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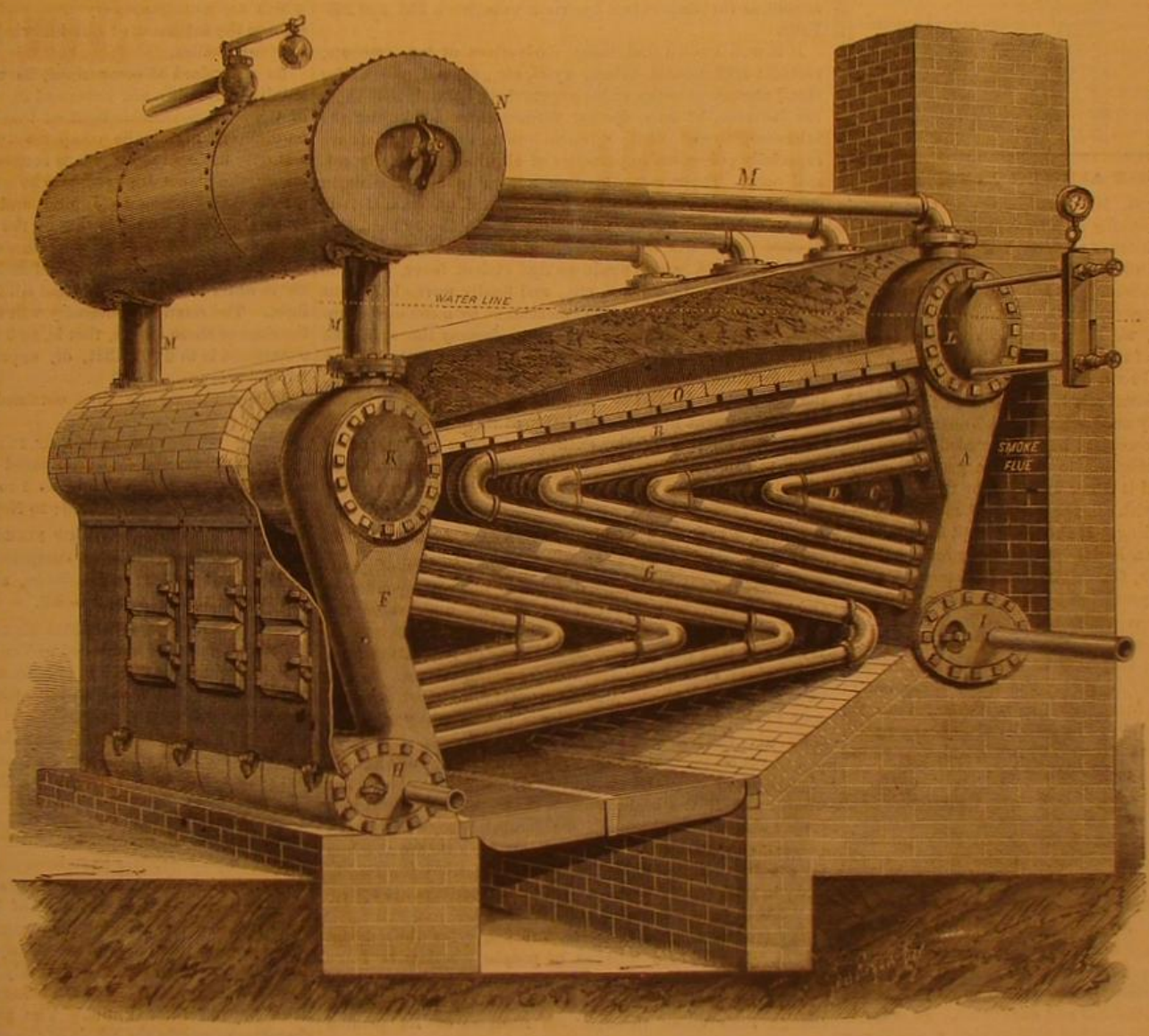
THE ECLIPSE SECTIONAL STEAM BOILER.

The invention herewith illustrated is a steam boiler composed of a number of separate sections, each by itself comprising all the parts of a complete steam generator. Our engraving represents a double form of the device, so constructed as to economize room and yet afford a large heating surface. The upright chamber, A, and < shaped series of tubes, B, compose one section; portions of others similarly constructed, placed beside each other so as to form the rear of the apparatus, are shown at C and D. Any required number of sections may be thus located. The chamber, F, and tubes, G, correspondingly arranged, constitute the first of a series of sections which form the front of the boiler. All the chambers communicate at the tops and bottoms, so as to form continuous mud drums at H and I, and water spaces at K and L, the latter connecting by means of the pipes, M, with the steam drum, N. The sections composing the front portion of the boiler are less in number than those in rear, for the reason that every other one is omitted in order to afford the necessary space for the doors.



THE ECLIPSE SECTIONAL STEAM BOILER.

Both parts of the apparatus, front and rear, have independent circulations, that in the former commencing in the mud drum, H, passing through the tubes, G, to the water space, K, and thence back; in the latter, the circulation commences from the drum, I, passes through tubes, B, space, L, and return, and, being very rapid, prevents the accumulation of scale or sediment in any portion except the mud drums, which may be easily cleaned. The sections have man holes on both sides, and are held together by short bolts on the inside around these openings. The facing strips are of sufficient thickness to hold the sections apart and to allow the smoke to pass, thus making the entire boiler into heating surface, except the steam drum and bottom of the mud drum. The drums will allow a man to enter and pass through the sections, so that, in any case, should a tube become disabled, it may be replugged without loss in the service of the boiler.

It is claimed that the angular form insures the greatest amount of heating surface, and at the same time allows for the unequal expansion of the tubes. One end of each pipe is screwed into a return bend and the other is fastened to the chamber by a long thread and lock nuts, making reliable steam joints, which may at any time be loosened if required. The tubes are also so arranged as to be readily cleaned from soot arising from the use of bituminous coal.

The construction of the grate needs no especial reference. The heated air in rising passes around the tubes and out between the back sections into the flue, and thence to the chimney. The roof of the fire space is lined with fire brick, above which a layer of any non-conducting material is placed. It is claimed that, owing to the large heating surface, increased rapidity of getting up steam and a consequent less expenditure of fuel are effected. We are informed that steam has been obtained from cold water in the period of fifteen minutes.

The water chambers are large enough to insure a free passage of the water, thus preventing foam and securing dry steam.

These boilers can be readily taken apart for transportation, put together by any engineer without injury to joints, and can be enlarged at will by adding sections. They are constructed double, as shown in the engraving, or single. In the latter case the form is easily understood by imagining the front sections, of the generator represented, to be removed. Corresponding alterations are made in other parts to accord with the single set of tubes, B, and chamber, A. The steam drum, N, is not used, the upper portion, L, of the sections answering the purpose.

The device in both forms, it is claimed, has been found well suited for high and low pressure, stationary, portable, and marine engines. It is also specially constructed for heating purposes.

We see by the Pittsburgh papers that Messrs. Jones & Laughlins, proprietors of the American Iron Works, have contracted with the Eclipse Steam Manufacturing Company for three large batteries of these sectional safety steam generators, of 240 horse power, to take the place of the four flue boilers which exploded on February 3. They have had a number of sections in use for a year, on trial.

Patented September 6, 1870. For further information address G. W. Bollman, President of the Eclipse Steam Manufacturing Company, 87 Wood street, Pittsburgh, Pa.

Scrap Iron.

Manufacturers should look well to their scrap iron; do not waste a piece, no matter how small; gather all together, assort, have different receptacles for steel, wrought, cast and malleable iron. The wrought iron from the carriage shop is the most valuable of scrap iron, but to bring the highest price there must be no malleable or cast iron mixed with it; every pound of scrap has a market value, and it should be packed in barrels or boxes and sent to market. If there be any considerable quantity, it will pay to send it to the mills and have it worked up into bars. It is the small manufacturers who do not take care of their scrap, but allow year after year to pass without paying any attention to it, and scraps of iron can be found all over their factories, while boxes and out of the way corners are filled with it, and hundreds of dollars of what would make the best of bar iron is allowed to go to waste.

Vertical Grist Mills.

The idea of placing the grinding stones on horizontal spindles, like common pulleys, is very old, but has never come into much use except for small mills, where coarse grinding and speed are wanted. It does not follow, however, that this plan cannot be successfully applied to the finer kinds of flouring. According to Leffel's *News*, "a vertical mill of somewhat novel character has lately been introduced, in which two or more pairs of millstones are combined on one horizontal shaft, or on sections of a shaft, and driven by one belt or gear, the power being applied directly to the shaft. No intermediate shafting is used, and the cost and care of a number of pulleys, belts, gears, etc., is thus in many cases saved by the adoption of such mill. Furthermore, the millstones are faced and furrowed on both sides instead of only one, and combined in groups of three or more. In a group of three the center stone is fast to, and revolves with, the shaft, with a stationary or bed stone adjusted on each side of it, making two mills out of three stones; and each of the three stones being interchangeable, there is afforded, practically, the grinding surface of three mills. As each stone is double faced, any one of the three may be taken out to be sharpened at any time and another put in its place, so that the mill can be kept running without interruption. If one more stone be added to a group of three, there will be three mills with four stones, or five stones will make four mills; and so on to any desired number, all being driven by one belt or gear, and occupying only one foot in length of shaft to each mill. It is argued in behalf of this arrangement that a group of five stones, making four mills, will occupy only the space usually taken by one mill, and that the four have only two bearings to care for, while the step so troublesome to millers is entirely done away with.

"There is evidently a very material saving of room in this arrangement, whatever may be its other merits or defects; and it must also be admitted that any device which enables the miller to simplify his machinery, dispense with complicated and costly gearing, and bring the work in close proximity to the power, is so far a very valuable gain."

Spontaneous Combustion.

In the last report of the Fire Marshal of New York city, sixteen recent examples of fires caused by spontaneous combustion are recited. During the year 1872, there were 1,380 fires in New York. How many were spontaneously caused, there are no means of knowing. Of the sixteen spontaneous cases above alluded to, nine originated among oily rags, cotton waste or rope materials, two in piles of coal, one in a mass of "excelsior" or fine wood shavings used for cheap upholstery purposes, one in salt hay, two in oily saw dust, one in rubbish.

New Electrical Discovery.—Dr. Blake, of the San Francisco Academy of Sciences, and Judge Hastings, of the California State Geological Survey, announce the discovery of a current of electricity running north and south at a distance of about 150 miles from the Pacific coast, along a belt of metallic deposits, which serves as a conducting chain between the poles.

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SMALL POX.—OLD AND NEW REMEDIES.

Superficially considered, it appears singular that certain contagious diseases, especially small pox, spread more in the winter season (which, in other respects, is the healthiest time of the year) when the cold destroys the miasmata which flourish in tropical climes and, in hot summers, sometimes visit portions of the temperate zone. But in order to explain this apparent anomaly, we have only to consider that in winter a large number of the lower classes of people huddle together in ill ventilated rooms, in order to shelter themselves against the cold. Of course this is favorable to the growth of miasmata, which only need suitable conditions to propagate themselves. Microscopists have succeeded in tracing the origin of many contagions to parasitic growth, either vegetable or animal, and it is not improbable that this will ultimately be the case with all, the denial of many medical authorities notwithstanding. It should be kept in view that, formerly, equally high authorities used to deny most peremptorily, to several diseases, the origin which is now, beyond the shadow of a doubt, proved to be the true one, namely, the growth of animalculæ or vegetable parasites. It should also be considered that the fact of not finding such, in certain cases, is only a negative proof; they may be there and the investigator may have failed to find them; but other searchers in course of time and with instruments more perfect than we possess at present, or by help of an improved *modus operandi*, will undoubtedly discover them. Microscopic investigation has only just commenced to be applied in medicine, and the most advanced physicians know now that it is one of the most powerful helps in medical diagnosis.

Eruptive fevers are diseases of the blood; they probably originate in a kind of catalytic poison in the system, which may be a result of parasitic growth, as is the case with fermentation and many other chemical changes. However, the future will decide the question definitely; in the meantime we must observe, use our best judgment, and apply all the light, as far as the present state of science allows, to combat this class of diseases, among which small pox is one of the most virulent, loathsome and dangerous. In order to be fully convinced of this, one has only to visit a small pox hospital and see this interesting disease in all its stages.

In regard to the effectiveness of the protection afforded by vaccination, the statistics show that this discovery, made by Jenner more than a century ago, had the most startling influence in staying the small pox ravages of that time, and it kept the nations who accepted it comparatively free; the experience of the physicians of the present day tends in the same direction, and all doubt fostered by some in regard to its effectiveness proceeds solely from want of acquaintance with the facts, which are overwhelming in proof of its great value to the human race. As the health and longevity of vaccinated persons is on the general average equal to that of others who escape the small pox without vaccination, there can be no serious objection on that ground. The rule, laid down by some, that persons must be vaccinated every seven years is totally arbitrary and without any foundation whatsoever; different individuals will differ greatly in this respect, and, in order to be safe, it is well to try if vaccination will "take" in case any danger is apprehended, even if it has been applied only three or four years ago. If no epidemic is prevailing and the person is exposed to no danger, it is needless to revaccinate every seven years; ten years or more may elapse, and we have known individuals who undoubtedly, by a single effective vaccination in childhood, have been protected for their whole lives.

In regard to the treatment, it must be kept in view that here, as in all eruptive fevers, it must have its course, and cannot be cut short without robbing the patient entirely of his chance of escape. Careful guarding against taking cold, good nursing, the mildest possible diet, and abstinence from irritating food and remedial agents similarly objectionable are the first necessities of small pox cases.

The latest medical journals recommend two new remedies, which experience has proved to be beneficial. Dr. Revillod, of Geneva, recommends glycerin as an exterior application; this, through its soothing action, diminishes the intensity of the eruption. He mixes it with soap and some mercurial ointment. Dr. Carl Nagel, Royal Chancellor of Health in Berlin, recommends xylol; he has administered this internally in eighty cases, thirty-six of which had the small pox in its worst form, and only four died, which is a better result than that of any other remedy thus far known. When administered while the disease is but suspected, xylol does not prevent it, but greatly eases the patient and facilitates a speedy recovery.

Xylol, or xylen, is also called the hydride of xylenyl; it is one of the hydrocarbons obtained by the distillation of coal tar, wood tar, or Burmese petroleum. The coal tar contains little of this ingredient, but one pound of oil separated from crude wood spirit contains about one ounce of xylol. It is a liquid similar to benzol and toluol, but has the antiseptic properties of carbolic acid from coal, and of creosote from wood. It separates from the crude wood spirit by the addition of water, and is purified, like other cognate products, by sulphuric acid; the brown mixture, after standing, is washed with a solution of potash and then in water, dried over chloride of calcium or glacial phosphoric acid, and then subjected to a fractional distillation, when the xylol comes over as soon as the temperature has risen to between 258° and 266° Fahr.

It is well known that many derivatives of tar, creosote, carbolic acid, benzol, toluol, xylol, etc., are all poisons for small organic growths, either vegetable or animal; that they, for instance, at once destroy fermentation by killing the microscopic yeast plant; it is also known that mercurials are especially poisonous to parasites of all kinds, especially animal ones. These remedies now appear to be effective in small pox, and this raises the very natural question if it is not an argument for the probability of the theory that this disease also is due to a morbid organic growth, perhaps in the blood itself, which produces that violent fever, with the symptoms of pain, nausea, etc., and finally works itself out through the skin and mucous membrane by a copious eruption, which is often strong enough to destroy the skin like so many burns, and sometimes even so violent as to destroy the life of the patient, in the same way as an extensive scalding does, which is fatal by arresting the natural action of the skin, consequent to the annihilation of its organic structure.

In consideration of the excitement about the spread of small pox in this country, we believe the above details to be of general interest and utility to our readers.

A WORD WITH THE READER, THINKER, AND WRITER.

We believe that there is no portion of our journal of greater interest than the columns devoted to our correspondence, and we should be unappreciative did we undervalue the practical suggestions and information imparted by its writers. We would take the present opportunity of requesting from our readers even more frequent communications. Let us have all possible ideas. Criticise everything that appears open to criticism; and, if experience has taught you differently, give the public the benefit of your wisdom. The mere fact of your finding any difficulty in committing your knowledge to paper need be no drawback. We want ideas, not words; and if the brain work is there, we will put it into proper shape. Every week we publish a large number of questions on different subjects. Sometimes we are at a loss for a suitable reply which many of our readers can readily find; in such cases responses from our subscribers are appreciated both by the enquirer and ourselves.

The modern newspaper is the substitute for the ancient forum. Instead of a number of people meeting in some public place, as they used to do, and discussing various questions of interest, they now write to their paper and interchange their views through the medium of its printed pages.

Necessarily, among the multitude of communications which reach us, there are many agreeing on some single topic. In such case we exercise our discretion in the publication of such as we consider the most sound and suitable. There are others devoted to the discussion of questions which it is only a waste of time to consider. We allude to perpetual motion, quadrature of the circle, and all of that class. We would earnestly impress upon all who entertain such chimerical ideas to turn their minds and labor to more profitable pursuits.

We believe that there is no better way of acquiring and and disseminating knowledge than to establish a co-operation between those who read and those who write—to place the opinions of the practical man beside those of the theorist, the worker beside the thinker, and thus obtain views clearer, better, and more comprehensive on subjects interesting alike to all.

THE PHOTOMETER APPLIED TO ASTRONOMY.

In a recent article on the physical nature of the planet Jupiter (see page 400 of our volume XXVII), we described the important results deduced from photometric observations of that planet; and we may add to this that photometry has often been applied to the starry heavens, in order to determine the comparative luminosity of the heavenly bodies. It is evident, however, that the common methods as applied here on earth to compare the relative intensity of different flames, and of which one was described on page 83 of this volume, are entirely inapplicable; and therefore other modes must be applied, and photometers based on totally different principles must be resorted to.

The most perfect photometer adapted to measure and compare the light of the heavenly bodies is undoubtedly that invented by Zöllner, the famous astronomer and spectroscopist of Berlin; he invented it as early as 1860, but only recently has he applied it extensively to celestial photometry. It is based on the principle of the polarization of light; and in order to accomplish his purpose, he makes use of the property of the analyzer (see Tyndall's lecture, page 35 of our current volume) to transmit or obstruct the polarized ray in proportion as it is turned round an arc of 90°; for intermediate portions of the angle of rotation, a strong light may be gradually diminished till the transmitted rays are equal to the weaker light.

