRICULTURAL AND MECHANICAL ASSOCIATION.—The First Annual Fair of this association will be held in Marshall, Texas, commencing Monday, November 7, 1870, and will continue six days. The secretary is W. W. Heartsill.

MISSISSIPPI STATE FAIR.—The Second Annual Fair of the Mississippi State Fair Association will be held at Jackson, Monday, October 24th, to Saturday, October 29th, 1870, inclusive. Copies of the premium list will be mailed to any address on application to J. L. Power, Secretary, Jackson, Mississippi.

A TELEGRPHIC CHALLENGE.—The manager of the National Telegraph Company, using Little's telegraph instruments, having claimed that that system is much more expeditious than the Morse or other methods now in use, the President of the Western Union Telegraph Company has offered a challenge for a competitive trial of speed. Each party is to put up $1,000 stakes, and to use one wire. The same message to be sent by both parties, and to contain not less than two thousand words, which would be equal to two columns of the SCIENTIFIC AMERICAN. The Western Union to employ only two operators, one at each end of the wire. The National to be allowed six operators, three at each end. The challenge has not yet been accepted.

A MONUMENT to Kepler has been erected at Weildiestadt, in Suabia. It is a statue standing on a base adorned with bas-reliefs. In the astronomer's left hand is a parchment, on which an ellipse is drawn, and in his right is a pair of compasses. The bas-reliefs represent scenes from Kepler's life. The monument is the work of a sculptor of Nuremberg, named Kreling.

Facts for the Ladies.

I purchased a Wheeler & Wilson's Sewing Machine eight years ago, and it has been in constant use ever since, making the heaviest cloaks, besides doing my family sewing. I used one needle fifteen months without even removing it from the machine, and made, in the meantime, eighty cloaks, besides doing other sewing. I have used other machines, but consider yours the best. MRS. P. GORDON.

Cedar Rapids, Iowa.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,214.—WOOD PAVEMENT.—W. W. Ballard, Elmira, New York. August 9, 1870.

2,228.—PUMPS.—G. C. Bishop, Montreal, Canada. August 11, 1870.

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.

C. D. C., of Mo.—The amount of diametric contraction before rupture takes place in bars exposed to tension has been found to vary greatly with the rapidity of application of the stress. The amount of elongation also so varies, both being greater when the stress is applied gradually than when it is applied suddenly. The amount of bending in transverse rupture also varies in the same way. The breaking load in good iron is often nearly the same as for steel if they have been worked by a similar method. The word steel now comprises various metals containing different ingredients in various proportions. We should like to have some one invent a good definition for the word steel; we know of none that exactly answers the purpose in the present state of metallurgic science. Any alloy of iron or combination of it with carbon, silica, boron, chromium, etc., is now called steel, and without further definition it is impossible to determine which is meant by steel.

H. A. W., of N. C.—We know of nothing that equals in convenience of application with efficiency the asphaltum of the gas works as a protection to iron from the oxidizing action of water. Two or three coats applied hot and allowed to become perfectly hard will keep iron from rusting a long time. Of course neither this nor any other similar substance can be used on a surface exposed to wear without soon exposing the metal surface. When properly applied it will not give taste or smell to water except for a short time.

D. M. P., of Cal.—The expansion of homogeneous solids by heat is for the most part proportionately the same in their various dimensions. There are, however, exceptions. Wood expands more in the breadth of its fibers than in length. Lead permanently changes its form by heating and cooling, and it is probable that there are other metals which do the same thing in a very small degree. It has been asserted that iron has manifested this peculiarity under certain conditions.

G. R. S., of Me.—Rodman's perforated cake powder was made in solid cakes, the cakes being subjected to a pressure equal to what they would be subjected to in the gun, and also being perforated with holes to permit access of flame. The object of this was to make the powder burn slowly, so that heavy projectiles might attain their maximum initial velocity gradually, and thus subject the gun to less strain than when quicker burning powder is used.

D. R. T., of Cal.—Your device for mixing mortar is not patentable. You will find almost an exact description of it, with engraving, in Gilmore's treatise on Limes, Mortars, and Cements. It was invented by M. Greyveldinger, and used by him in Paris on public works. The materials were fed into a hopper and passed through a horizontal cylinder in which revolves a long series of screw blades which delivered the mixed mortar into buckets or tubs at the end.

T. B., of N. J.—No definite advice can be given you in respect to the state of your boiler except through the personal examination of an expert. There are plenty of men in your city who can and will give you advice on application. It is quite evident you know too little of boilers to rely upon your own judgment. Get a practical man of experience to look at it.

L. M., of N. J.—The following recipe for blacking for harness is highly recommended: Treacle, ½ lb.; lamp black, 1 oz.; yeast, 1 spoonful; sugar candy, olive oil, gum tragacanth, and isinglass, each 1 oz., and one ox gall. Mix with two pints of stale beer, and let it stand before the fire for an hour.

D. R., of La.—You can make a useful tracing paper of larger size than you can purchase by brushing over one side of good thin unsized paper a varnish made of equal parts of Canada balsam and turpentine. If required to take water color it must be washed over with ox-gall and dried before being used.

L. G., of Fla.—You can keep ink made from the bark of the witch hazel, or from any other vegetable substance, from molding by putting into it creosote or carbolic acid. Only enough to give a distinct odor is required. Cloves will also keep ink from spoiling.

A. N., of Vt.—There are devices for burning hydrogen and oxygen in a steady jet without danger of explosion. Hans' oxy-hydrogen blow-pipe is the best. This flame (you can use more than one if you wish) will give you all the heat you require, if, as you say, expense is not an object.

G. P. R., of Conn.—A Daniell battery will sometimes act for twenty days or more without renewal or attention where the current is not constantly employed. In telegraph offices we believe they require renewal every ten or fifteen days.

L. D., of Texas.—Any gaseous envelope about the sun or a planet would be called its atmosphere. It is not necessary that it should be composed of oxygen and nitrogen. It might contain even vapors of solid substances.

T. N. R., M.D., of Ga.—Dr. Bastian's work, "The Beginnings of Life" can be obtained of Macmillan & Co., of New York, and the papers referred to were published in the July numbers of *Nature*.

D. G. B., of Tenn.—The numbering of spectacle glasses is, in England and America, purely arbitrary. In Continental Europe the numbers indicate the radius to which the curvature of the glasses are found.

Recent American and Foreign Patents.

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

COMBINED WOOD AND IRON PAVING BLOCK.—John S. Kelly, New York city.—This invention has for its object to furnish improved blocks for paving streets, which shall be more durable, and more conveniently laid than the ordinary wood pavement blocks, and which will allow the pavement to be readily taken up for repairs, the laying of sewers, water pipes, gas pipes, etc., and which may again be relaid with the same blocks.

COMBINATION SPRING POWER.—John M. Cayce, Franklin, Tenn.—The object of this invention is to provide for public use a spring power so constructed that any required number of springs may be employed, winding up by the same shaft, but independently of each other. In applying their power to the working shaft, the operator can, at will, use any one, or any number of the springs at the same time, so that, although a force sufficient to overcome only one spring is necessary to wind up the apparatus, yet the combined power of all the springs is available whenever needed, or they may be used separately one after the other.

HARVESTER.—Daniel Stukey, Lancaster, Ohio.—This invention consists in the combination of a saw blade with the knives of a harvester in such a manner that the teeth of the saw blade project forward of the points at which the inclined sides of the knives meet, so far as to prevent stalks of grass or grain from collecting in the corners between the knives and choking or clogging the same.

LAMP SHADE HOLDER.—John Foller, Washington, D. C.—This invention relates to an improvement in shade holders for lamps, and consists of a peculiarly constructed hinged band which secures the holders to the neck of the lamp, and a frame constructed of two wires, the lower end of which serve as pintles for the hinges of the band.

WAGON JACK.—Jeremiah W. Walton, Decatur, Mich.—The main feature of this invention is a device for varying the hight of the jack lever without lowering it on the standard in order to readily adapt it to axles of different elevations; there being also other minor improvements.

FEED-WATER HEATER.—Daniel Lordon, Memphis, Tenn.—This invention relates to improvements in feed-water heaters for steam boilers or generators, and consists in the peculiar construction and arrangement of the terminations of the coil of pipe which traverses the furnace chamber, whereby a circulation of water is maintained when the "doctor" or feed pump is stopped.

STEADFAST AND TRAVELING AUTOMATIC HAY FORK PULLEY.—Charles R. Foreman, West Branch, N. Y.—This invention has for its object to furnish an improved device for carrying a loaded hay fork or other weight from the place where it is hoisted to the place where the load is to be deposited, which shall be so constructed and arranged as to be held steadily in place until the fork or other weight has been raised, and which will then detach itself automatically and carry the said weight back to the place where it is to be deposited, and which shall be, at the same time, simple in construction and easily operated.

ADDING MACHINE.—Gilbert W. Chapin, Brooklyn, N. Y.—This invention has for its object to furnish an improved adding machine, simple in construction, easily, conveniently, and rapidly operated, and accurate in operation.

REVOLVING DOUGH AND CAKE MIXER.—Thomas Holmes, Williamsburgh, N. Y.—This invention has for its object to improve the construction of an mproved dough mixer, patented June 15, 1869, and September 21, 1869; and numbered respectively 91,335, and 95,021, so as to make it more convenient and effective in use.

ROLLING MILL.—William Brown, David Brown, and Francis Watkins, Smithwick, England.—This invention has for its object to facilitate the rolling of large and heavy masses, or bars of iron, steel, and other metals, and to obviate the necessity of lifting the said heavy bars or masses from one grove to another of the rolls as is necessary in rolling by the ordinary machinery, and to dispense with the three-high rolls and the heavy machinery required for the ordinary reverse gear.

TOP FOR SHEET-METAL CANS.—James Britton, Williamsburgh, N.Y.—This nvention has for its object so to construct sheet-metal covers for cans and boxes, that the circular piece cut out in the center of each cover will be supported by the inner part of the cover proper, so that it may be soldered down and unsoldered, without becoming destroyed during the opening of the can.