The first thing Zöllner had to do was to determine how far the angle would serve as a measure for the intensity of light. Mathematical theory teaches that the amount of light transmitted does not increase as the angles themselves, but as the squares of their sines. Zöllner found this law perfectly verified by practical experiment, in testing this photometer in many different ways. By attaching such a polarizing photometer to an astronomical telescope, he has been enabled to determine the comparative luminosity of divers heavenly bodies with greater accuracy than had previously been possible; and the results obtained will especially be most interesting to posterity, who will be able to determine what changes have taken place in the course of time, changes which are sometimes very great and of the utmost importance to the extension of our knowledge of the nature of the heavenly bodies.

As a standard of comparison, he uses the light of a lamp shining through a pin hole; and in order to be independent of the perhaps variable light of this lamp, which may differ on different nights, he compares two stars with the lamp, and only notices the difference between the stars. If, for instance, the planet Jupiter has to be compared with Venus, he directs the telescope to Jupiter and turns the analyzer till its luminosity is equal to that of the lamp shining through the pinhole, and finds it was turned, say, 10°; then he directs the telescope to Venus, and finds that he must turn it 25° in order to diminish its light till it is equal to the lamp light. The relative luminosity will then be as the square of the sines of these angles, that is, as $0{\cdot}0174^2$ is to $0{\cdot}0389^2$, or as 0·00030276 is to 0·00151321, or, approximately, as 3 to 15 or 1 to 5.

Among the results thus obtained by Zöllner are the following:

COMPARISON OF PLANETS.

The fixed star *Capella* as compared to Mars is as 1 to 7; to Jupiter, as 1 to 10; to Venus, as 1 to 50; to Saturn, as 1 to 0·4; to Uranus, as 1 to 0·0066; to Neptune, as 1 to 0·0007.

COMPARISON OF FIXED STARS.

The same star *Capella* as compared to *Sirius* is as 1 to 5; to *Vega*, as 1 to 1·2; to *Betelgeuse*, as 1 to 0·5; to *Regulus*, as 1 to 0·4; to *Pollux*, as 1 to 0·3.

THE MOON COMPARED TO THE PLANETS.

The full moon as compared to Venus, when full, is as 150 to 1; to Jupiter, as 700 to 1; to Mars as 1,000 to 1; to Saturn, as 18,000 to 1; to Uranus, as 1,159,000 to 1; to Neptune, as 10,000,000 to 1.

The sun as compared to the moon is as 700,000 to 1. Consequently the light of the sun surpasses that of the most distant planet, Neptune, 7,000,000,000,000 times.

DISCOVERIES OF TIN IN QUEENSLAND.

The most recent reports substantiate the fact that tin fields of unexampled richness have been discovered in the English colony of Queensland, Eastern Australia, the presence of the metal being detected over an area of 550 square miles. Mr. T. F. Gregory, the mineral land commissioner, states that, at the present time, only about 225 square miles of this area have hitherto been found sufficiently rich for working, but there are many instances of tin being found in paying quantities beyond these limits. The physical and geological character of nearly the whole of the area described is that of an elevated granite table land, intersected by ranges of abrupt hills, the highest limits of which are about 8,000 feet above the sea, its eastern escarpment forming the water shed of the Clarence river, the northern that of the Condamine, and the southwestern, the Severn and McIntyre rivers. The portion of the district over which the deposits of tin ore are distributed is that comprised by the water shed of the Severn river. The richest deposits have been found in the stream beds and fluvial flats, the paying ground varying from a few yards to five chains in width, occasionally broken by rocky bars; but even in these instances large deposits are frequently lodged in the pockets and crevices between the granite boulders.

The probable yield of ore is stated at ten tuns per lineal chain of the beds on the various creeks. In some instances, this has been found to extend to thirty tuns per chain. Regarding the mineralogical character of the rocks, it is stated that the ore is associated only with granite which is invariably red. The granite generally is coarse grained and seems to disintegrate rapidly under atmospheric influence. There are numerous bands of loosely aggregated rock, granitoid in in character, highly micaceous and traversed by bands and veins of quartz in all directions, in which the crystals of tin are abundant. No tin floors, as at the Elsmore mine in New South Wales, have yet been discovered.

As the lodes and veins have as yet been but very partially tested, it would be premature to give any decided opinion upon them. It is probable that they will prove a source of great wealth, and perhaps render Australia one of the first tin producing countries in the world.

A FEW GRATUITOUS HINTS TO INVENTORS.

It often happens that the germ of an important discovery is contained in a short paragraph; but as it is the early bird that catches the worm, so it is only the most alert reader that seizes upon the obscure fact and appropriates it to his own use. We have inserted a short notice of a number of discoveries which we hope to have brought back to us in matured plans for their application; but, for fear that some of them may have escaped the vigilance of our readers, we refer to them again in a more conspicuous manner by way of gratuitous suggestion.

Has the cupro-ammonium solvent for cellulose been employed on a large scale in the manufacture of artificial wood, water-tight paper, incombustible fabrics and the like? The name may frighten many persons from paying the regard to this important reagent which it deserves. It is very easy to make it, as it is only necessary to keep strips of copper standing in concentrated ammonia, occasionally shaking it to admit the oxygen of the air. Oxide of copper is produced, which dissolves with a blue color in the ammonia and gives the reagent sought. There is certainly a large scope for invention in the use of this material. Paper bags can be rendered impermeable to water by immersing them for a few moments in cupro-ammonium and running them between rollers. They can then be substituted for parchment for many purposes. If numerous sheets of paper were to be similarly prepared and pressed together, thick layers of great lightness would result, which could be employed as a substitute for wood in architectural structures and interior decorations. By impregnating the wood paper with tungstate of soda, it would be rendered wholly uninflammable, and in this manner theatrical decorations, and the packing surrounding steam pipes and boilers, could be made of it; and in its fireproof form, it is capable of a wide range of application which the inventor must think out for himself. It is said that paper bands, nearly as strong as leather, can be made on the same plan. The cupro-ammonia paper would find application for roofing, water pipes, hats, boats, clothing, collodion; and as all kinds of cellulose are attacked by this reagent, much waste material, such as seaweed, grass, sawdust, shavings and rags, could be applied to many purposes. It is a question whether, by combining cupro-ammonium and tungstate of soda, wood and timber could not be rendered fireproof as well as waterproof and otherwise indestructible. There is evidently a wide field for research in this matter, and it would be well for inventors to give it attention.

There is another question which sometimes occurs to our mind, which is this: Are there any practical applications of thallium in glass making and otherwise? Lamy exhibited a specimen of thallium glass at the Paris Exhibition of 1867, possessing a higher index of refraction than anything of the kind that had been previously made. Since that time a considerable quantity of thallium has been found in the various stages of metallurgical processes, and enough material could be found if there was any call for it. The whole astronomical world is turning its attention to the use of the spectroscope in observations on the stars: and it is of great importance to employ a highly refracting medium. Lead glass answers a very good purpose; but if thallium glass is better, it ought to be tried. For optical instruments of all kinds, a new material of this character would always prove most serviceable. The employment of thallium in medicine and in colors is also a matter to be investigated.

A third suggestion we have to make is in reference to new applications of copal. We have seen it stated that gum copal can be vulcanized, so that it becomes very hard and closely resembles amber, for which it can be substituted for many purposes. The vulcanized amber can be turned on a lathe and is said to possess great durability. In what way the process is accomplished has not been disclosed. It appears to be worthy of examination.

The above are some of the paths that might be taken by industrious students in their search for new applications, and we commend them as being worth pursuing.

PROFESSOR AGASSIZ ON OUR COLLEGES.

Professor Agassiz has evidently no very high opinion of our educational institutions, and publishes his adverse views with characteristic freedom. He says our colleges are nothing but high schools, and that even Harvard is far from being a university; while the knowledge imparted is "the traditionary learning of the middle ages," and only "the dregs of scholarship."

In common with all progressive lovers of science, Professor Agassiz strongly advocates a freer scope being given to the study of nature. This branch of education should begin in childhood, and not nominally be taught in normal schools from text books which are often unsuitable. With regard to our system of popular education, he acknowledges that it is better than the European, but declares that the substance is wanting.

It is probable that these ideas, from so eminent an authority, will give new impetus to the war of science against classics which, for some years past, has been waged in our colleges. That there is a strong and growing popular taste for science is amply evidenced by the interest manifested in the discourses of Professor Tyndall and the writings of other distinguished savants; but that, at the same time, there exists, even among people otherwise well educated, an inexcusable ignorance in scientific matters, is equally true. That the latter is, in a great measure, due to the imperfections of our college courses, we consider there is little doubt, and we adhere to the belief that, were the classics in our seminaries made subservient to the thorough study of the ordinary principles of science, the graduates would leave their books much better prepared to encounter the world.

DRAPER AND TYNDALL ON THE INVISIBLE RAYS.

To the Editor of the Scientific American:

In your issue of February 1, you gave an abstract of Professor Tyndall's lecture on "The Invisible Rays," in which I find the following statements: "On both sides of the spectrum there is a copious overflow of rays which are incompetent to excite vision, but which, however, are able to agitate the molecules of certain substances so as to shake them asunder and produce chemical decomposition," and, further on, "it is shown that the heat radiated from the non-luminous portion is seven or eight times as great as from the luminous or visible." The latter proposition is illustrated by a well known figure in which the invisible rays are represented by a curve very large in comparison with a similar line indicating the visible rays. In the same number of your journal you publish Dr. J. W. Draper's researches in actino-chemistry, in which the author says: "As Dr. Draper demonstrated the heating power of radiation to reside in all equally, whatever their refrangibility, so in this he proves the power to produce chemical changes to be manifested by rays of every refrangibility, different substances being acted on by different rays." The discrepancy apparently existing between the views of Drs. Draper and Tyndall, thus plainly indicated by the two articles from which the above extracts are made, has led me to obtain a more extended report of the investigations of the former physicist. The conclusions therein contained seem to me to be flat contradictions of Professor Tyndall's assertions, as proved by the following: It follows that the true distribution of heat throughout the spaces of the spectrum is equal, and that "the figure so generally employed in works on actino-chemistry to indicate the distribution of heat, light and actinism in the spectrum serves only to mislead. The heat curve is determined by *the action of the prism, not by the properties of calorific radiations*; the actinic curve does not represent any special peculiarities of the spectrum but the habitudes of certain compounds of silver."

Can you or any of your readers reconcile such completely opposite ideas? How is it that Professor Tyndall did not allude to so radically different a theory, of the existence of which he must have been aware, in the course of his lectures? When such eminent and learned doctors disagree, it is indeed a question who is to decide. A PERPLEXED PHYSICIST.

REMARKS BY THE EDITOR.—The discrepancy between the views of Dr. Draper and Dr. Tyndall, pointed out by our correspondent, did not escape the attention of scientific men during the visit of the latter to this country; and the subject was frequently discussed by them without the friends of either party being able to reconcile the differences. Dr. Draper, we are told, is disposed to think that the spaces in and out of the spectrum measured by Dr. Tyndall were so small that the chance for error was a very close one, and he intimates that an error was probably committed. On the other hand, Dr. Tyndall does not appear to believe in Dr. Draper's results. We suspect that Professor Tyndall did not allude to the radically different theory, of which he was fully aware, partly because it might have been considered a breach of hospitality and partly because the rostrum of a public lecture is not the place for the discussion of such nice points of physics. The question is one which can only be determined by actual experiment. The learned doctors must repeat their observations, and, if they still disagree, let a high court of arbitrators appoint competent physicists to go carefully over the same ground and report the results to a scientific congress. We take the opportunity to say that, in our opinion, Dr. Draper has never received the credit that fairly belongs to him for his early researches in prismatic analysis. In the *Philosophical Magazine*, for May, 1847, and February, 1848, are contained papers "On Methods for the Prismatic Analysis of Substances," in which will be found foreshadowed Bunsen's application of the spectroscope to chemical analysis. Bunsen at first proposed to substitute prismatic analysis for flame analysis as an aid to qualitative chemistry. In this he had been anticipated by Draper, but Bunsen went further and discovered a new element; that event fixed the method beyond all possibility of being forgotten, and Kirchoff clinched the matter by his magnificent researches in solar chemistry. Still it must not be forgotten that Draper pointed out this line of research fourteen years before Bunsen took it up, and that if he had not been loaded down with the cares of administration and the toil and drudgery of teaching, he too might have pursued it to such a degree of perfection that no subsequent doubt could have arisen as to his share in the great discovery. The present is a good time to revive these points of history, and to accord credit where it belongs.

RAPID TRANSIT IN NEW YORK.

The venerable Peter Cooper of New York has sent to State Senator Tiemann a new scheme to secure rapid transit in New York, which consists in locating a double railway track in the second story of the buildings along the line of the route. On these tracks he proposes to place a string of light cars in the form of an endless belt, to be moved by endless ropes. There are to be just as many cars as are required to move the vast numbers of people who are expected to patronize the work. The right of way is to be purchased by the corporation, to the stock of which, if placed in proper hands, Mr. Cooper engages to subscribe the sum of one hundred thousand dollars.

Peter Cooper, as all our readers probably know, is one of our most highly esteemed, generous, and practical fellow citizens. He rarely recommends to others a scheme in which he does not himself liberally engage. He was the originator of one of the earliest locomotives ever built in this country, and from that machine down to and including the Atlantic Telegraph Cable, to which he was one of the original contributors, he has been an assistant in many highly useful and successful enterprises. The Cooper Union Buildings, which have now for several years afforded the most splendid opportunities for education, free of charge, to working people, by its evening classes as well as day privileges, was a gift from him to our city, and will ever be a monument to his fame. Whether his present plan for rapid transit is ever brought into practice remains to be seen.

Mr. Speer and friends, whose plan for the Traveling Sidewalk was illustrated not long ago in the SCIENTIFIC AMERICAN, are also applicants before the Legislature for a charter intended to afford rapid transit to our citizens. They would like the privilege of erecting their improvements on posts over the present sidewalks on Broadway. The route is a good one. The plan of Mr. Cooper is somewhat analogous to this. The Traveling Sidewalk consists of an endless moving belt, in the form of a floor, on which settees and chairs are placed. You step on board the floor and away you go, and step off wherever you like. No stoppages.

Another new plan for rapid transit in this city is the "Mid-Avenue Elevated and Surface Railroad," of John B. Church, who proposes to erect a railway on iron columns in the center of some street to be selected for that purpose. He thinks that such a road can be built strong enough to carry trains and locomotives at a speed of thirty miles an hour, for three hundred thousand dollars per mile, the right of way being granted free by the authorities. This is lower than any estimate we have heard of. The estimate, we believe, for the Gilbert elevated railway, which, by the way, if is said is shortly to be built here, is from seven hundred thousand to one million dollars per mile. The construction is substantially what Mr. Church proposes, that is, in the street, on iron columns. We think that Mr. Church will find that one million dollars per mile are more nearly correct figures than those he has given.

Still another scheme for rapid transit is proposed by a party of citizens who desire to have some of their number receive authority from the State to manage the road, the money to build with to be supplied from the city treasury.

Meantime, while these various plans are being talked about, the committees of both branches of the State Legislature have unanimously recommended the passage of the bill authorizing the Beach Pneumatic Transit Company to go ahead and complete their railway under Broadway. When this bill passes we shall have a practicable route authorized for an underground railway, the construction of which costs one million dollars per mile, the same as the elevated; and it will be a valuable acquisition to rapid transit facilities in New York. In London the underground railway is very popular, and carries between fifty and sixty millions of passengers per annum.

SCIENTIFIC AND PRACTICAL INFORMATION.

PORTABLE DRY INK.

At a recent meeting of the Frankfort Polytechnic Association, Professor Boettger exhibited a novel kind of ink, which is admirably adapted to take on journeys and exploring expeditions. White blotting paper is saturated with aniline black and several sheets are pasted to form a thin pad. When wanted for use, a small piece is torn off and covered with a little water. The black liquid which dissolves out is a good writing ink. A square inch of the paper will give enough ink to last for considerable writing, and a few pads would be all that an exploring party need carry with them. As water is always available, the ink is readily made.

TO CLEAN SILVER.

Dr. Elsner says that hot water poured off potato parings or boiled potatoes is admirably adapted to clean silver. The objects can be easily rubbed by the fingers with the settlings of potato meal, and they become as bright as they usually do when rubbed with tripoli. The process is particularly advantageous for engraved and raised objects, where the powder is liable to collect in the cavities. German silver and plated ware can be cleaned in the same way. Potato water which has become sour by long standing can be substituted for acids to clean copper vessels.

NEW USES OF HYDRATE OF CHLORAL.

The hydrate of chloral, which is now made on a large scale, has been found to be useful for other purposes than the original one of a hypnotic. It is said to be an excellent antiseptic; it stops fermentation and destroys germs that would be likely to develope in organic substances. One per cent of hydrate of chloral will prevent the decomposition of glue and albumen for a great length of time. Another use of hydrate of chloral is as a reducing agent. It is said to precipitate metals from solutions, and this property suggests its possible application in photography and for depositing metals.

AN INDELIBLE RED INK.

Dr. Elsner states that an indelible red ink can be prepared as follows: Equal parts by weight of copperas and cinnabar, both in fine powder and sifted, are rubbed up with linseed oil with a muller and finally squeezed through cloth. The thick paste can be employed for writing or stamping woolen and cotton goods, and the color remains fast after the goods have been bleached. The reds usually employed are not fast colors, and do not resist the action of bleaching agents.