LETTER FILE.—John Cash and Joseph Cash, Jr., Coventry, England.—This invention has for its object to furnish an improved receptacle for filing away letters, papers, and other documents, to preserve them in an open state for convenient reference.

LOG TURNER.—William E. Hill, Erie, Pa.—This invention has for its object to furnish a simple, convenient, and effective device for turning logs and other timber upon the carriage of a saw mill.

FOUNTAIN PEN.—Gustav Adolph Becker, Seymour, Conn.—This invention has for its object to furnish an improved fountain pen, simple in construction, and convenient and effective in use.

PHOTOGRAPHIC BACKGROUND.—Daniel W. Van Riper, Columbus, Ga.—This invention has for its object to produce a negative from the camera, which, with the exception of the figure or figures to be represented on the card or larger picture, shall be perfectly bare glass or as transparent as the deepest shadows of the said picture producing a dark background and lighting up the darkest outlines of the figure or figures to any desired extent, so that the figures may be clearly outlined; or, in other words, accomplishing the reversion of the lights and shadows of the subject and background relatively, according to the wishes of the operator, the circumstances of the case, and the effect desired to be produced.

WASHING MACHINE.—John Prehn, New York city.—This invention relates to a new machine for washing clothes, and consists in a novel mechanical movement for imparting a peculiar scooping, rolling, and pressing action to the plunger by which the garments are agitated.

COMBINED CORN PLOW AND CULTIVATOR.—Jacob M. Landes, Sanders, Pa.—This invention has for its object to furnish an improved machine, simple in construction and effective in operation, and which may be easily and quickly adjusted for use as a corn plow or cultivator, as may be required.

METAL ROOFING.—Seymour Hughes, Hudson City, N. J.—This invention relates to a new joint for connecting metal roofing plates and to a novel arrangement of providing water courses, with transverse, projecting joints and has for its object to combine great strength with simplicity of construction, so that the joints will be durable and comparatively inexpensive, while a free escape of water is provided at the end of each joint, so that the water cannot accumulate on any part of the roof.

FIRE PLACE FOR GRATES.—T. W. Baird, Bowling Green, Ky.—This invention relates to a new fire place for grates, and has for its object to increase the radiating surface back of the fire so as thereby to augment the heating capacity of the same.

BREAST STRAP PROTECTOR.—L. R. Ward, Ward's Corners, Iowa.—This invention relates to a new lining for breast straps, whereby the wearing of the same by the neck yoke ring will be prevented. The invention consists in the combination of a curved shield with two links which are hinged to the ends of the shield to clamp the same against the breast strap.

ADJUSTABLE DIE FOR MOLD-BOARDS.—J. H. Franklin, Avoca, Wis.—This invention consists in forming a die for curving or bending plates of metal into the shape of a plow mold-board by means of screws passed through movable plates pressed towards each other be means of cams, the mold-board being formed on the ends of the screws.

FIRE ESCAPE.—William Miller, Boston, Mass.—The object of this invention is to provide a convenient and reliable apparatus for bringing a fire ladder to any desired position, and for retaining it therein for use.

MEDICAL COMPOUND.—Michele Ferro, Iuka, Miss.—This invention and discovery relates to a new and useful composition to be used as a medicine for the cure of chills and other diseases.

PISTON PACKING.—John Keesey, Chester, Pa.—This invention relates to a new and useful improvement in the mode of packing the pistons of steam engines whereby the packing rings are made self adjusting, and the piston is made to work steam tight in the cylinder, and the invention consists in a grooved central ring on the spider of the piston, and in segmental packing rings in combination therewith.

WIRE CUTTER.—Joseph Johnson, Marshalltown, Iowa.—The object of this invention is to provide simple and efficient means for cutting up wire into pieces of uniform length, and at the same time provide a rule by means of which the wire is measured to any desired length and the gage set thereby.

HEEL ROUNDING MACHINE.—J. C. White, Auburn, N. Y.—This invention has reference to a new and improved machine for rounding the heels of boots and shoes of all sizes, whereby much labor and valuable time are saved.

COMPRESSED AIR FORGE HAMMER.—Charles Vogel, New York city.—This invention relates to a new and useful improvement in hammers for forging iron and other metals which are actuated or partially actuated by compressed air, and it consists in the mode of controlling the air and regulating the stroke of the hammer, and in the arrangement and combination of parts.

HAIR ROLLS.—J. H. Vogt and George Dietzel, New York city.—This invention relates to a new manner of holding rolls for ladies' hair, distended by means of a spiral spring which tapers towards its ends to fit the roll.

COMBINED MARKING AND BORING MACHINE.—G. M. Nickason, Ellenville, N. Y.—This invention has for its object to provide a machine for marking carpenters' stuff, such as is used on window frames, sashes, shutters, etc., and the invention consists in the application of a rotary marker, which has also a laterally reciprocating motion, to produce marks of suitable length with great precision and exactness.

HARROWS.—Stephen Woodard and Albert Woodard, Saratoga, Ind.—This invention relates to a new and useful improvement in harrows for cultivating the soil whereby such implements of husbandry are made much more useful, convenient, and durable than they have hitherto been, and it consists in making the harrow self-adjusting, by means of which it will pass be tween stumps, rocks, and narrow spaces and immediately assume its full width and proper proportion.

FRUIT BASKETS.—Richard Mitchell, Smyrna, Del.—This invention relates to a new and useful improvement in baskets for holding and transporting fruits, vegetables, and other articles, and it consists in securing the staves by beveled hoops, and in curving the staves and side of the basket, and in the mode of ventilating the contents.

TANNING MACHINE.—John Robinson, L. F. Robinson, and C. C. Putnam Skowhegan, Maine.—This invention relates to a new and useful improvement in a machine for tanning hides whereby the process of manufacturing leather is greatly facilitated, and it consists in a tanning cylinder whose outer surface or periphery is formed of movable lags or bars separated by narrow spaces and provided with brads from which the hides to be tanned are suspended on the inside of the cylinder, the said cylinder being revolved in a vat or tank partly submerged in the tanning liquor.

OPERATING VALVES.—A. L. Pennock, Upper Darby, Pa.—This invention relates to a new and useful improvement in operating valves whereby they may be arranged in short tubes of small diameter, and removed from the tube with great facility, and it consists in opening and closing the valve by means of a screw valve stem connected with the valve by a ball and socket joint, the socket being slotted and the valve being connected with the tube by means of a hinged arm.

PENCIL SHARPENER.—M. W. Dillingham, Amsterdam, N. Y.—This invention relates to a new and useful improvement in sharpeners for lead pencils whereby they are made more convenient and useful than they have hitherto been, and it consists in forming the sharpener in two separate principal parts connected together by a band and screw nut, clasp, or snap joint.

GAIN CHISEL.—Hiram Bigelow, Skowhegan, Maine.—The object of this invention is to provide a tool for facilitating the operation of letting butt hinges into window blinds, shutters, doors, trunks, and for all purposes for which butt hinges are used when they are let into the wood.

MACHINERY FOR MAKING HARD AND SOFT GIMP.—Thomas U. Dale, Jr., and Geo. Kranik, Paterson, N. J.—This invention relates to improvements in machinery for covering cotton or other material for making hard or soft gimp, and consists in an arrangement of the bobbins containing the covering material on a supporting disk or table, permanently attached to the frame, and a twister or covering device in connection therewith, in such a manner that the covering is accomplished by the rotation of the twister. The object is, by twisting the silk equally around the cotton, to cover with less silk than is done in the ordinary manner, where the silk and cotton are both twisted together, by means of an ordinary flyer, around each other. This machine twists them together, too, but the twisting, being done centrally, through a hollow spindle, the cotton is kept in the center, and silk is drawn up around it.

TREADLE MOTION.—Charles M. Guess, New Orleans, La.—This invention relates to improvements in treadle motions for sewing machines, turning lathes, and the like, and consists in a combination with two loose pulleys on the shaft to be driven, carrying pawls, working in ratchet wheels, fixed to the said shaft, and having springs to impart the back motion for winding on the belts, which give the forward motion, and with the belts for actuating the said pulleys of a treadle, vibrating on pivots, to the long arm of which one belt is connected, and an arm projecting from the side of the shaft on pivots opposite to that where the belt is connected to the treadle, to which arm the other belt is connected, so that while only one treadle is used, the belts will be worked in opposite directions, one winding up on the pulley which is returning, while the other is winding off its pulley and impelling the shaft.

COTTON-GIN FEEDER.—J. Ralston, Brenham, Texas.—This invention relates to improvements in apparatus for feeding cotton gins, and consists in an arrangement in a frame adapted for ready attachment to the frame of a saw gin on the receiving side, of an endless apron, toothed rollers, and toothed distributing and equalizing bars, in a manner to spread and equalize the cotton, before it is delivered to the saws, and to separate the said dirt, gravel, nails, and other like matters, to prevent contact with the saws and injury to them, and the danger of igniting the cotton, and thereby to improve the quality of the lint.

COVERING METAL ARTICLES WITH INDIA-RUBBER.—Constantine Hingher, New Brunswick, N. J.—This invention relates to new and important improvements in covering buckles and other metal articles with india-rubber, and consists in the employment of varnish, soap, or other substances which will expand under the action of heat, between the surface of the metal article to be coated and the coating of rubber, for preventing the india-rubber coating from shrinking away from the walls of the mold while confined in it, in the vulcanizing process, which shrinkage is very damaging to the coating which, not being confined upon the smooth surface of the mold becomes rough and requires considerable finishing after removal, and is often wholly ruined.

WATER WHEEL.—Geo. Miller, Providence, R. I.—This invention relates to improvements in water wheels, and in the gearing for transmitting the power of same. It consists in mounting the large wooden or iron breast overshot or similar wheels, commonly mounted on central shafts, on friction rollers, and in transmitting the power through the medium of the said friction wheels, geared together and arranged for gearing with suitable transmitting gear, the object being to simplify and cheapen the cost of the wheel and transmitting gear, as well as to reduce the friction of the bearings of the wheel.