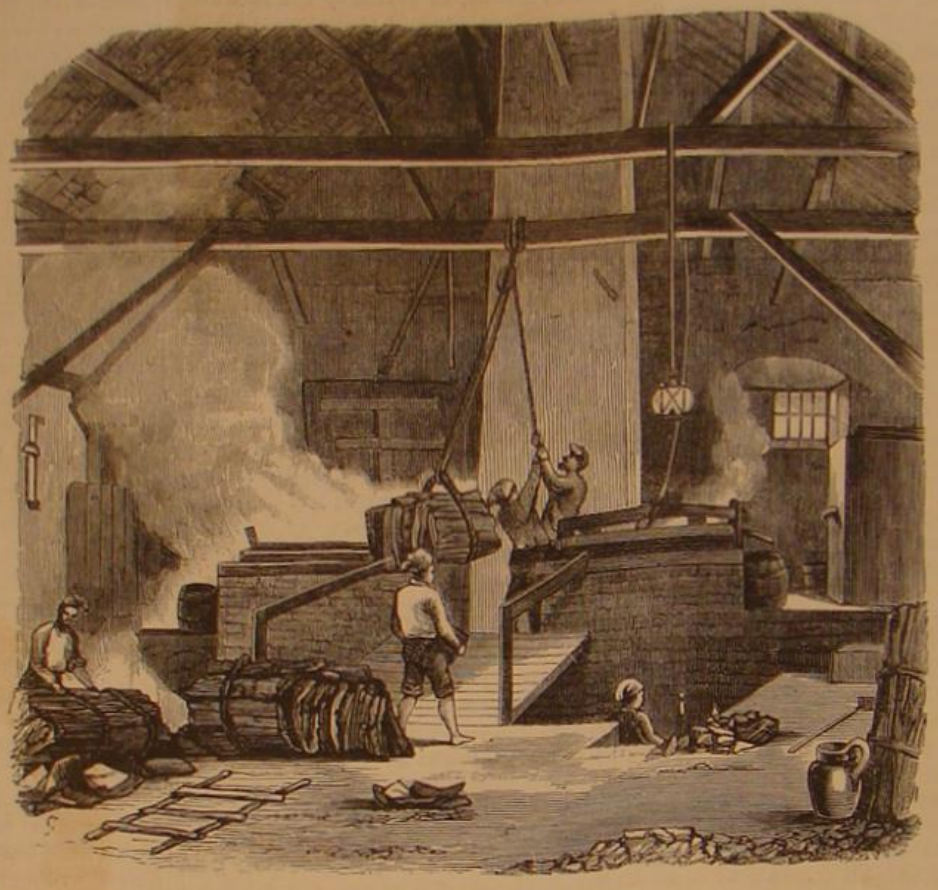
THE TRANSIT OF VENUS.

The planet Venus, it has been calculated, will apparently cross the disk of the sun on December 8, 1874. A full explanation of this important astronomical event, and of the nature of the knowledge which, it is expected, will be derived from its observation, will be found in Professor Young's excellent lecture on "Our Present Knowledge of the Sun" on another page of this issue.

SORTING CORK FROM THE ROUGH BALES.

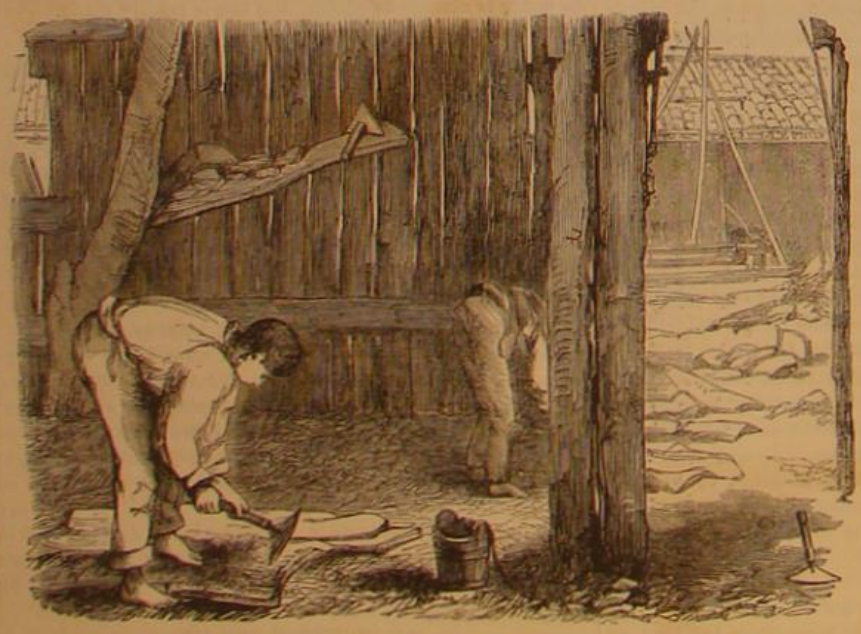
BURNING THE OUTSIDE OF THE COMMON CORK WOOD

CORK TREE WITH BARK ON.

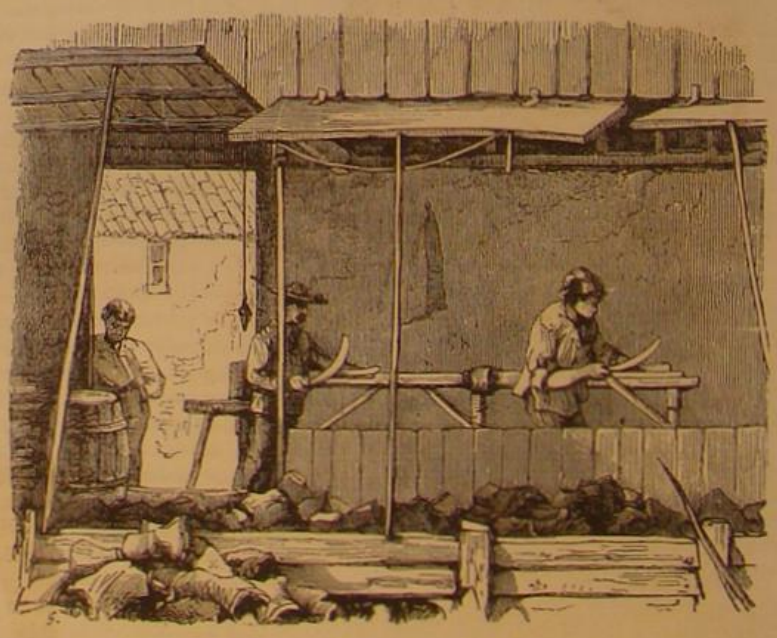


THE CORK BOILING DEPARTMENT.

CORK TREE PARTLY BARKED



SCRAPING THE CORK WOOD AFTER BOILING.



FACING THE CORK WOOD FOR THE MARKET.

CORK PRODUCTION AND MANUFACTURE IN SPAIN.

CORK CUTTING IN SPAIN.

The recent political revolution in Spain, involving the voluntary abdication of the throne by the late King Amadeus, and the almost unanimous adoption by the Cortes of a Republican form of government, imparts a new interest, for Americans at least, in the industrial resources of that wonderful country. Not least among these resources is the production of cork.

The cork tree is found in its wild state in the south of Portugal, Africa and Spain. In the latter country the preparation of the bark for foreign markets is one of the staple industries, furnishing labor and subsistence to a large proportion of the population.

The tree is a peculiar kind of oak, and the cork is the soft cellular interior bark, lying just inside the exterior woody covering. It is removed by making several longitudinal clefts up and down the trunk, and then girdling the latter with horizontal incisions. This operation is not performed, however, until the tree has attained a certain age, generally fifteen years, and the first crop is employed only for inferior purposes. Seven years afterwards the tree will have another coating of bark, which is stripped and used for making corks, and so on every five to seven years, according to the quality of the ground. The tree does not suffer from the process of scraping as it generally lives from one to two hundred years.

Between the cork and the tree, there is another bark that is used for tanning; but this is only removed when the tree is cut down. It is a curious fact that if any portion of this inner coating be destroyed, further formation of the cork on the injured spot ceases. After the layers of the cork are stripped, they are inspected and assorted, according to their sizes and quality, those of the finest texture being of the greatest value. The inferior portions are generally sorted out, their crust burnt off and sold mostly for floats, thus receiving the name of fishing cork. The better qualities are first boiled and scraped, and then blackened over a coal fire the object being to make the surface smooth, and at the same time to conceal flaws. Some varieties, generally the best, are faced in order to exhibit the fineness of their texture. All these various processes will be found graphically depicted in engravings given herewith. After being for

warded to the warehouses, the largest slabs are cut into pieces of about three and a half feet in length, eighteen inches in width and ranging from one half inch to three inches in thickness. Drying and packing in bales weighing one hundred and fifty pounds each follows, and the cork is ready for exportation.

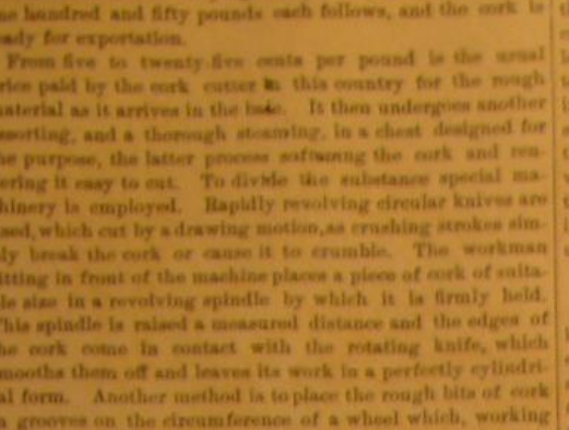
From five to twenty-five cents per pound is the usual price paid by the cork cutter in this country for the rough material as it arrives in the bale. It then undergoes another assorting, and a thorough steaming, in a chest designed for the purpose, the latter process softening the cork and rendering it easy to cut. To divide the substance special machinery is employed. Rapidly revolving circular knives are used, which cut by a drawing motion, as crushing strokes simply break the cork or cause it to crumble. The workman sitting in front of the machine places a piece of cork of suitable size in a revolving spindle by which it is firmly held. This spindle is raised a measured distance and the edges of the cork come in contact with the rotating knife, which smooths them off and leaves its work in a perfectly cylindrical form. Another method is to place the rough bits of cork in grooves on the circumference of a wheel which, working automatically, carries each piece to a point where its ends are received by a small lathe. The cork is then revolved slowly while a large circular knife removes a thin shaving, thus giving it the necessary taper, and a surface as true and smooth as if sand-papered. As fast as a cork is finished by the automatic lathe it is released and another substituted in its place.

Every portion of the material is utilized, either as stuffing for cushions or life preservers, or as a non-conducting substance for placing between walls or floors of buildings to deaden sound.

It has been estimated that it would require 4,000 men to be continually at work to supply New York alone with corks, if all had to be made by hand. There are at present 60 manufactories in the United States, cutting and supplying corks to the value of $2,250,000 per year.

TEXTILE FIBERS UNDER MICROSCOPE.

The present large demand for textile fabrics has led, not only to the discovery and application of new fibers, but also to several improved methods of disintegrating old rags that the fibers may be respun and used, either by themselves or in combination with new material. Wool thus treated is called shoddy, and its use has long been a common practice with makers of the lower qualities of woolen cloth. But as yarns are now spun for the making of mixed fabrics, wool, silk, cotton, and linen are so intimately blended that they all appear in the same thread, and a close examination with the microscope is necessary to detect the presence and the proportion of any of the four. Using a power of from 100 to 150 diameters, we observe, as in the engraving, the scaly hairs of wool, W, the smooth thread of silk, S, the cylindrical fiber of linen, L, or the spiral one of cotton, C, the colors of these varying considerably. When the presence of all or any of the four has been observed, a further test may be made by adding a drop of the ammoniate of peroxide of copper; by this salt, silk and cotton will be immediately destroyed, linen will gradually follow, and wool only will remain, its fibers being slightly increased in size. Concentra-



ted sulphuric acid will dissolve the wool, producing a red color. The next step in the investigation is to determine whether some or all of the fibers of the wool have been previously used. This is shown by the differences of the dyes, as the microscope enables the observer to discriminate between indigo, purpurine, madder, aniline, and any other dyestuff that may have been used, and worn fibers show traces of the bleaching to which they were submitted before being treated for a second process of manufacture. Another test for old fibers is the irregularity of their diameters, and the disappearance, in places, of the surface scales. A still further method of detection is the application of a lye of potash or soda, which attacks old wool with a rapidity to which new material is inaccessible.

To ascertain the proportion of old fiber in any mixed fabric, the threads should be laid as nearly parallel as possible. A power of from 20 to 50 diameters is sufficient to enable the investigator to count the fibers, the relative number of each being shown by the appearances above described. The chemical tests already mentioned will reveal at once the composition of the fabric to a careful observer. But there is obviously room for an improved method of distinguishing the different materials, and the importance of the interests engaged in the manufacture will probably induce the scientific world to bestow some attention on the subject.

TURPENTINE to be good should be as clear and white as water, of a strong penetrating smell, and very inflammable.

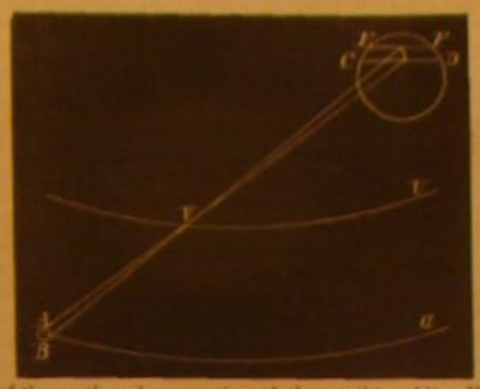
OUR PRESENT KNOWLEDGE OF THE SUN.

Professor C. A. Young concluded the annual course of lectures before the American Institute by an interesting and able discourse on the above topic. Modern science traces to the sun almost the whole range of terrestrial activity. We can easily follow out the solar action in our winds and no less easily in our waterfalls. The pumps that raise water to the hills are in the sun. The power that is expended in intercepting water in its downward flow is at the expense of solar fires. In a more remote way we may trace to the sun the steam power which is derived from fuel. The very force with which we move our limbs, the sound of our voices, even the power of mind, the impulses exerted in forming thought, in exciting emotions, are sun-derived, when traced to their ultimate source.

DISTANCE OF THE SUN.

The first point to be ascertained in relation to the sun, or indeed to any of the heavenly bodies, is its distance from the earth. The method of actually measuring the intervening space which can be most relied upon is by means of the transit of Venus. The planet will meet the eastern side of the sun's disk near the northern edge and will pass obliquely across. In Fig. 1, A and B represent stations on opposite

FIG. 1.



sides of the earth and *a* a portion of the earth's orbit. V is the planet Venus and *v* a portion of its path. C D and E F represent the apparent paths of the planet across the sun's disk. Fig. 2 shows the track of Venus more clearly. The upper and dark circle represents the planet as seen from the southern hemisphere, and the lower light circle, the planet as seen from the northern. The arrow shows the direction of the motion. The problem is to measure the distance between the center of the black dot on the great face of the sun to the edge of the latter with the utmost accuracy. An error of a hundredth part of a foot, at a distance of about 40 miles, would be fatal to any increase of the accuracy of our present knowledge.

STATIONS ON THE EARTH.

The earth must be regarded as seen from the sun the moment when the planet strikes the disk of the sun, provided an observer on the earth were at its center. At that moment we must suppose ourselves transported to the sun, looking toward the earth. This will show the apparent path of the shadow of Venus upon the earth. Stations are selected around the edges of the world, all along in Japan, Kamschatka, Siberia, China and Siam in the northern hemisphere, and in New Zealand and some islands in the Southern Ocean.

METHODS AND INSTRUMENTS EMPLOYED.

In measuring this distance, there will be three different methods pursued. The old fashioned way was to note when the planet strikes the sun and when it leaves it, from which we may know the number of hours it takes to pass across the disk of the sun. Thus at the northern station we have the length of the chord which it passes over, and the same at the southern station; and knowing the length of the two chords it is not difficult to compute the distance between them. Sir George B. Airy, the Astronomer Royal of England, is disposed to rely mainly upon that method. But there are great difficulties with it. The main difficulty is this: A bright object looks to the eye larger than its real size; and a dark body projected upon it looks smaller than its real size, so that it is difficult to determine the precise moment when the planet enters upon the sun's disk.

FIG. 2.

Another method, which will be used mainly by the German astronomers, is to measure the position of this spot from time to time in reference to the edges of the sun's disk by means of the heliometer, an instrument by which we can measure very accurately the distance of the little round spot from the edge of the bright circle on which it will be shown. The other method, which will be used by all the nations, but will be mainly relied upon by the French and the Americans, is by photography. The English will use a common telescope, driven by clock work, with an eye piece to enlarge the image of the sun to about four inches in diameter. With this they will from moment to moment take photographs of the solar disk while the transit is going on, and they will afterward measure these photographs. The objection to this method is that the eye piece used to enlarge an otherwise too small image almost invariably produces a certain amount of distortion. The round image will not be round on the glass or paper, and it is very difficult to allow for that distortion. They propose to photograph with the same apparatus a scale of equal parts, putting up a board perhaps as long as this room, with laths nailed upon it at equal distances, to be photographed, and thus they propose to calculate, by comparison, the distortion of the different parts of the field of view. The Germans will use a telescope of the same kind and an eye piece of the same kind; but at the focus of their telescope they will place a piece of glass ruled with fine lines into squares. These will be measured beforehand very carefully, and the image of the sun and these ruled lines being photographed together, if there is any distortion it will affect these little squares precisely as it affects the sun; and they need only refer their measure to the nearest lines of this network to get an accurate result.

The best plan will be that pursued by the French and the Americans and by Lord Lindsay's party from England. The telescope will be 30 or 40 feet long—it need not be very large in diameter—and the image will be large enough not to require enlargement. Of course such a telescope would be very unwieldy if mounted in the usual way; and the method proposed is to put the telescope horizontally, perhaps in a tunnel underground to protect it from currents of air, though that is not essential, and to throw the image of the sun into the object glass by means of a flat mirror. In this case "flat" means a great deal. It is very difficult to make a mirror flat; and that is the difficulty in this method. The mirror must be so flat that at no point shall the curvature equal a radius of 18 miles.

NATIONAL EXPEDITIONS.

Russia will establish 25 stations in her Siberian dominions. France will send expeditions to Palestine, the Red Sea, Pekin and Japan, the island of St. Paul, New Caledonia, and possibly to the Sandwich Islands. The Germans will send to the Falkland Islands, McDonnel's Island, and Kerguelen's Island, in the southern hemisphere. The English will send to Oahu, to Roderick's Island, to the Falkland islands, and to Alexandria, in northern India. Lord Lindsay will send a private expedition to Mauritius. The United States will

FIG. 3.

send out eight parties; four to Japan and China, and the other four to New Zealand, the Falkland islands, Van Diemen's Land and possibly Kerguelen's Island.

ILLUSTRATIONS OF THE SUN'S DISTANCE.

At present we consider the distance of the sun from the earth to be 92,000,000 of miles, with a margin of error of about 500,000 miles. It would take a railroad train 263 years to move from the sun to the earth; so that if the Pilgrim Fathers had started from the sun at the time they started from England, by a train whose only stopping places would be Mercury and Venus, they would not have arrived yet. It would take a cannon ball, going at full speed, about nine years to make the journey. Light takes eight minutes. Sound, if it could be carried over the celestial spaces, would be fourteen years on the way. You know, continued the lecturer, that if you touch a part of the body, one does not feel it instantly. If you touch the hand of any one with a pin, it will be an appreciable part of a second before he will feel it and draw his hand back. Now if I had an arm long enough to reach to the sun, and should put my fingers into the solar flame and burn them there, it would be one hundred years before I should find it out, and another hundred years before I could remove my hand.

DIMENSIONS AND DENSITY OF THE SUN.

Once having found out the distance of the sun, it is very easy to find out its diameter, which is about 860,000 miles. If the earth were represented by a ball 2¾ inches in diameter, the sun would require a ball of 18 feet in diameter, which would just about lie between this stage and the ceiling. If the earth were placed at the center of the sun, the moon would be so far inside the sun's surface that there would be almost room for another moon beyond, the distance of the moon from the earth being 240,000 miles, and of the surface

of the sun from its center, 430,000 miles. In bulk, the sun is a million and a quarter times larger than the earth; that is, it would take that number of earths rolled into one to make up the bulk of the sun. It would not take that number to make up the weight of the sun, for the sun is lighter, bushel for bushel, than the earth. It weighs about 325,000 times as much as the earth. With that enormous mass, the force of gravity must be 28 times as great as on the surface of the earth; so that the weight of an ordinarily heavy man on its surface would be about two tuns.

THE HEAT OF THE SUN

is estimated by French physicists to not greatly exceed that of the electric arc, being, perhaps, once and a half or twice as great. Secchi, on the other hand, estimates it at 2,000,000° Fahr., and Ericsson at from 6,000,000° to 7,000,000°. Sir John Herschel illustrates the quantity of heat given out by the sun, as determined by his experiments, as follows: Suppose ice should be formed into a rod forty-five miles in diameter, and that rod of ice should be darted at the sun with the velocity of light: if all the heat of the sun could be concentrated upon the point of that advancing javelin of ice, it would never approach the sun, for the point would melt off as fast as it came. Or we may put it in another way: Suppose we should build a railroad from here to the sun, and should take to it two and one quarter miles square of solid ice, carrying it clear by the moon, Mercury, and Venus, and if we should concentrate upon that the heat of the sun, it would take just one second to melt it, and in seven seconds it would be volatilized, changed into steam, and invisible.

THE ORIGIN OF SOLAR HEAT

has been attributed by some to chemical combinations, but if the sun were of solid coal, it would have been completely burned out in 5,000 years, giving out heat at the present rate. The proper view is that its heat is maintained by the influx of matter. As meteors fall upon the earth, several millions in a day, so they fall into the sun, millions of millions per day, and contribute to the solar heat. But that does not account for it all. Another cause, I doubt not, is the contraction of its volume. If the sun were to contract one hundred and twenty feet in radius, or two hundred and forty feet in diameter, in a year, that would account for all the heat it gives off. Bodies may give off heat without growing colder. If we freeze a pail of water, it gives off heat while it is freezing, but the thermometer will indicate no fall of temperature until it is all frozen. So it is quite likely that the gases in the outer surface of the sun will enter into combinations with each other, dissociating and uniting in other forms, and emitting heat in the combination.

THE PHYSICAL APPEARANCE OF THE SUN

in the telescope is like a mass of clouds, or rather curdled milk or cotton wool. It is much darker on the edges, which is a very important point in explaining its constitution, and there are also numerous bright streaks, called faculæ, besides the solar spots. Mr. Nasmyth thinks that these irregular forms resemble willow leaves. I have not seen that, but I have seen in the sun what seemed irregular masses, dark spaces, and here and there apparently little holes.

The bright spots, called faculæ, are elevations on the solar surface. But the most remarkable objects on the surface of the sun are the spots; they are far more striking than the faculæ, and this before you (pointing to the diagram) may be taken as a good example or type of such spot, fairly formed and well established. In the center of it is a dark spot looking like a hole. The holes are not usually uniformly dark; there are usually little bays formed in the surrounding region; the edges of these are sharply defined, with no shading. Around this center, called the umbra, there is a wide border called the penumbra, almost invariably darker toward its outside edge, and striped radially. This hole—the umbra, if it be a hole—is so large that the earth might be dropped through into it without touching its edge. It is over 12,000 miles in diameter. The faculæ are always very numerous near the spot. Where the faculæ comes to the edge, there is a little projection. As to the nature of the

SUN SPOTS,

it is absolutely certain that the dark centers are depressed below the solar surface, but whether they are holes through to the body of the sun is another question, but they are cavities when the spot is first formed. You do not see the umbra, but the penumbra. To talk of temperate zones in a body as hot as the sun seems strange, but the spots are found in the temperate zones. They are not common in the sun's equator, or more than 30° from the equator. Rare examples have been found at 40° or 45° from it.

VARIATIONS OF SUN SPOTS.

The most curious thing about them is that they are not equally frequent in different years, and are regular in their irregularity or periodicity. After appearing in great force, they become infrequent for three years; then they gradually increase in number until, in about ten years from the first period or maximum frequency, they are again abundant. Sometimes as many as 400 or 500 separate groups of spots have been remarked upon the sun in a single year, and again there is a year when spots are few, and there may not be more than 80 or 100 in a year; so that in the year of maximum spot-frequency, the number is four times as great as on the year of minimum frequency. The cause of this is not yet known, but it is surmised that it is connected with the motions of Mercury, Venus and Jupiter, though it is probably due to a periodical boiling over of the vast caldron. When we examine the sun with the spectroscope, we find outward motion. Under the cloudy surface there is an ocean of liquid, and slags are formed in this ocean, and there is a blowing out of matter which gives rise to the penumbral phenomenon. There is undoubtedly an underfeed from the outside toward the center, but whether by a rush downward from the center of the spot, I cannot say. The English astronomers believe it is from the outside atmosphere to the center of the spot.

Professor Young then proceeded to explain and illustrate by diagrams on the screen, the solar prominences and their spectra. Fig. 3 is a representation of the sun with chromosphere and prominences, showing the relative magnitudes of the latter as compared with the sun, and also their number. The inner circular line is the boundary of the sun proper as distinguished from the chromosphere. The remainder of the lecture was devoted to the description of eclipses and the lecturer's observation of phenomena, the details of which have already appeared in our columns.

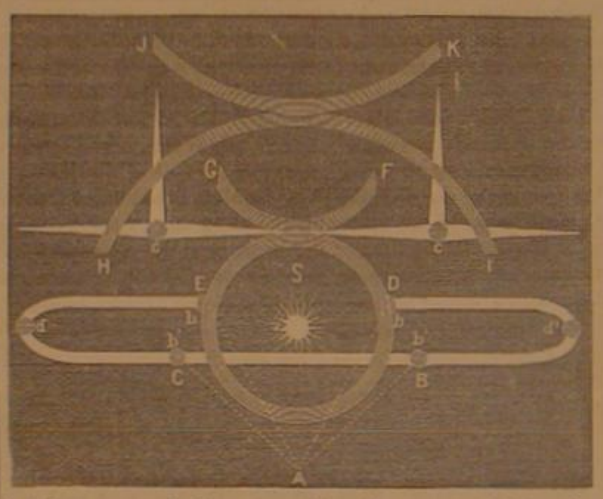
Correspondence.

Extraordinary Parhelia observed at Independence, Mo.

To the Editor of the Scientific American:

The inclosed diagram represents phenomena that occurred here on Saturday, January 25, at 9 o'clock A. M. In order that it may be better understood and more highly appreciated, it will be necessary to give some few points of description.

A is the place of observation; S the sun, E D a circle around the sun, or rainbow; F G is what we term the first reverse circle or rainbow; H I is a second circle or rainbow, whose brilliancy is cut short by the bright silvery belt, D B C E, which extends the whole heavens around, from east to west, in a plane, the night of the sun, and parallel to the plane of the horizon, having its origin in the two dazzlingly brilliant sun dogs, or false suns, *b b*; J K is the second reverse rainbow, which was the most brilliant of all. The observations A B and A C, are west, and point to two very bright sun dogs, *b' b'*, which seem to correspond to D E in the east. *d* and *d'* are in the north and south, and quite bright also. But what is more singular, two more are at *c c*,



but they are much the same as the others, except *b b*, in color, being bright and silvery; and emanating from each, at right angles, are the silvery bright streaks shown in the figure, which neither absorb nor are absorbed by the semicircle, H I, but cross and produce the remarkably beautiful figure as seen in the misty clouds that morning. J K is a remarkably brilliant rainbow. E G is not so brilliant in the rainbow as J K, but is made dazzlingly bright at the point of contact with E D, by the two streaks from *c c*. Part of the circle, E D, is very brilliant, and H I is nearly as distinct, if not more so. The two sun dogs, *b b*, were fiery red around the edges, and some colors of the bow attend, which made them dazzlingly brilliant. One very singular thing about it was the appearance of the entire upper part of the figure in a plane, horizontal to D B C E, instead of in a vertical one, as is usually seen in rainbows. The background for the streaks proceeding from *c c* was a dark hazy blue, somewhat deeper than a sky blue.

The segment of the arc, J K, was apparently 90°; that of H I, 125°. Radius of H I seemed about 1,000 feet; J K, 750 feet; F G, 375 feet, and E D, 500 feet. The citizens here desire you to give or explain the philosophy of every part of the whole thing, either through your columns or by private letters. As we think it would be a very interesting matter to many of your readers, we hope you will insert the diagram and an explanation in your valuable paper.

The sky was, generally, slightly cloudy, hazy, and misty, and the earth was, and had been for some time, deeply covered with snow.

Will you please explain, particularly, the reversion of these rainbows? Some parts we understand, but what we want is an explanation of the whole thing as it was seen. The extreme upper part of the figure was east of a vertical line, and the whole was northwest of the sun's position.

D. M. WOODSON.

Independence, Mo.

REMARKS BY THE EDITOR.—When the sun is seen in a clear sky, the luminous disk is visible to us without any attendant phenomena; but if the air is loaded with moisture, or there are other favorable conditions, a great variety of phenomena present themselves and become the subject of investigation and study. The name halo is given indiscriminately to the circles which appear around the sun and the moon, and, for the purposes of precision, it has been proposed to call the rings about the sun "parhelia," and those about the moon, "paraselenæ." The parhelia witnessed at Independence were of rare occurrence, and we can only give the explanation of the phenomena that has been propounded by Newton and accepted by other philosophers. In cold weather, when particles of ice are floating in the higher regions, the sun is sometimes surrounded with the most complicated rings, circles, and mock suns, formed at the points where these circles intersect each other. Sir Isaac Newton considered the rings as produced by the light passing through very small drops of water, in the same manner as colors are produced by thin plates. Descartes supposed that the halos were due to refraction, through crystals of ice and snow floating in the air. The same view was taken by Mariotte, Young, Cavendish, and Brewster. In order to explain the larger halo, Dr. Young supposes that the rays which have been once refracted by the ice prisms fall on other prisms, and the effect is doubled by a second refraction, so as to produce a deviation of 90°. This explanation is not accepted by Brewster, who thinks that the external halo may be produced by the refraction of the rectangular terminations of crystals. All parties agree that such phenomena as were observed at Independence, Mo., are due to solid particles of ice floating in the higher regions of the air, and that refraction through ice prisms is the primitive cause. The air has been unusually charged with frozen water this winter, and an extraordinary number of halos, around the moon as well as around the sun, have been observed. On Lake Superior, the sun has been known to sink below the horizon and then to come up again to view, owing to a sudden change in the refracting medium through which the light passed. At Independence there was an unusual number of mock suns; but the other features of the parhelia were the same as have been pictured and described in works on natural philosophy. In fact, our correspondent will find in Brewster's "Treatise on Optics," two diagrams, one of parhelia and the other of paraselenæ, witnessed in 1630, which coincide very closely with the drawing shown by our engraving. The explanation of the whole set of phenomena is, therefore, resolvable into this, that the light was doubly refracted by ice prisms floating in the air, the sun being at a convenient hight above the horizon to produce the best effect. Experiments to prove the accuracy of this theory have been prepared and shown in the lecture rooms of professors of physics; and until a better explanation is offered, we prefer to abide by the above decision.

A Brilliant Meteor in Massachusetts.

To the Editor of the Scientific American:

I notice in your journal mention of meteors seen in Mason City, Ill., and in England, and the perusal calls to my mind a very sharp flash seen on the evening of January 11, 1873. It was caused by a large ball of fire, about the size of a bushel basket; it fell in Tyngsboro', Mass., some 6 or 7 miles from Lowell, on the Boston, Lowell, and Nashua Railroad. The flash was seen some twenty-five miles all around, and a dull rumbling sound was heard. It fell near or upon the railroad track, just in advance of an approaching passenger train, and caused quite a panic among the passengers, for a short time, until the conductor could satisfy them that there was no danger in proceeding. W. H. R.

Lowell, Mass.

Tree Transplantation.

To the Editor of the Scientific American:

On page 37 of your current volume some one says: "Most persons make a fatal mistake in trimming trees when transplanted. Never cut off a limb or a twig till they (the trees) have a secure foothold."

This advice, in the SCIENTIFIC AMERICAN, at once becomes a powerful influence. Whatever affects the tree-planting interest is of national importance; and I think I can show by reasons sufficient, as I could by the experience of all successful tree planters, that the advice referred to is radically wrong, and should read: "Always cut down the top of a tree transplanted, so that the relative proportion be preserved between roots and branches."

A tree to secure a foothold in its new bed must make a new growth of wood both at the top and root; otherwise death results in all cases after transplantation. Most trees lose, in transplanting, the larger portion of their roots; how does this operate when the top is left of full size and untrimmed? The leaves come out full with the advent of spring; and it takes all the nourishment supplied by the remaining roots to support the leaves, and no new wood is made.

If the top of the tree is cut down and the leaf buds destroyed, then, of necessity, in order to put forth leaves, there must be a new woody growth; when this occurs, there is always a corresponding root growth, and thus a foothold is secured. Many trees, like the sugar maple, only make wood during a brief period in spring; consequently, if transplanted with ever so much care after this season, they invariably die.

A tree which continues making wood during the entire season, like the willow and locust, can with care be transplanted at any time; but it may be set down as a rule, with but few exceptions, that deciduous trees should only be transplanted when bare of leaves, and then the top left must be proportioned to the root.

To further illustrate the fallacy of the no trimming theory, suppose that in putting out cuttings, as of the cotton wood or willow, a top was left. Does any one suppose that a new root would be formed? It is the growth of the new top that is accompanied by new root growth; in fact they are inseparable. The everywhere popular white elm and sugar maple, although exceedingly difficult to transplant successfully with large tops, will generally live and grow if every branch is cut off and the short bare poles only set. E.H.R.

A Spider Balloon.

To the Editor of the Scientific American:

If a description of a spider balloon will be of any interest to your readers, I will endeavor to give you particulars of one that I saw on the 10th of last October. It was a very calm and pleasant day, and not a breeze disturbed the still waters of Lake Seneca. In company with others I was crossing the lake, and when near the center one of the party noticed and called our attention to a small wake, caused by the moving of some insects; and with some difficulty we succeeded in gaining a point where we could see that they were spiders, three in number, gliding at a rapid rate over the smooth surface of the water; and we were much surprised to see a single thread, the size of a knitting needle, extending in the air to the hight of thirty feet, at an angle of sixty degrees, terminating with an enormous balloon-shaped web. I should think that it was eight feet long and five feet wide, with stays fastened to the main thread, something similar to those of a balloon; and it was managed, apparently, by an innumerable number of these insects stationed at proper intervals. Wishing to obtain a closer view, we undertook to approach it; but when we were within a few feet, it began to rise, though the last spider, which proved to be about the size of a house fly, was brought back by the stroke of an oar. The balloon went onward and upward until it was lost to sight. Whether this is a mode of travel peculiar to spiders, and how the balloon is kept in its proper shape, I am at a loss to know; and I should be glad to have an opinion.

Rock Stream, N. Y. C. F. HATHAWAY.

Heating of Journals.

To the Editor of the Scientific American:

I take great interest in reading the various articles in your paper, especially under the head of "Answers to Correspondents." I have watched the discussion lately in regard to running and standing balance, and last week I was called to look at an engine which was heating in the journals of the main shaft to such an extent that water had to be used to cool them off. I found the fly wheel about ¼ of an inch out of truth edgeways, the key being imperfectly fitted. The shaft was about 7 feet long and 5 inches in diameter, and the wheel, 10 feet in diameter. After properly fitting the key and trueing the wheel, I found the tendency of the shaft to "wobble" had disappeared; and after a few days of careful usage, the engine ran quietly and the bearings were cool.

C. C. C.

Spinning Cotton in the South.

To the Editor of the Scientific American:

In your issue of January 25, a correspondent from Aiken, S. C., mentions the necessity for a machine to spin cotton, that can be operated by the same power which gins the cotton in the Southern States.

This reminds me that, about thirty-five years since, some one introduced in this section a machine worked by hand, which ginned the cotton and spun it into yarns. These machines were usually placed in the hands of slaves and soon became worthless. Now is it not possible that some scientific mechanic might so enlarge and improve this machine as to make it available for the purpose suggested?

Warthen's Store, Ga. JOHN H. WALKER.

Powder versus Dynamite.

The explosive power of dynamite as compared to that of blasting powder is 2⅔ to 1, that is to say, the same quantity of dynamite will do 2⅔ times the work of powder. At the calamine mines of Chrzanow, the working effect of each hewer, driving in hard dolomite rock, is in an eight hours shift 6·5 cubic feet with dynamite against 3·5 to 4 cubic feet with powder, and when using the former each man can bore and fire three holes of 16 inches against two with powder. The explosion of dynamite is very sudden, and the rock is far more shattered by it, without being projected, as is the case with powder. At the tin mines of Graupen, in Bohemia, dynamite only shows a decided advantage when deep bore holes can be used, but it is unquestionable that in water-bearing rocks, when a charge of dynamite has never failed when judiciously treated, it is considered as much safer than powder. When sinking a round shaft of 12 feet diameter at the Britannia colliery, near Mariaschein, in Bohemia, through a bed of very hard and tough clay, another explosive, "haloxyline," was employed. Three holes of 30 to 40 inches were bored in the bottom of the shaft, and inclined to the sides of the shaft with an angle of 60°. They were charged each with 3·5 ounces of haloxyline, and fired simultaneously by electricity, when the whole mass of the rock, about 226 cubic feet, covering the area of the shaft, and to the depth of the holes, was so completely shattered that it could be easily removed.