PULLEY LUBRICATOR.—Joseph E. Hendrick, Waterbury, Conn.—This invention has for its object to provide a lubricator attachment to loose pulleys whereby the bearings of the same, on the shafts, will at all times be properly oiled. The invention consists in arranging within the lubricator cup a tube, and within said tube a short movable valve, which has a groove or channel cut into its bearing surface. The valve is thrown up and down in the tube during the rotation of the pulley, but allows the oil to flow under it through the groove when it rests on the seat.

SHUTTLE FOR LOOMS.—Theodor Bosshard, Columbus, Ohio.—This invention has for its object to so construct shuttles for looms that their motion will be arrested immediately after the breaking or giving out of a thread. The invention consists in the application to the shuttle of a self-acting drop lever which is held up by the thread, while the same is held tense, but which, when the thread breaks or becomes slack, immediately swings out to project from the shuttle and prevent its further movement by coming in contact with some stationary part of the loom.

WALKING CULTIVATOR.—B. F. Osborn, Nashville, Tenn.—This invention relates to improvements in the construction and arrangements of the joints of the horizontal bars of the frame of cultivators with the axle and the hitching apparatus, to make permanent and durable joints, and to provide for moving the frame vertically and horizontally. It also relates to improved apparatus for connecting the handles to the beams of the frame for adjustment and for rigidly holding them.

FURNITURE FASTENING.—Leonard A. Johnson, Candor, N. Y.—This invention relates to improvements in fastenings for the joints of bedsteads and other articles of furniture which are required to be taken apart frequently. The invention consists in the application to the side rails at the ends and on one side of a cross-piece of wood or metal, having a pair of tapered dovetailed lugs, one at each end, which fit into correspondingly shaped notches in a piece of wood or metal attached to the post or part to which the side rail is to be attached.

SCRUBBING BRUSH.—J. Odell, Petroleum Center, Pa.—This invention relates to that class of scrubbing brushes which are operated by a person standing and by means of a long handle. It consists in forming two distinct and independent brushes upon the same block, at a wide interval apart, and with a shorter stiff intermediate strip placed centrally between them

MEASURING FAUCET.—Francis C. Heiser, Williamsburgh, N. Y.—This invention has for its object to construct a measuring faucet for casks, cans etc., whereby the desired quantity of liquor will be drawn, and no more

SHAFT COUPLING.—Marshall S. Bassett, West Haven, Conn.—This invention relates to a new shaft coupling, which is of very simple construction, but so arranged as to firmly lock two shafts together, permitting their being taken apart whenever desired.

CHURN.—Hermann Kuhlmann, Cincinnati, Ohio.—This invention relates to a new mechanism for operating churn dashers, and to a novel construction of dashers, and has for its object to facilitate the production of butter by a thorough agitation of the cream.

MUSICAL ROCKING CHAIR.—Clayton Denn, Frankford, Philadelphia, Pa.—This invention has for its object so to construct a rocking chair that its motion may be utilized for working a bellows and producing music.

CHURN DASHER.—Thomas H. Weaver, Marietta, Ga.—This invention relates to improvements in churn dashers, and consists in a short cylinder of sheet or cast metal, with perforations in the sides, and having a perforated disk at the center, to the center of which is a screw-threaded tube, by which the dasher handle is attached.

COVERING METAL ARTICLES WITH INDIA-RUBBER.—Constantine Hingher New Brunswick, N. J.—This invention relates to improvements in covering metal articles with india-rubber. It is designed mainly for covering hames and is intended to overcome the difficulties arising from the action of the air confined in the clefts and cavities in the surface of the iron, also from the gases generated by the scale on the surface.

LIME KILN.—Daniel Hills, Richville, N.Y.—This invention relates to a new lime kiln, which is so constructed that in it a full charge of lime can be thoroughly burnt, while the kiln will be preserved and ready for continuous use. The invention consists in constructing the kiln wider at the bottom than at the top, so that the products of combustion will be retained in it long enough to utilize their entire heat.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING Sept. 6, 1870.

Reported Officially for the Scientific American

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106,981.—CORN PLANTER.—Michael Ackermann, Steamboat Rock, Iowa.

106,982.—GANG PLOW.—J. H. Andrews, Benicia, Cal.

106,983.—EGG CARRIER.—J. R. Asher (assignor to himself and R. I. Robeson), Oskaloosa, Iowa.

106,984.—DETACHABLE BOOT AND SHOE HEEL.—Charles W Bailey, Boston, Mass.

106,985.—FIREPLACE.—Thomas W. Baird, Bowling Green, Ky.

106,986.—MOP.—Charles L. W. Baker, Hartford, Conn. Antedated August 25, 1870.

106,987.—FOUNTAIN PEN.—Gustav A. Becker, Seymour, Conn.

106,988.—STAVE JOINTER.—John B. Bell, Pittsburgh, Pa. Antedated August 25, 1870.