A New Paper.

Iron, the Journal of Science, Metals and Manufactures, is the name of a new first class weekly paper, of large size, which made its appearance in London, on the 1st of January. It is devoted chiefly to iron-producing interests and iron manufactures, including also other metals. The numbers before us give evidence of marked ability in the editorship of every department, and the paper promises to be a most valuable addition to the ranks of scientific and special journals.

AN old colored minister, in a sermon on hell, pictured it as a region of ice and snow, where the damned froze throughout eternity. When privately asked his purpose in representing Gehenna in this way, he said: "I don't dare to tell dem people nuffin else. Why, if I were to say dat hell was warm, some o' dem old rhumatic niggas would be wantin' to start down dar de bery fust frost!"

How to Search for Metals.

SEARCHING FOR GOLD.

The paying localities of gold deposits are the slopes of the Rocky and Alleghany Mountains. Gold need not be looked for in the anthracite and bituminous coal fields, nor in limestone rock. It is seldom found in the beds of rivers. The thing itself is the surest indication of its existence. If soil or sand is washed, and the particles of gold are not heavy enough to remain at the bottom, but float away, the bed will not pay.

Along streams rather high up among the mountains, and in the gravelly drift covering the slopes of the valley below, are the best prospects. Where the stream meets an obstacle in its path, or makes a bend, or has deep holes, there we may look for "pockets" of gold. Black or red sands are usually richest. Gold-bearing rock is a slate or granite abounding in rusty-looking quartz veins, the latter containing iron pyrites or cavities. Almost all iron pyrites and silver ores may be worked for gold. When the quartz veins are thin and numerous rather than massive, and lie near the surface, they are considered most profitable. Few veins can be worked with profit very far down. As traces of gold may be found almost everywhere, no one should indulge in speculation before calculating the percentage and the cost of extraction. Gold hunting, after all, is a lottery with more blanks than prizes.

The substances most frequently mistaken for gold are iron pyrites, copper pyrites, and mica. The precious metal is easily distinguished from these by its malleability (flattening under the hammer) and its great weight, sinking rapidly in water.

SEARCHING FOR SILVER.

This metal is usually found with lead ore and native copper. Slates and sandstones intersected by igneous rocks, as trap and porphyry, are good localities. Pure silver is often found in or near iron ores and the dark brown zinc blende. The Colorado silver lodes are porous at the surface and colored more or less red or green. Any rock suspected of containing silver should be powdered and dissolved in nitric acid. Pour off the liquid and add to it a solution of salt. If a white powder falls to the bottom, which, upon exposure, turns black, there is silver in it. Silver mines increase in value as in depth, whereas gold diminishes as we descend.

SEARCHING FOR COPPER.

The copper ores, after exposure, or after being dipped in vinegar, are almost invariably green on the surface. They are most abundant near trap dykes. The pyrites are generally found in lead mines, and in granite and clay slate. Copper very rarely occurs in the new formations, as along the Atlantic and Gulf borders, and in the Mississippi valley south of Cairo.

SEARCHING FOR LEAD.

Lead is seldom discovered in the surface soil. It is also in vain to look for it in the coal region and along the coast. It must be sought in steep hills, in limestone and slate rocks. A surface cut by frequent ravines, or covered by vegetation in lines, indicates mineral crevices. The galena from the slate is said to contain more silver than that from the limestone. The purest specimens of galena are poorest in silver; the small veins are richest in the more precious metal. A lead vein is thickest in limestone, thinner in sandstone, and thinnest in slate.

SEARCHING FOR IRON.

Any heavy mineral of a black, brown, red, or yellow color may be suspected to be iron. To prove it, dissolve some in oil of vitriol and pour in an infusion of nut gall or oak bark; if it turns black, iron is present. If a tun of rich magnetic ore costs more than $4 at the furnace, good hematite more than $3, and poor ores more than $1.50 or $2, they are too expensive to pay, unless iron is unusually high. Deep mining for iron is not profitable. Generally speaking, a bed of good iron ore, a foot thick, will repay the cost of stripping it of soil, etc., twelve feet thick. Red and yellow earths, called ochers, contain iron. Magnetic ore is easily found by a compass.—*Underground Treasures, by Professor James Orton.*

[Dental Cosmos.]

Treatment of Exposed Dental Pulps.

BY DR. C. E. FRANCIS.

If, by any unlucky turn of the excavator, a healthy pulp gets suddenly uncovered and wounded, there is no necessity for destroying its vitality. Proper care and gentle treatment will almost invariably save it. Indeed, we have but to prevent inflammation by keeping away irritating agents, and the pulp will soon heal by first intention and deposit a sufficient amount of calciferous matter to fill the breach, and thus protect itself. Now let us see how this may be accomplished. If the tooth is aching, apply just sufficient carbolic acid to allay the pain; then cover with a small cap of note paper, and carefully fill with a tolerably thick paste of oxychloride of zinc. This has been my method for several years, as has been repeatedly stated and published. I have found, however, that though protected in this manner, pulps would sometimes become irritated by the application of the zinc, thus endangering their vitality. Recently I have overcome this trouble, and now have little fear of such danger. After applying the carbolic acid, and carefully mopping out the excess with a bit of soft spunk, I cover one side of the paper cap with a solution of balsam of fir with chloroform, and place it gently over the wound. The chloroform quickly evaporates and leaves a smooth, glossy coating of soothing balsam, which perfectly protects the pulp and holds the paper snugly in its position. The coating cannot be permeated by the muriate of zinc, and consequently bids it defiance.

Having given reasons for using the balsam, let us consider the benefit derived from the use of the paper "cap." Cut from note paper, it is smooth and of just the thickness to be manageable, and is the best substance of the same bulk for protecting the pulp from thermal shocks that can be used.

As for the zinc, its office is purely mechanical. It simply makes a good, firm cover to the pulp, and a floor or foundation for a gold filling. Some individuals seem to imagine that oxychloride of zinc possesses some medicinal virtue that acts with magic influence upon an exposed pulp. No such thing! Despite its "antiseptic properties," it tends to irritate wherever applied, and endangers the vitality of any pulp that it touches.

Aerial Navigation.

M. Hannel, Ingénieur des Arts et Manufactures, lately presented to the French Aëronautical Society some observations upon the flight of birds, which are worth noticing. He assumes that, during normal flight, the speed of the center of movement of the wings is constant, and equals 1·15 meters or 3¼ feet per second. This center of movement is situated on the line which divides the triangle representing the wing in two equivalent parts. The weight which a bird can support without fatigue, may increase, according to circumstances, up to one half of its own weight; the mean value is equal to one fourth of its weight. The total load, that is to say, the weight of the bird, increased by the weight that it can carry, is thus, on an average, equal to five-fourths its proper weight. The relation between the total load and the breadth of wing is $x = y \log. 500$, or, $x = y^{2\cdot69897}$.

In this formula x represents the total load expressed in kilogrammes, and y the breadth of the wing in meters. A kilogramme is 2·2 lbs., and a meter is 1·1 yards nearly. This formula can be applied to insects as well as to birds.

Supposing this formula to hold good for all bodies passing through the air, and carrying with them their motive power, the application of it can be made to a man or a machine. For a machine weighing 3·5 tuns, the spread of wing should be 26 feet, and 6 yards for a man weighing, with the necessary appliances, 220 lbs.

The conclusions of M. Hannel have been discussed by a large number of the Society, who in the majority do not agree with them. They have been compared with those of M. Harting, according to whom the weight increases according to the cube of the lengths of the wings, modified by a coefficient which varies with different kinds of birds. M. Hannel and M. Harting do not consider the weight and spread of wings in the same manner, and they do not adopt the same speed. Besides, M. Hannel assumes a constant speed in the center of motion, an assumption which has not been proved mathematically.

Improvement in the Manufacturs of Sulphuric Acid.

The platinum vessels employed for the concentration of sulphuric acid are extremely costly. A small portion of the platinum is moreover constantly dissolved, and represents a money loss of considerable importance. Manufacturers have, for these reasons, long sought for a less costly material to replace the platinum. In 1844 M. Kulhmann, of Lille, remarked that the temperature of boiling sulphuric acid at 66° Baume, when, instead of being subjected to atmospheric pressure, it was kept almost in vacuo, was reduced from 325° to 190 or 195°. Now lead is not attacked by the acid at a temperature below 200 or 205°.

M. de Heuiptume, a manufacturing chemist of Molenbeek-Saint-Jean-les-Bruxelles, has succeeded in establishing, on a commercial footing, a process of concentration in lead vessels and in vacuo.

The vacuum is made to the degree desired by the condensation of steam injected into a cast iron boiler in communication with the concentrating vessel.

According to the calculation of M. Heuiptume, the concentration of one bottle of sulphuric acid, weighing 220 lbs., costs 17·4 cents, if effected by the platinum process, and 9·46 cents if his vacuum method be adopted. The gain therefore, resulting from this latter system would be 7·94 cents per bottle, or 44 per cent.

The Purification of Rivers.

Mr. J. J. Lundy, of Edinburgh, Scotland, recently published a pamphlet on the above topic, in which he proposes a plan which will take, from foul water, impurities of every kind, whether of sewage or of manufacturers' and dyers' waste waters.

The substance used is a peculiar kind of animal charcoal made from any substance which is not bone. It is stated to be not only a powerful decolorizer but has peculiar powers of absorbing not only organic but also inorganic substances, while it is from twenty to fifty times cheaper than ordinary bone charcoal.

In carrying out the method proposed by the author, of using this material, the sewage is caused to fall into a bed of sand which lies on a thinner bed of gravel, under which lies a bed of the charcoal. After passing through another layer of gravel, the liquid goes upward through more charcoal and flows over into a bed of sand. It is thus thoroughly filtered and purified.

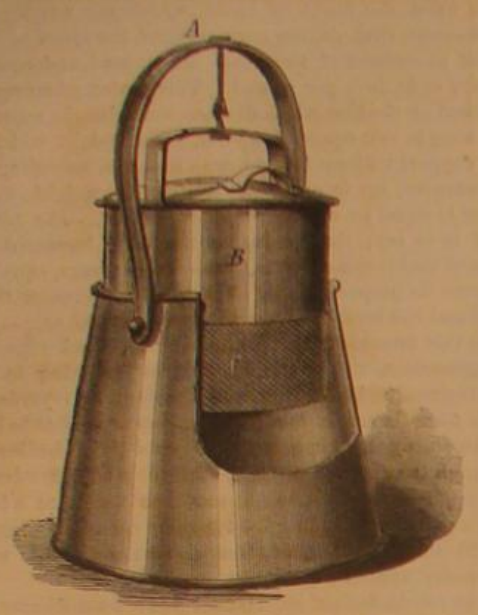
The charcoal after use may be laid aside in the open air without causing any smell, and in a little time will recover its original power, or it may be reburnt or distilled with great profit, as the whole of the nitrogen taken from the sewage would pass over in the distillation as ammonia, accompanied by other valuable products.

THE production of musical sounds from magnets, by Dr. Page, was effected in 1837.

CULINARY BOILER.

We leave the question to housekeepers generally whether, in all the varied routine of the kitchen, there is anything more extremely disagreeable—soul-trying we might say—than to elevate a heavy kettle from the range and pour off the water from its contents, thereby scalding one's fingers or, in an unguarded moment, dumping the cooked articles into the sink. With the presumption that the universal response will be that there is not, we present an illustration of an invention which, by the simplest possible method, does away with the whole difficulty.

Here is a large kettle having a curved bale, A. Within is a smaller vessel, B, having a cover and bale, the lower part of which, C, instead of being solid, is perforated. This inner kettle has a flange around its top so that it fits closely into and on the outer vessel.



Water is placed in the large kettle, and the thing to be cooked in the small one, which, of course, is tightly covered, and set down in place. Then, when the boiling is finished, the inside kettle is lifted by its bale and hung by a hook to a swivel attached to the bale of the outer vessel in the position shown in our engraving, and there it is left until its contents are properly drained or steamed.

Ruth Russell, of 132 Union street, New Bedford, Mass., is the lady to whom the credit of this excellent little invention is due, and from her further particulars may be obtained. Patented January 2, 1872.

Statue of Elias Howe, Jr.

The model for the statue of the inventor of the sewing machine, Elias Howe, which is to be placed in the Central Park in this city, is now complete. It is the design of Mr. Ellis. The work is eight feet in hight and the tall figure stands erect, the weight of the body resting on the left foot. In the right leg a certain stiffness is noticeable, and the knees are closer together than perfect proportion sanctions. These peculiarities, however, belonged to Mr. Howe's physique, and demand recognition in any honest portrait of him. The right hand holds a walking stick, the left a broad brimmed hat. The costume is simply a reproduction of that of the ordinary man of business in the upper walks of life. The long and many-ringleted hair, which constituted so impressive a *chevelure*, is exceedingly well rendered, and the countenance expresses that intrepidity, obstinacy, patience, honesty and hope which sustained the inventor of the sewing machine through the quarter of a century through which he toiled to obtain permanent success. The statue is to be cast in bronze in Philadelphia, and is to be ready in May next. Three bas-reliefs are to adorn the pedestal. One of these is to illustrate the misery of the pre-sewing machine needlewoman, as indicated in Hood's "Song of the Shirt." The second will show Elias Howe, Jr., in his workshop pondering over his first machine. The third will indicate the perfected instrument under the easy manipulation of the average worker. These bas-reliefs will adorn three sides of the pedestal. An inscription will probably find place on the fourth.

Magnetic Iron.

Magnetic iron ore, or "magnetite," received its name in early times from its magnetic properties. A mass of the ore influences the needle at a great distance. The magnetism of the ore is polar, the same side which repels one end of the needle attracting the other, and *vice versâ* with the other side. It crystalizes in the cubical system, the octahedron and rhombic dodecahedron being common forms. It occurs in Sweden, Norway, the Ural Mountains, etc., and on a very much smaller scale in England. In the southeast corner of Dartmoor, a band of this kind of ore deranges a compass as it is carried past its vicinity, and sailors say that there is a place in Cardigan Bay where, on passing a reef of rocks, the needle is influenced, and set oscillating. A large mass of this deposit in the southeast extremity of the Island of Elba has a similar effect; in Sweden, too, deposits are discovered by means of this property. Meteorites frequently contain a percentage of iron greater than magnetite, associated with nickel and chrysolite in some cases; but the rarity of their occurrence precludes them from being classed as iron ores, by which term we understand a mineral containing iron in sufficient quantity to be economically and advantageously extracted.

OSCILLATING PUMP.

The accompanying engravings represent a new form of oscillating pump, the novelty of which consists in the use of a section of a hollow cylinder, oscillating on its longitudinal axis, in connection with a stationary packing and suitably arranged valves. By this construction it is claimed that increased efficiency of working parts is obtained, and that the usual boring out and much of the necessary fitting, incident to pumps of this class, are dispensed with.

Fig. 1

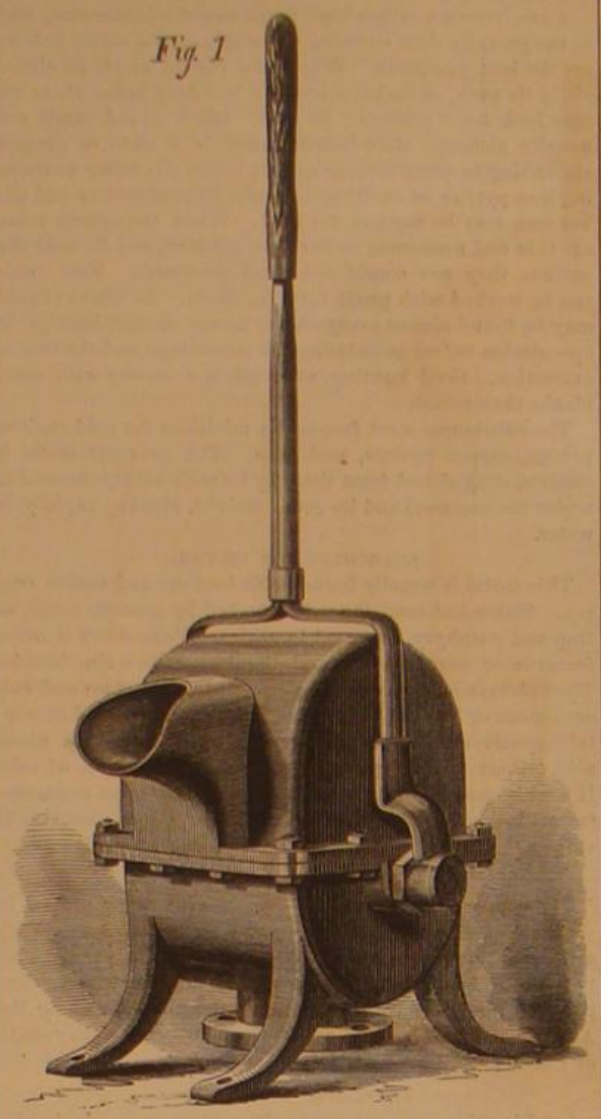
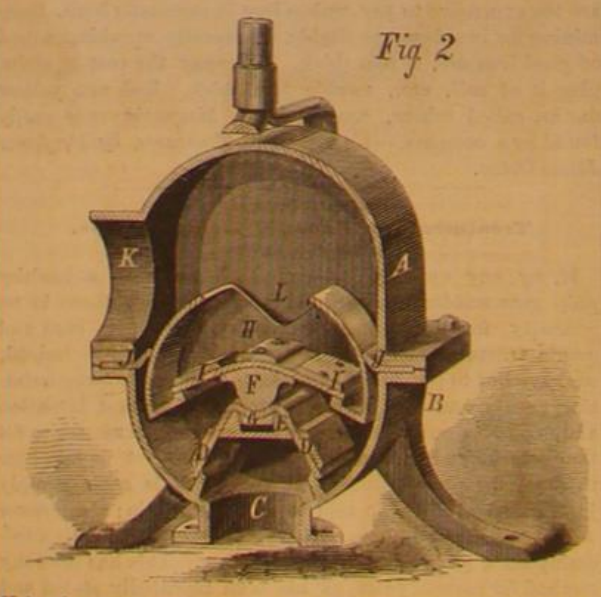


Fig. 1 affords a perspective view of the device, and Fig. 2, a representation of the interior portions. A and B are the two sections of the shell or outer casing, each provided with a flange and bolted together to form an oblong cylinder with closed ends. C is the induction chamber, in which are valves opening upwards. The leather forming these valves is in one piece, passing over the abutment, E, thereby packing the joint between it and the shaft, F. G is a plate supported on springs in a groove in the abutment and serves to hold the leather in close contact with the shaft. H is a sectional hollow cylinder connected to the shaft, F, by plates through which are ports, closed by the valves, I I, opening upwards.

The joint between the sections, A and B, is packed with leather, the inner edges of which are turned up as shown at J J, and, resting against the periphery of the cylinder, H, serve also as packing between said cylinder and the casing.

Fig 2



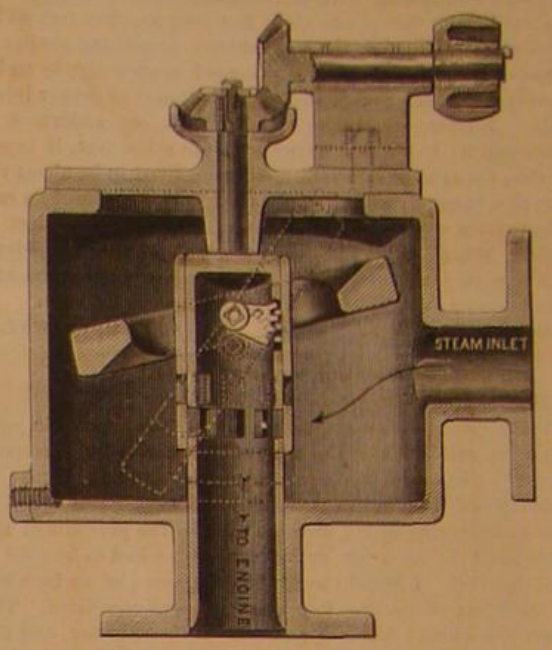
K is the discharge opening leading from the air chamber formed by the upper portion of the section, A The outer ends of the shaft, F, are squared to receive a handle, as shown, by which the cylinder, H, is caused to oscillate in its bearings. By this means, through the action of the valves, I I, the water is drawn into the interior of the cylinder, whence it passes through the opening, L, and finally escapes from the discharge, K.

The invention, as is evident from the illustration, is very simple in construction. The cylinder, H, is turned off with great facility, and as the two sections of the case are cast separately, each in a single piece, little is required beyond attaching the lower valves and bolting the flanges together. By removing the top section, the entire working parts are exposed for examination and repair.

Patented November 12, 1872. For further information address Messrs. Murrill & Keizer, machinists, No. 44 Holliday street, Baltimore, Md.

NEW GYROSCOPE GOVERNOR.

The accompanying plan of a recently invented gyroscopic governor, which we find in *Engineering*, is simple in form and very sensitive in action. The device is contained in a casing in which the steam from the boiler enters, as shown. Motion is obtained from the bevel gearing, the horizontal wheel of which is keyed to a spindle which passes through the top of the case. This spindle is made in a single piece with the tubular portion represented as extending down into the pipe through which the steam passes. The upper end of this tubular casting is closed, and being caused to fit tightly, by the pressure of the steam, against the lower extremity of the socket through which the spindle enters the casing, a steam-tight joint is obtained without employing a stuffing box.



A brass sleeve, sliding freely on the tubular casting has formed in it a number of ports which, when the sleeve is in a certain position, correspond to similar orifices in the casting. When the two sets of ports correspond, the steam has clear passage to the engine, but as the sleeve is raised the apertures are more or less closed until the steam way is shut off altogether. Upon a spindle which passes transversely through the sleeve and casting, is mounted a heavy "flyer," of the form shown in the cut. The spindle is attached to the sleeve and rises and falls with it, oblong holes being made in the casting to allow of such motion. At the center of the spindle is a quadrant which gears in a rack inside the tubular casting.

Suppose the various parts to be in the position indicated by the dotted lines, and the steam way full open. When the governor is set in motion, the flyer will become nearly horizontal, and in assuming such position will cause the spindle and its quadrant to partially rotate. The effect is to cause the latter to climb up the rack, lifting with it the spindle and consequently the flyer and sleeve. This motion, of course, closes the steam ports to a greater or less degree. It will be seen that the principle of the device is to oppose the constant weight of the flyer and sliding sleeve to the centrifugal force.

British Iron Manufacture in 1872.

According to *Iron*, the most noteworthy events connected with the British iron manufacture, for 1872, were the practical introduction in England of two American inventions by which the business is being rapidly revolutionized. We allude to the Rotating Puddling Furnace of Samuel Danks, of Cincinnati, Ohio, and the Chemical Puddling process of James Henderson, of New York city.

The latter consists in treating the molten iron with fluorine, by which all impurities are quickly eliminated. The common cinder ore, which the ironmasters in this country have heretofore been accustomed to haul out at much expense and throw away, will, when remelted and Hendersonized, yield fifty-five per cent of the very finest quality of iron. The great masses of this refuse, which surround the vicinity of nearly all iron works, are, by this new process, converted into deposits of precious value. One establishment in this country is said to have enough of this refuse at its doors to yield a profit of six millions of dollars over all expenses of re-working. The Henderson process produces pure iron, no matter what may be the impurities of the pig, whether phosphorus, sulphur, manganese, carbon or silicium. Even from iron pyrites the process brings out pure metal.

EBONY wood weighs eighty-three pounds to the cubic foot; *lignum vitæ*, the same; hickory, fifty-two pounds; birch, forty-five pounds; beech, forty; yellow pine, thirty-eight; white pine, twenty-five; cork, fifteen; and water, sixty-two.

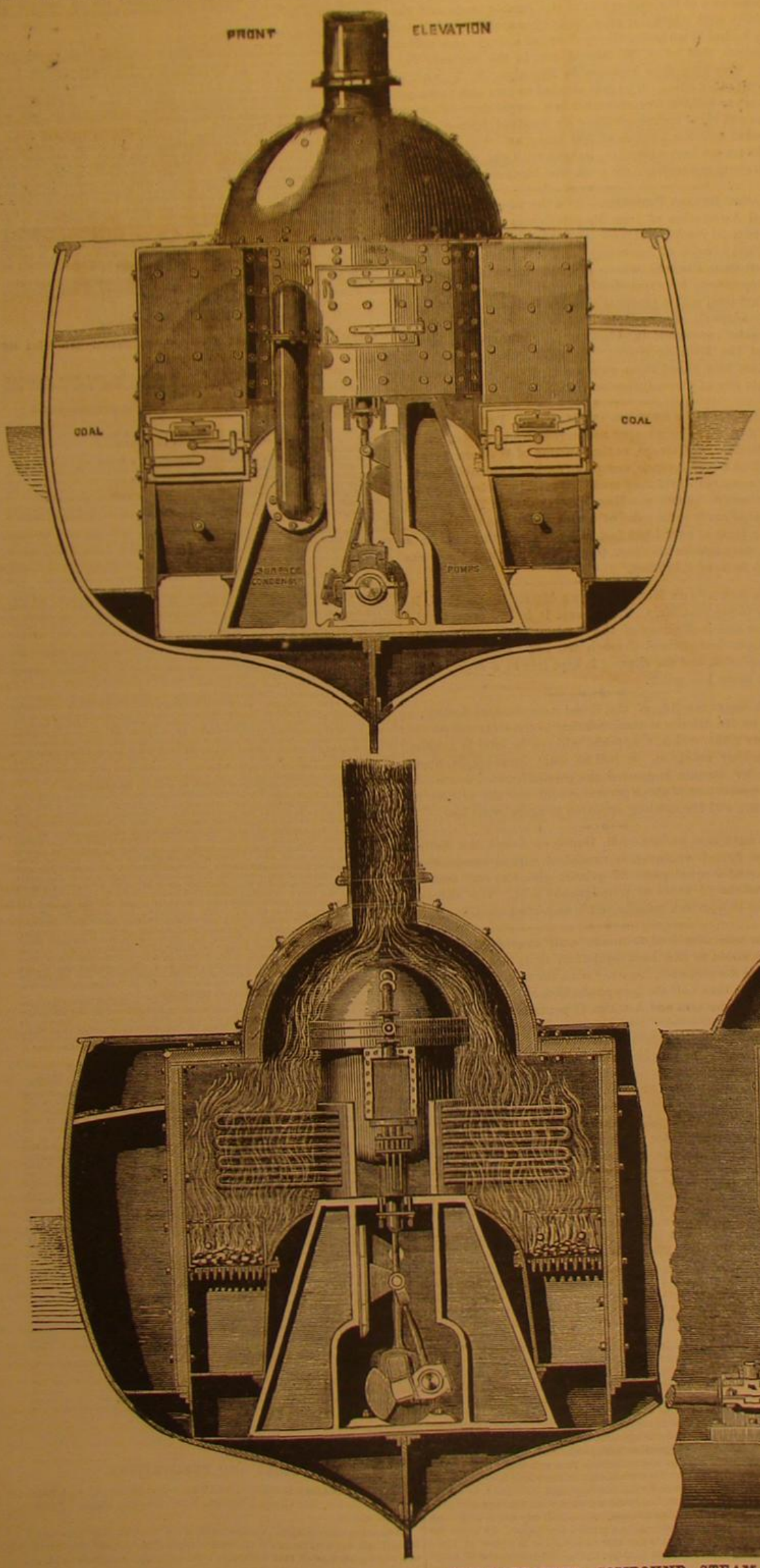
THE Managers of the Nashville Industrial Exposition announce their third annual display, to take place during the whole of the month of May, 1873. Buildings have been erected specially for this exhibition, and the departments have been increased in number and extended in range. For further information, see our advertising columns.

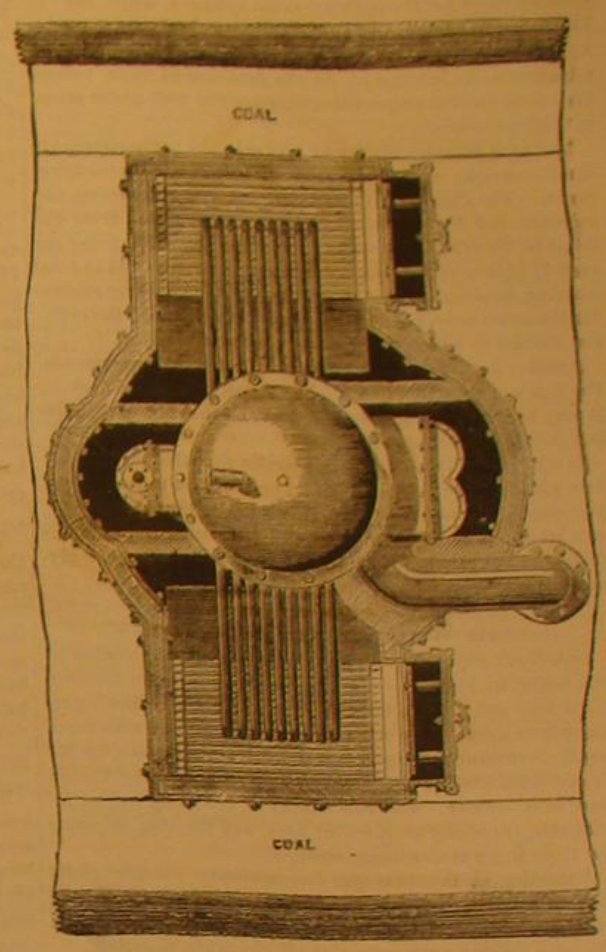
NON-RADIATING STEAM ENGINE.

The illustrations which we herewith give have been prepared for the inventors, Messrs. Moy & Shilly, by Mr. N. P. Burgh, and show the machinery as fitted in a 17 ton yacht. We wish it to be understood, says *The Engineer*, from which we quote, that for the present we *prefer* to reserve all expression of opinion as to the merit of the invention other than is contained in the statement that the principle adopted by the inventors is apparently consistent with the conditions essential to obtaining high economy of fuel. The difficulties which the inventors will have to contend with lie in devising such a mode of construction as will prevent the engine from being destroyed by the high temperature and excessive dryness of the fluid by which it is worked, which fluid is essentially what has been well termed, by the late Professor Rankine, "steam gas," which is a very different thing from ordinary saturated steam.

It will be seen that the engine *proper* is constructed on the compound principle, with two cylinders. These, with a portion of the boiler, are made in one casting. The heating surface is supplied by a number of horizontal ⊃ tubes projecting from that portion of the boiler which surrounds the cylinders. The boiler and cylinders are together included within an iron casing lined with fire brick, which also includes the furnace, as will be readily understood from a glance at our engraving, and the course taken by the products of combustion, will be easily comprehended. By thus putting the cylinders in the boiler, and the whole boiler in the furnace, radiation of heat is of course practically prevented, and for this reason the title of non-radiating engine has been selected by the inventors.

The engine we illustrate is nominally 10 horse power, but it is anticipated that the efficiency of the steam will be so





NON-RADIATING COMPOUND STEAM ENGINE.

great that it can be worked up to 100 indicated horse power.

The high pressure cylinder is 6 inches in diameter, and the low pressure cylinder 15 inches in diameter, the stroke of the pistons being 12 inches, and their depths or thickness 6 inches, because the lowest working pressure of the steam is 200 lbs. on the square inch, and the highest pressure, 400 lbs. on the square inch in the small cylinder. It will be noticed that the pistons have no rings or springs, but grooves are formed in them to keep them tight on a well known principle. [Patented by Wm. S. Gale, of New York city, July 21, 1857.] The cylinders have wrought iron liners for the purpose of renewal and strength.

The steam valves are cylindrical, with the ports cut out as required; the steam or cut-off valve is fitted in the larger or exhaust valve for the high pressure cylinder, while, for the low pressure engine, two single cylindrical valves are used—half cut in two for the exhaust. Mr. Burgh has had some experience, he informs us, in the working of those valves, and, with careful proportions, they answer well under steam of high pressure.

The next features worthy of notice in the arrangement are the dimensions over all, in proportion to the indicated horse power. The diameter of the boiler or casing inclosing the cylinders is 2 feet 5½ inches, and the total depth from the dome to the stuffing boxes is 3 feet 3 inches. The tubes are each 1⅛ inches outside diameter, 2 feet long, and 144 in total number, making an area of 122 square feet heating surface for the tubes only, to say nothing of the surface of the cylinder casing, to which the tubes are secured.

Another matter the inventors claim is that, in large vessels, the stoking, with inverted engines, is on the second deck, or it may be often on the weather deck, so that hot stokeholes low down in a ship are eliminated.

It will probably be found in practice that the heating surface provided is too small; but let opinions on the subject of proportion be what they may, it is certain that the scheme, as a whole, is sufficiently novel and promising in numerous respects to entitle it to the prominence which we have given to it.

Salt Water for New York City.

New York city, it is well known, is almost surrounded by salt water, as it occupies a tongue of land, some fourteen miles long and about a mile broad, the sea water flowing up along both sides. The city is at present supplied with fresh water, for extinguishing fires and all other purposes, by the Croton Aqueduct, 42 miles long, which conducts the Croton river into the city. But this supply is becoming rather inadequate, especially in cases of fires, and the idea of using the river water is now being studied.

A meeting of the municipal Committee to consider plans on this subject, was lately held. One proposition was to provide a series of floating fire engines to patrol around the city, and throw up water from the docks when required.

Thomas Miller's plan was that water should be drawn from the river and forced into a column or receiver by a pair of heavy duplex pumps. The water would be carried into the sewers by the overflow when the column was full, and when the pumps were working at full speed the thirteen inch supply pipe would provide more water than the 22½ inch fire nozzle could draw off. A house would be built around the base of the column for the purpose of keeping hose carts ready for use at any time. The upper part of the building would be reserved for the use of the employees. The streets could be excavated, pipes be laid from the river and the whole plan be carried out within eight months, at a cost of from $160,000 to $180,000.

William Nelson, Jr., proposed that pipes should be laid from river to river every ten streets below Fourteenth street, beneath the surface of the river, so that there would always be a supply of water. The cost would be about $10 a foot.

Captain Hugh McKay submitted a plan whereby salt water, as the tide ebbs and flows, may be forced into towers or reservoirs, placed on the wharves.

A Simple Method of Warming Greenhouses.

The London *Grocer* suggests that greenhouses, containing half-hardy plants and in which no regular method of heating exists, may be warmed even during a hard frost by lighting and distributing a dozen or so common oil lamps, at convenient localities. In selecting these lamps they should be chosen with vases large in proportion to the size of the flat wick, in order that they may continue burning all night without refilling or other attention. It will be readily understood that, whether one or many lamps are used, the total amount of heat given off is proportionate to the quantity of oil burned, provided the combustion is complete. And in using a lamp, all the heat of combustion is utilized; none goes up the flue as with stoves or fire places.

The same journal, we notice, refers to Pratt's Astral Oil as a very carefully and skilfully refined petroleum product. As this material, in addition to other advantages, possesses that of safety, it would be especially suitable for use as above described.

SWEDEN is taking her place among inventive nations. Some very ingenious and useful inventions have recently been sent to this country to be patented. During the past week we have filed in the Patent Office applications from two different parties, natives of Sweden, and have since received instructions to prepare a third case, the latter the invention of a Swedish lady, residing in Stockholm.

A LARGE WATER WHEEL.—A correspondent, R. H. D., reminds us that there is at Rockville, Conn., a breast water wheel 55½ feet in diameter and 10 feet wide.

Cheap Postage Coming.

We recently chronicled the passage of a law abolishing the franking privilege, as a result whereof a reduction of postage was expected. We are glad to say that the House of Representatives has recently passed a bill reducing the postage on all letters from three to two cents. We earnestly hope that the Senate will also pass the bill, so that it may be come a law.

The bill also provides that newspapers shall be prepaid at the office where mailed.

The Way the Forests Go.

Some idea of the vast extent of the lumber trade and the rapidity with which our great forest trees are being consumed may be had if we notice the products of a single saw mill in Michigan, that of A. W. Sage & Co., in the Saginaw Valley. This firm does business in Brooklyn, N. Y., and in several other cities. The mill alluded to cuts and turns out as high as 370,000 feet of lumber in a single day. Five engines and eight boilers, yielding six hundred horses power, together with the services of 300 men, are required. The buildings are very extensive, lighted with gas, and supplied with every convenience for work that ingenuity can suggest.