106,989.—WOOD PAVEMENT.—Albert Betteley, Boston, Mass.

106,990.—STREET LAMP.—Emil Boesch, San Francisco, Cal.

106,991.—TOP FOR SHEET-METAL CANS.—James Britton (assignor to himself and Garrett Brower), Williamsburgh, N. Y.

106,992.—ROLLING MILL.—Wm. Brown and David Brown, Smithwick, England.

106,993.—PULLEY MECHANISM.—William H. Brown, Bangor, Me.

106,994.—GRAIN SEPARATOR.—John D. Brunner and Edwin R. J. Ueberroth, Doylestown, Pa. Antedated August 26, 1870.

106,995.—FLOOD BRIDGE.—Thomas Alfred Bryan, Baltimore Md.

106,996.—FRUIT LADDER.—C. S. Cannon and C. D. Cannon, Chicago, Ill.

106,997.—BEDSTEAD FASTENING.—Wm. H. Carter, Candor, N.Y.

106,998.—WHIP SOCKET.—Edwin Chamberlin, Lansingburg, assignor to himself and J. O. Marriam, Troy, N. Y.

106,999.—ADDING MACHINE.—Gilbert W. Chapin, Brooklyn, N. Y.

107,000.—MODE OF FORMING UMBRELLA HANDLES FROM PLASTIC MATERIAL.—Levi Chapman, New York city. Antedated Aug 26, 1870.

107,001.—BUTTON-HOLE SEWING MACHINE.—Wm. Chicken, Chelsea, Mass.

107,002.—METHOD OF HANGING GRINDSTONES.—Henry M Church, Brunswick, Ohio.

107,003.—FRUIT JAR COVER.—T. A. Clark and H. C. Mascroft, Worcester, Mass.

107,004.—HARVESTER RAKE.—Daniel Clow, Janesville, Wis

107,005.—DEVICE FOR LUBRICATING, COOLING, AND WASHING VERTICAL HAMMER SHAFTS OR STAMPS.—Z. E. Coffin, Newton, Mass. Antedated August 24, 1870.

107,006.—WIRE FOR WIRE GOODS.—W. F. Collier, Worcester, Mass.

107,007.—WATER WHEEL.—J. M. Cook (assignor of one half his right to B. J. Cole), Lake Village, N. H.

107,008.—RAILWAY CAR COUPLING.—R. Cowell, Cleveland, Ohio. Antedated July 15, 1870.

107,009.—BUTTON-HOLE CUTTER.—D. H. Cunningham, Waltham, Mass. Antedated Aug. 20, 1870.

107,010.—MACHINE FOR COVERING CORD.—T. N. Dale, Jr., and George Kraink, Paterson, N. J.

107,011.—MAXILLARY COMPRESS.—C. E. Davis, St. Helena Cal.

107,012.—BEEHIVE.—Enos Davis, Noblesville, Ind.

107,013.—WARDROBE, BEDSTEAD, AND BUREAU.—J. R. Davis and Frederick Rominger, Bloomfield, Iowa.

107,014.—PADDLE WHEEL.—David De Haven, New Orleans, La.

107,015.—COOKING TABLE.—Eliza D. Dodge, Worcester, Mass.

107,016.—IMPLEMENT FOR CUTTING THREAD.—Frederick Egge and R. W. Churchill, Bridgeport, Conn.

107,017.—BRICK MACHINE.—J. S. Elliott, Boston, Mass., assignor to Union Stone Co.

107 018.—HAND RAKE.—Minot Ellis, Greenfield, Mass.

107,019.—FEEDING MECHANISM FOR SEWING MACHINE.—G A. Fairfield, Hartford, Conn.

107,020.—FENCE.—Edward Fales, Glenwood, Mo.

107,021.—BURGLAR-PROOF SAFE.—John Farrel, New York city.

107,022.—FILLING FOR FIRE-PROOF SAFE.—John Farrel New York city.

107,023.—MECHANISM FOR OPENING AND CLOSING SAFE DOORS.—John Farrel, New York city.

107,024.—MEDICAL COMPOUND FOR THE CURE OF FEVER AND AGUE.—Michele Ferro, Iuka, Miss.

107,025.—CORNER SUPPORT FOR CARRIAGE BOXES AND SEATS.—William Fisher, Marathon, N. Y.