DANKS' ROTARY PUDDLER.—At a late meeting of the National Association of Iron Manufacturers at Philadelphia, Mr. Samuel Danks addressed the members in regard to the practical benefits of his rotary puddler. He has lately returned from England, where, after encountering considerable opposition, he succeeded in introducing about fifty of his furnaces, with a prospect that his invention will be generally adopted. In the United States, these furnaces are in successful operation in Cincinnati, Chattanooga, Tenn., and at the Millville Works, Pittsburgh, where a new mill has just been added at an expense of $500,000, intended to contain five of these furnaces.

TEN THOUSAND REAPERS AND MOWERS A YEAR FROM ONE CONCERN.—The new reaper and mower works of McCormick and Brother, at Chicago, at the junction of Western Avenue and Blue Island Avenue, occupy an enclosed space of twenty-three acres. In 1847 they made 500 machines; but they now manufacture 10,000 machines per annum. The present buildings cover three sides of a square, are five stories high, have a front of over 1,000 feet in length, and there is also a three story middle building. On the lake and canal, the works have a front of 1,300 feet.

THE BAR AT THE MOUTH OF THE MISSISSIPPI.—E. K. R. writes to say that Mr. C. W. Stewart is in error as to the number and inefficiency of the dredge boats employed in keeping a clear channel through the bar. Only two boats are employed, and the channel is kept free to a depth of 17 feet at mean low water.

AT a recent meeting of the Royal Astronomical Society, a paper by Mr. Hind was read, relating to the solar eclipse of the year 2,151, which, it appears, will not be total in London though very nearly so. It will be total, however, in Sheffield. Mr. Dunkin suggested the possibility that no considerable proportion of those present would see the eclipse in question; and the meeting appeared to agree with him.

THE navigable balloon of M. Dupuy de Lome, the distinguished French engineer, is varnished with a composition made up of 3 equal parts of gelatin, glycerin, and tannin, dissolved in 12 parts of pyroligneous acid. The varnish has been on fourteen months and is in perfect condition.

IF the total length of railroads in all countries is 146,243 English miles, as has been computed, it is not surprising that their maintenance, together with the new construction, takes more than half the iron production of the world. Europe has 48 per cent and America 47 per cent of the whole.

NOT only will the repeal of the franking privilege save so much, directly, to the Department, but it will lead to the suppression of a large portion of Congressional printing, heretofore ordered by Congress.

THE Commissioner of Patents has granted a patent to George C. Campbell, for putting a mixture of corn meal and rye meal into a package, as a new article of manufacture.

Facts for the Ladies.—Mrs. D. W. Torrence, New York, uses the Wheeler & Wilson Lock-Stitch Machine for her own family sewing, and besides doing her housework, earns more than a dollar per day as pastime. See the new improvements and Woods' Lock-Stitch Ripper.

WHERE AND HOW TO ADVERTISE.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matte discretion is to be used at first; but experience will soon determine tha papers having the largest circulation among the class of persons mos likely to be interested in the article for sale, will be the cheapest and bring the quickest returns. To the manufacturer of all kinds of machinery, to the vendors of any new article in the mechanical line, and for proposals for all kinds of engineering works, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 45,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world, and ten times greater than that of any other publication of its class. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $3.75 per line to advertise in one of forty-five thousand.

PATENT OFFICE DECISIONS.

IMPROVEMENT IN BILLIARD TABLES.—COLLENDER VS. GRIFFITH.—INTERFERENCE.

If an application is filed for a mechanical patent for construction, and if a design for which a patent has been granted can be produced only by that construction, an interference should be declared between the application and the patent.

THACHER, *Acting Commissioner:*

This is an appeal from a decision of the Examiner dissolving the interference. The main reason for the dissolution is that an interference is improper between an application for a mechanical patent and a patent for a design.

The decision of the Examiner dissolving the interference is overruled.

IMPROVEMENT IN HARVESTERS.—CHAS. G. DICKINSON.—EXTENSION.

Where an assignee of a patent has had it reissued, and the inventor has accepted an assignment of one half of the reissued patent, he cannot have an extension of the original.

THACHER, *Acting Commissioner:*

In 1868 Dickinson assigned to J. R. Parsons all his right in the patent "and in all extensions and reissues of the same." In May, 1871, Parsons surrendered and reissued, the new patent being granted to him as assignee. *

To enable him to apply for an extension, applicant has obtained from Parsons a re-transfer of one half his interest in the invention. He petitions for the extension of the original patent, and bases his right to the same on the fact that the reissue was obtained without his knowledge and consent, and that he never has taken an interest therein. If this was the fact the application would be proper, and the prayer of petitioner, the testimony being sufficient, might be granted.

In the re-assignment to Dickinson, however, Parsons transfers to him "one undivided half part of *my entire* interest in said invention and letters patent issued therefor." Now, the only patent in *which* the assignor had an interest at the time of making the instrument was the reissue obtained by him, and it is evident, therefore, from the terms of the assignment, that by the transfer the assignee became invested with a one half interest in the reissued patent. Judge Blatchford, in *Potter vs. Braunsdorf*, 7 Blatchford, 97, where the extension of an old patent which had been reissued was declared valid, bases his decision upon the fact that the original patentee had never assented to the reissue or acquired any title thereunder. This is set forth so distinctly as to authorize the conclusion that the converse must be true—that is, if the inventor by any act of his own has adopted the reissue, or in any way assented thereto, the extension of the original patent would be invalid. The purchase by the original patentee of an interest in the reissued patent stamps the act of surrender and reissue with his approval; an assent in words could not be stronger.

I have come to the conclusion, therefore, that the extension of the original patent in this case would be invalid, and the prayer of the petitioner must consequently be denied.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

THE LOCOMOTIVE ENGINE SAFETY TRUCK COMPANY VS. THE ERIE RAILWAY COMPANY.—PATENT OF A. F. SMITH, FEBRUARY 11, 1862, FOR TRUCKS FOR LOCOMOTIVES.

[In Equity.—Before Blatchford, Judge.—Decision December 30, 1872.]

BLATCHFORD, *Judge:*

This suit is founded on letters patent granted to Alba F. Smith, February 11, 1862, for an "improvement in trucks for locomotives." *

The claim is:

"The employment, in a locomotive engine, of a truck or pilot wheels, fitted with pendent links to allow of lateral motion to the engine, as specified, whereby the drivers of said engine are allowed to remain correctly on the track, in consequence of the lateral motion of the truck allowed for by said pendent links, when running on a curve, as set forth." *

The issue is as to the novelty of the invention. I order to determine this question, it is necessary to clearly see what invention is claimed in Smith's patent.

He does not claim laterally moving trucks—that is, trucks with laterally swinging bolsters. Nor does he claim pendent links, by themselves. Laterally moving trucks applied to railroad cars which had at each end one of such trucks, free also to swivel around a king bolt which connected the car to the truck and passed through the center of the swinging bolster, which was the center of the truck, were old. The specification so admits. But Smith's invention, as claimed, is for the use in, and the combination with, a locomotive engine—that is, a structure having at its rear end, not a swiveling truck, but non-swiveling driving wheels, with axles rigidly attached to the body of the engine—of a swiveling pilot or leading truck, provided with pendent links to allow the forward part of the engine to move laterally over the truck when the truck and the driving wheels are not together in a straight track, whereby the forward part of the engine can move onward in a line tangent to a curve, while the axles of the driving wheels are parallel, or nearly so, to the radial line of the curve, and the axles of the truck wheels also become parallel to the radial line of the curve, because the truck is made to swivel around the king bolt by the action of the rails on the flanges of the truck wheels. *

The patent granted to Bridges and Davenport, May 4, 1841, for an "improvement in railway carriages," shows a swinging bolster in a truck swiveling on a king bolt, the body of the car being connected to the truck frame by pendulous links, from which such body is hung, whereby a lateral motion of the truck is permitted, independently of the body of the car, the sidewise motion being checked by springs in the truck. But the specification of that patent does not suggest the use of such truck in any other structure than a car having one of such trucks at each end and two king bolts. Nor did it, or the use of two of such swinging bolsters in a car, suggest, from 1842 to 1862, the combination of such a swinging bolster truck with a locomotive engine, for the purpose set forth in Smith's specification. *

The only other pre-existing invention brought up to affect the novelty of the Smith invention is the patent granted to Levi Bissell, August 4, 1857, for an "improvement in trucks for locomotives." Bissell's truck is shown under the forward part of a locomotive engine. It has a provision designed to allow a lateral motion of the truck independently of the motion of the body of the engine, and a provision to cause the forward part of the engine to mount up an incline toward the outer side, in a curve, and thus check the sidewise movement, and to descend by its gravity to the normal position on resuming the straight track. The specification of Bissell's patent says that the object of his invention is "to retain the truck with the axles always at right angles to the rail, whether on a straight or curved track, and prevent the truck swinging around on its center pin in case of meeting with any obstruction, and to make the curvature of the rail the means for turning the truck, so that the axles are parallel to the radial line of the given curve, in which position they are retained firmly until the direction of the track again changes." The specification then points out the difficulties in the use of locomotive engines on curves with the ordinary pilot truck, resulting in a "constant sidewise sliding motion on the rail," in consequence of the driving wheels being forced in a line deflected from that of a cylindrical forward rolling motion, and in a constant bearing of the truck to the outer side of the curve, and in the tendency of the engine to go off the track, "particularly in case a broken rail or obstruction occurs, when the truck swivels around on its center pin." *

It is apparent that the truck in Bissell's locomotive has no swiveling motion around its center pin or king bolt—that is, around the center pin in the center of the truck which connects the truck with the engine. Bissell expressly states that such center pin loses its character as a center of motion, and becomes simply a draft block or pin, and that the center of motion of the truck—that is, its only center of motion—is thrown back to the point h outside of the truck. *

In the engine of Smith the truck wheels and the drivers can at all times when the engine is on a curve, and when it is leaving a curve, and when is passing from a curve in one direction to a curve in another direction take their proper positions, respectively, without either being controlled or interfered with by the other. The reason for this is that the truck in the Smith engine has a swiveling motion on its king bolt, and also admits of the swinging motion across the track of the engine over the truck or the truck under the engine. Neither of these motions affects the other. If either motion interfered with the other the same result would follow as in Bissell's engine, and the position of the drivers would at times control the position of the axles of the truck wheels. But with Smith's arrangement the track alone controls the position of the axles of the truck wheels, and therefore they assume their correct position on any track, straight or curved, and on any form of curve, and whether the drivers are on a straight track with the truck wheels, or on the same curve with the truck wheels, or on a straight track while the truck wheels are on a curve, or on a curve while the truck wheels are on a straight track, or on one curve while the truck wheels are on a different curve. This is a result not attained in Bissell's engine, and it results from the fact that the arrangements and modes of operation of the two structures are different. The truck wheels in Smith's engine are never twisted on the track, and the direction of the longitudinal center line of the engine does not affect the position of their axles.

It results from these considerations that, in the engine as a whole, the Smith arrangement of truck is not merely an equivalent for the Bissell arrangement of truck, because, when the former is substituted for the latter, the resulting structure has a different mode of operation, and produces results which the other structure cannot produce. The thing to be looked at is the combined and mutual action of the drivers and the truck wheels, for that was the problem which both Bissell and Smith were trying to solve. Smith's claim is substantially a claim to the combination, with the drivers, of a truck arranged as he describes, allowing of the lateral motion described, and securing the proper position of the drivers on the track on curves. That combination is not found in Bissell's engine.

It needs no argument to show, in view of the foregoing considerations, that there was a patentable novelty in the combination which Smith made in his engine, although the truck which he employed existed before, as the Kipple and Hallock truck. The combination produces a new mode of operation and new results in the structure as a whole, although the truck, as respects itself, in swiveling and in having a lateral movement operates in the same way it did in the car which had two of such trucks. *

Decree with costs to the plaintiffs.

Keller & Blake, for complainant.

C. A. Seward, for defendant.

NEW BOOKS AND PUBLICATIONS.

THE YALE NAUGHT-ICAL ALMANAC FOR 1873. C. C. Chatfield & Co, 460 Chapel Street, New Haven, Conn. Price 35 cents.

An amusing little pamphlet, something after the "Josh Billings' Alliminax style, illustrated with humorous sketches of student life at Yale. Graduates and undergraduates of that venerable institution will doubtless find the book of especial interest and entertainment.

Recent American and Foreign Patents.

Condensed Milk Can Holder.

Robert J. Tanner, Lake View, N. J.—This invention consists of a new article of manufacture, which is a mug or cup adapted to hold the small tin cans of condensed milk used on the table, the object being to provide means for using the said milk cans on the table without exposing their unsightliness, it having a neat external finish.

Improved Cotton Seed Planter.

Francis E. Habersham, Old Church, Va.—This invention has for its object to furnish an improved machine for planting cotton seed. The frame of the machine consists of two long side bars connected near their ends by two short cross bars. The axle revolves in bearings attached to the side bars, to the ends of which are attached the wheels so as to carry the said axle with them in their revolution. The seed hopper is placed just in front of the axle and is hinged at its forward side to the frame by suitable means. The hopper is held in position by a spring, the elasticity of which allows the hopper to be shaken to shake down the seed. To the center of the axle is secured a plate with three or more arms. Upon the outer ends of the arms of the plate are formed saw teeth. As the machine is drawn forward the armed plate is revolved, and as its arms enter the hopper, blocks upon them strike an inclined plate attached to the inner surface of the rear side of said hopper and depress said rear side. As the blocks slip from the inclines the elasticity of the spring raises the hopper with a jerk, shaking down the seed. As the arms of the plate move down through the hopper, the saw teeth draw out a quantity of the seed. To the center of the front cross piece of the frame is adjustably attached an opening plow for opening a deeper or shallower furrow to receive the seed.

Improved Head Block for Saw Mills.

Charles Leddel, Morristown, N. J.—In this improved log setting apparatus there is a long toothed rack on the back side of the log beam, parallel with it and movable in the direction of its length. This rack gears at each head block so that by its movement the log beam will be moved forward or back alike on all the head blocks. The pinion shaft at the head of the carriage rises as high or higher than the hight of the largest logs, and has a ratchet wheel on its upper end, with which wheel is a pawl lever and other mechanism, for actuating the lever from the sawyer's position in front of the saw, and to prevent the back pressure of the log from turning the ratchet wheel, all being arranged so that the aforesaid wheel may be worked by the sawyer to set the log and shift the log beam back for a new log. The invention also comprises a knee for setting out the log to saw tapering stuff, worked independent of the aforesaid apparatus, which is for setting the log to be sawed into stuff with parallel sides. The device also comprises a novel arrangement of a scale and movable pointer to show the distance of the dogs from the saw and guide the operator in setting the log.

Improved Reel Rake for Harvester.

Munson R. Church, Stamford, Canada.—This invention has for its object to furnish an automatic trip for opening the gate or operating the lever that controls the rake of a harvester, and which is so constructed that it can be set to open the gate each time, at every second, third, fourth, fifth, or sixth time a rake passes the table.

Improved Organ Case.

George Woods, Cambridgeport, Mass., assignor to himself and George P. Carter, of same place.—This invention consists, first, in a construction of the front projection of the organ, calculated to expose the keys and stops very prominently to view, when seen from the ends, thereby greatly increasing the beauty of the instrument. This construction is also designed to dispense with the projecting front. The invention consists, secondly, in a novel construction of the "key slip" or fret work piece in front of the keys, also of the ledge or projection below, whereby the said "key slip" and ledge are extended around the corners so as to show the aforesaid end views in a manner to lend additional features of beauty to the instrument; and, thirdly, in a construction of the fall or cover whereby it is adapted to the peculiarities of the organ front above mentioned.

Improved Cotton Press.

John T. Williams, Blakely, Ga.—This invention is an improvement in the class of cotton presses wherein two followers are simultaneously operated in opposite directions by means of toggle levers. When the windlass is turned by hand or otherwise, a pin will be moved with the band forward or backward, according to the direction of rotation of the windlass. When the pin is moved backward—that is, away from the press—it will cause the toggle levers to be vibrated so as to force the followers together, and compress the contents of the press. When the pin is moved toward the press it will cause the toggles to draw the followers apart to allow the removal of the bale and the insertion into the press of fresh material to be pressed.

New Combined Water and Liquor Cooler.

William A. Jones, Erie, Pa.—This invention has for its object to furnish an improved cooler which shall be so constructed as to enable liquors to be cooled by the same ice that cools the water. The body of the cooler, in which the water and ice are placed, is made with double walls, the space between said walls being filled with suitable non-conducting substance. The body of the cooler is provided with a faucet, through which the ice water is drawn out, as required. In the cover are formed holes leading into sockets, the upper ends of which are attached to the cover, and which are made of such a length that their closed lower ends will not touch the bottom of the cooler, so that there may be a space for ice water between. In the bottoms of the sockets are placed coiled springs, upon the upper ends of which rest the bottles that contain the liquors to be cooled. To the cover, around the holes in which the bottles are placed, are secured rubber rings, so as to fit snugly upon said bottles, and prevent the entrance of warm air into said sockets.

Improved Breech Loading Fire Arm.

Francois Gueury, Paris, France, assignor of one half his right to Ernest Dubois, of same place.—This invention relates more especially to that class of breech loading fire arms in which the breech is closed by a bolt, which has a sliding movement in the line of the barrel for opening and closing the breech, and a movement about its axis for the purpose of locking or unlocking it. The invention consists in the provision of an arched shield or cover which is susceptible of being turned laterally by the axial movement of the breech bolt for uncovering the breech receiver, in which position it is retained when the breech bolt is drawn back, and again returned to its normal position by a reverse movement of the bolt when the breech is being closed.

Improved Grate Bars.

James A. Sinclair, Bridgeport, Ohio.—The invention consists in pivoting one end of each bar to a vibratory cross piece, while the other end slides loosely in grooves of another cross piece. The object and effect of this mode of putting together a grate is to allow convenient room for the expansion and contraction in the bars themselves, and to afford increased facility in maintaining the interstices clear of all deposit.

Improved Lubricating Compound.