107,026.—LAMP SHADE HOLDER.—John Foller, Washington, D. C.
107,027.—COMPOUND FOR DESTROYING THE ODIUM IN VINES, PLANTS, ETC.—C. P. Folliet, Amonce, France.
107,028.—ELEVATOR.—Charles R. Foreman, West Branch, N. Y.
107,029.—BALANCING MILLSTONE.—Charles V. Foreman, Mechanicstown, Md. Antedated Aug. 26, 1870.
107,030.—GAME BOX FOR TEN PINS.—George B. Fowler, Brooklyn, N. Y.
107,031.—SELF-WINDING COUNTER SPOOL.—W. J. Fox, Morrisania, N. Y.
107,032.—ADJUSTABLE DIE FOR BENDING MOLD BOARD.—Jonathan H. Franklin, (assignor to himself and J. P. McAllister), Avoca, Wis.
107,033.—PLOW.—Horatio Gale, Albion, Mich.
107,034.—CAR SPRING.—Perry G. Gardiner, New York city.
107,035.—CAR SPRING.—Perry G. Gardiner, New York city.
107,036.—CAR SPRING.—Perry G. Gardiner, New York city.
107,037.—PLOW.—Robert Gibbs, Brunswick, Mo.
107,038.—HAY LOADER.—H. L. Gockley, Jackson, Ill.
107,039.—HARVESTER.—Lewis Hall, Metamora, Ill.
107,040.—GRAIN DUMP.—William H. Hall, Jr., Bloomington Ill.
107,041.—SEWING MACHINE.—C. F. Harlow, Boston, Mass. Antedated August 27, 1870.
107,042.—SAFE CASE FOR BOOKS.—S. H. Harris, Chicago, Ill.
107,043.—FRAME OF SAFE CASE FOR PAPERS.—S. H. Harris, Chicago, Ill.
107,044.—LUBRICATOR.—J. E. Hendrick (assignor to himself and Philo Brown), Waterbury, Conn.
107,045.—MOCCASIN BOOT AND SHOE.—Thomas Hersey, Bangor, Me.
107,046.—PEN FOR RULING MACHINES.—Wm. O. Hickok, Harrisburgh, Pa.
107,047.—BEEHIVE.—J. M. Hicks, Indianapolis, Ind.
107,048.—SCHOOL SEAT.—George W. Hildreth, Lockport, N. Y.
107,049.—HOBBY HORSE.—C. Hitzelberger, South Orange, N. J.
107,050.—DOUGH AND CAKE MIXER.—Thomas Holmes, Williamsburgh, N. Y.
107,051.—MACHINE FOR MAKING TUBULAR LIGHTNING CONDUCTORS.—B. F. Housel and S. O. Thayer, Winona, Minn.
107,052.—SULKY PLOW.—Benj. R. Hubbard, Hillsborough, Ill.
107,053.—SEPARATING STONES, ETC., FROM CLAY, ETC.—D. J. Hunter, Boston, Mass.
107,054.—TEAPOT OR WATER HEATER.—Edward Hunter (assignor for one half his right to H. H. Gallup), Norwich, Conn.
107,055.—SLEIGH KNEE.—Obadiah Johnson, Lassellsville, N. Y. Antedated August 25, 1870.
107,056.—SEEDING MACHINE.—J. Herva Jones, Rockford, Ill.
107,057.—HARROW.—Wm. P. Jones, Arcade, N. Y.
107,058.—BALE TIE.—W. A. Jordan, New Orleans, La.
107,059.—PAINT COMPOUND.—W. N. Jordan, Cambridge, Mass. assignor to himself, P. M. Smart, and H. W. Cook.
107,060.—GARDEN HOE.—A. C. Judson, Grand Rapids, Ohio.
107,061.—CAN OPENER.—Joseph Kaufman, New York city.
107,062.—PISTON PACKING.—John Keesey, Chester, Pa.
107,063.—PLOW FOR CUTTING POTATO ROOTS.—H. M. Keith, Commerce, Mich.
107,064.—SHOE FASTENING.—Jonathan Coykendall, Farmington, Ill.
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107,079.—KEROSENE STOVE.—R. B. Mitchell, Chicago, Ill.
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107,099.—GUN CARRIAGE.—A. F. Potter, Oakland, Cal. Antedated August 27, 1870.
107,100.—LOCK.—Titus Powers, New York city.
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107,102.—COTTON-GIN FEEDER.—Joe Ralston, Brenham, Texas.
107,103.—DRAIN PIPE.—George Richardson, Milwaukee, Wis.
107,104.—CAPSTAN.—J. W. Riggs, Wade, Ohio. Antedated September 1, 1870.
107,105.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—H. T. Robbins, Boston, Mass.
107,106.—BRIDGE.—Jacob Seebold, Kautz, Pa.
107,107.—MILK CAN AND COOLER.—Samuel Shattuc, Kipton, Ohio.
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107,156.—CORN PLANTER.—J. L. Bond, Marshalltown, Iowa. Antedated Aug. 27, 1870.
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107,167.—FAN BLOWER FOR SMITHS' FORGES.—Lindsay Duskin and Benjamin Sledge, Thomasville, N. C.; said Duskin assigns his right to Wm. Dickson and J. D. Delap, same place.
107,168.—LOOM TEMPLE.—W. W. Dutcher (assignor to the Dutcher Temple Co.), Hopedale, Mass.
107,169.—MACHINE FOR WASHING AND SCREENING ORES AND FERTILIZERS.—Alfred Duvall, Baltimore, Md. Antedated Aug. 26, 1870.
107,170.—AXLE BOX FOR CARRIAGES.—L. R. Dye, Cranberry, N. J.
107,171.—WIRE CLOTH FOR COAL SCREENS.—J. G. Frick, Pottsville, Pa.
107,172.—PRUNING TOOL.—Samuel Gamwell, Wayland, Mich.
107,173.—SPRING CARRIAGE.—Demon R. Gould and Warren S. Ickham (ssignors to themselves and N. B. Mallory), Chestertown, N. Y.
107,174.—PERMUTATION LOCK.—Henry Gross and J. L. Hall, Cincinnati, Ohio.
107,175.—WHIP HOLDER.—Nelson Hanchett, Leslie, Mich.
107,176.—LOCK FOR SECURING STAMPS UPON BARRELS.—J. L. Harley, Baltimore, Md.
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107,188.—URINAL.—Samuel Males, Cincinnati, Ohio.
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107,193.—HARVESTER.—Halvor H. Nestestu, Deerfield, Wis.
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107,199.—CLOTHES DRYER.—Geo. W. Richardson, Taunton, Mass.
107,200.—PAINT BRUSH.—G. L. Shuttleworth, Sharon, assignor to himself and D. E. Washburn, Woodstock, Vt.
107,201.—TORPEDO FOR OIL WELL.—Henry J. Smith, Boston, Mass.
107,202.—NUMBERING MACHINE.—J. D. Smith, Washington, D. C.
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107,205.—CLOTH-MEASURING MACHINE.—Thomas Weedan and Thomas Tribe, Hillsdale, Mich.
107,206.—STEAM AND VAPOR ENGINE.—F. A. Morley, Syracuse, N. Y.
107,207.—COMBINED LOCK AND LATCH.—S. C. Weddington, Jonesborough, Ind.
107,208.—APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.—H. G. Ludlow, Troy, N. Y.

REISSUES.

4,114.—ATTACHING KNOBS TO SPINDLES.—Matthew Andrew, Melbourne, Victoria. Patent No. 101,808, dated April 12, 1870.
4,115.—WEIGHT FOR SASHES, CLOCKS, ETC.—D. B. Lacy, Mott Haven, N. Y., Isaac A. Lacy, Saugerties, N. Y., Thomas T. Lacy, Jersey City, N. J., the Lacy Sash Weight Co., and the Standard Sash Weight Co., New York city, assignees, by mesne assignments, of D. B. Lacy.—Patent No. 58,172, dated Sept. 18, 1866.
4,116.—CARRIAGE WHEEL.—J. D. Sarven, New Haven, Conn. Patent No. 17,520, dated June 9, 1857: reissue No. 3,079, dated August 11, 1868.

DESIGNS.

4,324 to 4,333.—CARPET PATTERN.—Robert R. Campbell (as signor to Lowell Manufacturing Company), Lowell, Mass. Ten Patents.
4,334.—KNITTED FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,335.—CUPBOARD LATCH.—William Gorman (assignor to the Russell & Erwin Manufacturing Co.), New Britain, Conn.
4,336.—COLLAR BOX.—S. F. Hilton, Providence, R. I.
4,337.—NET FABRIC.—R. H. Jefford (assignor to A. G. Jennings), New York city.
4,338.—CLOCK CASE.—S. B. Jerome (assignor to Samuel Peck & Co.), New Haven, Conn.
4,339 to 4,343.—CARPET PATTERN.—Elemir J. Ney, Dracut, assignor to Lowell Manufacturing Company, Lowell, Mass. Five Patents.
4,344.—FLOOR OIL CLOTH.—John T. Webster, New York city and Albert F. Powers, Lansingburg, assignors to Deborah Powers, A. E. Powers, and N. B. Powers, Lansingburg, N. Y.
4,345.—CURTAIN CORNICE, ETC.—Henry Whittemore, Passaic, N. J.

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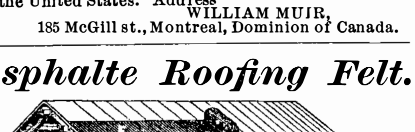

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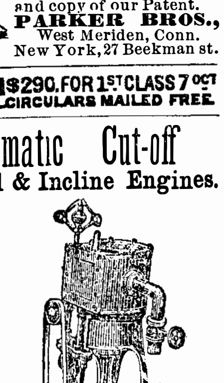

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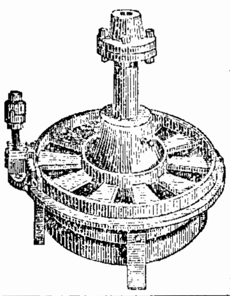

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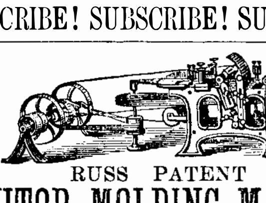

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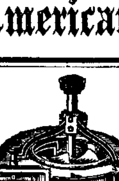

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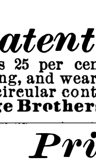

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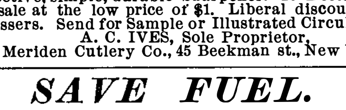

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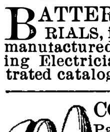

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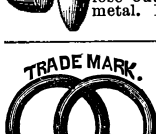

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