Henry R. Hutchinson, Empire Iron Works, Ky.—The object of this invention is to furnish a compound for lubricating car axles and similar frictional surfaces, which shall prevent the friction and heating of axles and boxes, and be lasting and durable when applied. It consists of tallow and mineral oil, melted and burnt until the more volatile or light portion has been consumed and all watery particles vaporized and expelled, and the melted tallow or oil is reduced to the required consistency. It is then allowed to cool until it becomes semi-fluid, when pulverized sulphur, pulverized plumbago, animal charcoal and hydrated lime are added. The composition is mixed by grinding, when it is ready for use.

Improved Furnace for Locomotives.

Thomas Davies, Cleveland, O.—This invention relates to a new and useful improvement in the furnaces of locomotive steam boilers; and consists in the means employed for supplying atmospheric air to the fire box. An arch extends across the front of the fire box, and extends back toward the fire door one half the depth of the fire box, the crown of the arch being just beneath the tube section. The doors or apertures are placed just below the arch. This arch confines the admitted air and forces it to mingle with the smoke and gaseous products of combustion.

Improved Manger for Horses.

Joseph C. Higgins, Millstone, N. J.—The object of this invention is to so construct a manger for horses that the horse will be prevented from biting or gnawing it, and from what is known among horsemen as "cribbing" and it consists in pivots or journals in the ends of the manger by which the manger is supported and on which it freely turns.

Improved Chill for Casting Smoothing Irons.

James F. Bless, Newark, N. J., assignor to himself and Robert Drake, of same place.—This invention relates to a new form of mold for casting a smoothing iron in, with the object of obtaining a chilled surface for the entire iron. The inventor obtains the desired result by making the mold jointed and applying the hinge at one end, so that it can be freely opened to release the iron and handle when finished. The invention also consists in providing the mold with a certain advantageous form of handle, which relieves the hinge from strain during expansion.

Improved Cigar Tuck Cutters.

Le Grand Scholfield, Providence, R. I., assignor to National Cigar Machine Company, New York city.—This invention consists of a machine for automatically feeding, adjusting, cutting, and discharging cigars, in which the cigars are placed on an intermittingly acting endless carrier, and delivered by it into or upon a cutting bed, when a plunger pushes them along the right distance for presenting the "tuck" ends to a pair of cutters, which cut off the said end, and there a discharger ejects them from the bed, the said discharger at the same time opening a discharge passage by raising a movable side of the bed, used to prevent the cigars from bounding off when falling upon said bed, and closing it again ready for the next.

Improvement in Producing Chlorine.

Louis Emile Aubertin, Paris, France.—This invention relates to a new process for producing chlorine by causing a mixture of air and gaseous or liquid ydrochloric acid to pass over sesquioxide of chrome, heated, by preference, oabtemperature of about 600° Fahrenheit.

Improved Truck for Moving Buildings.

William E. Walker, Albion, Iowa.—Two broad truck wheels are fixed on the axle with a space between them, which admits the sand board. This sand board rises up to the surface of the wheels, and the board bolster rests thereon. The upper end of the king bolt projects above the bolster and plate, and is a little tapering, and is intended to enter the under side of the sill of the building to be moved. The regulating arms are attached to each end of the bolster, to which they are firmly secured by iron straps. Stay braces are so attached and connected with the axle and sand board that the bolster may be turned to the right or left, as may be desired, to vary the direction of the building. By means of holes in the bolster, the bolster may be attached to the sill of the building by screws. The truck will run on a track, laid for the purpose, of planks or timber. Chains are attached to the ends of the axle, or to the linch pins and to the regulating arms when the line of motion is straight. When it is necessary to turn in either direction one of the chains is let out and the other one is taken up, so that the bolster is held stationary in any desired position. Four, more or less, of these trucks are placed under the building to be moved.

Improved Machine for Making Baskets.

James Moore and Samuel W. Day, Oak Creek, Wis.—This invention has for its object to furnish an improved machine for use in making splint market baskets, laundry baskets, etc., for turning up the sides and putting on the hoops, enabling the baskets to be made rapidly. The invention consists in the table upon which the woven splints of which the basket is to be made are laid, and which should be of the size required for the basket, so that the said woven splints may be cut off to the desired size before the sides are turned up. The woven splints are secured to the table by a form which is made of the exact shape and size of the bottom of the basket. To the center of the form is secured a bar so arranged that it will always move up and down in a vertical line. The upper end of the bar is pivoted to a lever, to the free end of which is attached a cord that supports a weight sufficiently large to raise the form away from the table when the lever is unlocked for convenience in removing the basket. The lever is locked to hold the form down firmly upon the woven splints by a bar to rest upon the said lever and press it down. The sides of the basket are turned up over the edges of the form, and are held in place by flaps hinged to the table. A form, which slides up and down upon the bar, is made of such a shape and size as to fit into the mouth of the basket. The form is bound with an iron hoop, and around it is placed the inner hoop of the basket. After the corners of the basket have been woven, and the form and inner hoop lowered into place, the outer hoop is placed around the mouth of the basket, and is secured in place by the clamps, one leg of which is inserted in a hole in the form, and in a screw hole in the end of its other leg is inserted a hand screw, which is screwed against the said outer hoop. The outer and inner hoops are then secured to each other and to the body of the basket by nails driven in through the outer hoop, which are clinched by being driven against the iron band of the form.

New Machine for Chamfering and Crozing Barrel Staves.

Joel W. Jones, Middleport, Ohio.—This invention consists in certain improvements upon machines for crozing barrel staves. The machine is composed of the end cutting saws, chamfering cutter heads, and grooving saws; also of stationary curved beds on which the staves are held and carried during the operation by projecting pins on rotary feed disks; and also of a vibrating feed dash, which places the staves upon the curved bed in the requisite order. The grooving saws cut a square crozing, which will be adapted to receive the full edge of the barrel head and insure greater firmness and durability of the barrel.

Improved Wheel Plow.

Harlow M. Freeman, John Lowe, and John F. Stevens, Lathrop, Mo.—This invention has for its object to furnish an improved wheel plow, simple in construction, convenient in use, easily controlled, and effective in operation. The wheels revolve upon the journals of the axle and the one that is to run in the furrow is made slightly larger than the other. The axle is made deep; the journals are so arranged that the frame work, when the machine is at work, may run level. The axle frame consists of bars which form a rigid frame, rigidly attached to the tongue. The plow beams are curved downward, upward, and downward, and to their rear ends are attached the plows. The arms of the U shaped guide bars are slotted longitudinally, so that the plow beams may have a free vertical movement while being held against any lateral movement. By this construction the plow can be raised from the ground by operating either a foot lever, or a hand lever, or both. When the plows are fully raised a bent lever locks itself and thus holds the plows raised, in which case, by moving the foot lever slightly with the foot, the plows will drop to the ground. Suitable arrangements cause the plows to work shallower or deeper in the ground.

Improved Horseshoe Nail Machine.

Albert D. Bingham, Vergennes, Vt.—This invention consists of a machine comprising two pairs of rolls with dies and one pair of plain rolls, or it may be hammers between the two pairs with dies. The first pair have grooves of the width of the body of the nail to be formed and suitable depth for the thickness, with depressions at suitable intervals to form the necessary enlargements for the heads, but only the same width as the shanks. The second pair are plain and arranged at such distance apart as not to affect the shank, but to flat down the head to some extent; and the third have grooves of the requisite width and depth for finishing or nearly finishing the body with wider and deeper shapes for the head, to complete the reduction of the blanks. These are to be formed from a rod or bar of suitable size, the blanks being connected at the heads and points when they escape from the rolls, to be separated and finished at the points by punching dies to be used for cutting them apart and trimming or finishing the points at the same time.

Improved Folding Chair, Bed, and Ottoman Combined.

Eugene Fauh, New York city.—This invention relates to a new folding bedstead, which when folded together will produce an ottoman, and therefore be in the most contracted form possible, and which when extended can have its head piece raised and its foot piece lowered to form a convenient easy chair. The invention consists in forming the bed in three jointed sections, which contain at their under sides the supporting legs that can be folded under them respectively, each leg when extended being stiffened by jointed braces that connect it with the section to which it is attached, so that a strong and reliable support will be given to the bedstead.

Improved Knitting Machine.

Hugo Gunther, New York city, assignor to himself and Charles Lupprian, of same place.—In this machine the needle bed is extended downward, and also the grooves in the same, for the reception of an additional series of needles, which are pusher or setter needles only, for pushing the latch needles up, the downward motion of the latter being produced by wing cams directly moving the same in the ordinary manner. The invention consists, also, in a new arrangement of cams in the lock of the slide or carriage of the knitting machine, in which arrangement the upper or wing cams are set as usual to move the latch needles downward while in the lower part of the lock. The V shaped driving or raising cam is set further down than usual, in order to apply to and operate the setting needles, and not to the latch needles. This will, of course, allow power to be applied to the setting needles, so that, when raised, they will move the latch needles. The latter will thereby be greatly protected, and if any injury is done by the elevating cam it is only done to the setting needles, which are inexpensive and easily replaced.

Improvement in the Extract of Yucca.

Louis G. Fellner, Las Vegas, New Mexico.—This invention has for its object to furnish yuccatin or extract of yucca root, so prepared and put up that it will be protected from moisture, and may be put into market as an article of commerce; and it consists in yucca root ground, steeped in water, and pressed. The liquid thus obtained is evaporated to the proper consistence, and then molded in forms. Yuccatin cleans the skin, hair, wool, and other animal substances from foreign matters without destroying their softness. Samples, neatly prepared by Dr. Fellner, have been sent to this office, and from what he says of his extract it seems to have peculiarly good properties.

Improved Pedal Attachment for Pianos.

Charles W. Held, Jr., and Alphonso M. Baugh, Brooklyn, N. Y.—This invention consists of a vertical bar adjustably attached to the pedal frame, with a vertically adjustable foot rest supported on it, having pedals upon it and rods extending from the pedals down upon the ordinary pedals through suitable guides, and having certain controlling springs, all constituting a very simple and efficient attachment, to enable children to work the pedals and so contrived as not to interfere with the working of them by adults without the attachment.

Improved Die for Capping Screws.

George W. Briggs, of New Haven, Conn.—This invention has for its object to furnish an improved die for capping screws. By suitable construction should the edge of the circle piece be battered or worn, it may be turned, and, should the slot in the screw head not be exactly true, the said circle piece can adjust itself to said slot. By this construction, also, a spring will allow the guide or circle piece to yield and be forced down into the rest should the slot in the screw head be shallow, or otherwise defective or wanting, so that no part of the die need be broken.

Improved Scroll Saw.

Frank H. Hardenbergh, Hawley, Penn.—The invention relates to a new construction of saw blade for use in scroll sawing and other fine work, and consists in filing a double set of teeth on the cutting edge of the saw by a series of oblique incisions in opposite directions, whereby the saw is made more effective, and whereby it can be sharpened on an ordinary grindstone in the same way as other edge tools are sharpened.

Improved Wheel for Vehicles.

Hiram Kellogg, Floyd, Iowa.—The invention consists in securing the inner ends of the spokes in tubular projections of rings that are adjustable on the hub, so that said rings can be set closer together on the hub the more the felloe is expanded, and the spokes placed more in line with the rim, to b adapted to the larger diameter of the wheel.

Improved Exhaust Valve for Air Brakes.

William Riley, Terre Haute, Ind., assignor of one half his right to Charles R. Peddle, of same place.—This invention has for its object to furnish an improved valve, designed especially for the escape of air or steam from the brake cylinders upon railroad cars, to allow the air or steam to escape instantly and simultaneously from the cylinders of all the cars. By suitable construction, when the engineer admits the air or steam it presses open the ingress valve, and passes into the cylinders, and at the same time holds the exhaust valve firmly to its seat. When the engineer lets off the air or steam from the inlet pipes, the pressure in said pipes will be instantly reduced, and the expansion of the air or steam within the cylinders forces open the exhaust valve and allows the said air or steam to escape into the air through the openings. By this construction, the air or steam will escape instantly from all the cylinders, withdrawing all the brakes at the same time.

Improved Balanced Slide Valve.

Thomas Beesley, Muscatine, Iowa.—This invention consists of two valve seats on opposite sides of an elevation above or projection from the ordinary valve seat, with a slide valve upon each seat connected by pressure bars at their ends, which project beyond their seats, by temper screws, which adjust the valve so as to work steam tight on the seats, and so as to relieve them of the pressure of the steam on the valves, which is mainly sustained by the pressure bars.

Improved Crib Attachment for Bedsteads.

Edwin F. Bryan, Savannah, Ga.—This invention has for its object to furnish an improved attachment for bedsteads, to form a bed for a child, or to form a table or support to receive articles required by an invalid. It is simple in construction and convenient in use, being readily detached when not required.

Improved Soldering Iron.

James D. Norton, St. Louis, Mo.—The object of this invention is to improve the common tinner's soldering iron, and to render it easy to renew or change the copper; and it consists in a shank which screws into the copper, and in a sleeve screw which screws to the copper, and in a holding nut on the shank. By this arrangement a variety of coppers may be kept on hand and used as occasion may require, as the copper on the shank is readily detached, so that a new one or a different form may be put on.

Improved Grocers' Sample Case.

N. Barker McCreary, Phelps City, Mo.—This invention relates to a new box or case to be used by grocers and others for containing and displaying spices and other goods and the prices of the same, and for protecting the contents against injury from atmospheric influences, insects, etc. The invention consists in providing the box with a sliding glass top, through which the contents can be inserted, removed, and inspected, and in combining it with a shield or plate near one end for indicating the price of the contents.

Improved Ejecting Apparatus for Bottles.

William S. Ward, New York city.—This invention consists of a simply contrived force pump, let into a perfumery or other bottle or vessel, with its stem or piston rod passing through the cork or stopper in such manner that by suddenly pushing the rod down a small quantity of the fluid in the bottle will be ejected, preferably through the piston rod made hollow for the purpose, constituting a simple and convenient contrivance for perfuming the handkerchief and other articles, and calculated to prevent the waste of perfume which takes place when the stopper is removed.

Improved Sliding Support for Clothes Lines.

Michael Bubser, Jersey City, N. J.—This invention relates to an improvement in the class of supporters for clothes line holders consisting of a slotted bar provided with one or more pulleys, the same being in practice so applied that two lines pass through the slot. The improvement consists in adapting the support by dividing or cutting through one of the sides to form a spring, whereby it can be pressed inward.

Improved Fluting Machine.

David R. Saunders, Houston, Texas.—This invention relates to a machine for fluting or crimping articles of ladies' apparel; and consists, mainly, in a gage which is attached to the bed piece, by means of which the width of the fluted part is regulated. By the use of the gage the flutes in the article are made to terminate in a straight line, and the fluted part may be located wherever it may be desired. The article to be fluted may be spread over the bed, and the gage adjusted thereon to govern the position of the roller.

Plow.

John Love, Cusseta, Texas.—This invention consists in the mode of applying several plow irons to the same plow frame, so that they may be conveniently fastened and adjusted relatively to each other.

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Wanted—An experienced manufacturer of Door Locks and light hardware, with $10,000 Capital, to take charge of Shops. Edward Rowe, Jr., Mansfield, Ohio.

Wanted—The address of the manufacturer of Cotton Gin Saw Sharpeners. P. Kyle, Tuskegee, Ala.

Tin Ware Manufacturers should see the patent Weighing Scoop. For Sale, or Worked on Royalty. D. H. Priest & Co., 3 Tremont Row, Boston, Mass.

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Notes & Queries

1.—Our correspondent, T. W. Bakewell, who addresses us on the subject of calculating strength of boilers, refers to a letter of Professor Henry upon the subject. We also have been informed that Sir William Fairbairn has furnished a letter on the same subject. We should like to be able to publish these letters, as the opinions of those gentlemen, when correctly presented, are entitled to unusual consideration, and the fact of the existence of skepticism in relation to the proposition of our correspondent, on the part of nearly all well known engineers, will secure for them unusual attention.

2.—S. asks how to get sulphate of nickel and how to convert it into a nickel solution?

1.—H. J. H. asks: How can I give a brilliant black finish to a quantity of wire goods, such as hair pins?

3.—F. C. would like to know how to temper a steel screw driver, that has been put in the fire by mistake.

4.—A. T. Y. asks: Is there any preparation with which I can blow a bubble (similar to a soap bubble) strong enough to bear being knocked about the room?

5.—D. R. W. says: Can any one tell me of a process by which common pitch may be purified for optical purposes, such as polishing lenses and specula?

6.—W. N. asks for a detailed description of the cupola furnace designed by Henry Kriger, of Berlin, Germany, mentioned in the SCIENTIFIC AMERICAN a few months ago.

7.—D. asks: How can I color extract of lemon a light yellow in manufacturing it? By manufacturing it from oil of lemon and alcohol, and exposing it to the light, it will fade nearly to white.

8.—T. N. says: When a bevel wheel is being geared with wooden cogs, what method is adopted, when turning off the outer ends, to find when the pitch circle is of the proper diameter?

9.—S. D. P. Jr., says: How can I make a cheap coloring material to apply to paper or board, a sort of sizing; also a cheap varnish for the same? For varnish I have used alcohol and shellac, but it is too costly.

10.—H. asks if there is any way to make a fountain something on the principle of Hero's, as explained in the school books on philosophy. "I wish one to set on a table for decoration, and Hero's will not throw a stream high enough."

11.—S. asks: Which is the most probably true and best established theory in regard to the polar attraction, its causes, etc.? Is the idea that the atmosphere, acting as a prism, condenses all the violet light of the spectrum at the poles and thereby magnetizes them, at all reasonable?

12.—C. A. S. says: Given a cylinder of the internal capacity of 1,000 cubic feet: If I force ordinary illuminating gas into it to a pressure of forty pounds to the square inch, how many cubic feet of gas will it contain? In other words, if I had taken the gas through an ordinary meter, how many feet would the meter have registered? Can you give a rule for finding the number of feet at any pressure?

13.—J. E. G. says: In your issue of February you answer to G. W. D.'s question "will a wagon be as easily drawn by a long as by a short rope" that there is no difference. Now suppose I receive a dray load of each, rope and sugar, which must be drayed up a long hill. The drayman loads the sugar on the wagon, then attaches the team to one end of the rope and the wagon to the other; can he haul my two loads of goods at one time? Will I get the rope and sugar hauled for the price of hauling the sugar, according to your answer?

14.—D. H. S., Jr., says: Most of the wheat produced here is generally of good quality, but contains considerable smut. In many cases this infection has been avoided by steeping the seed grain for 24 hours in a solution of blue vitriol. For eight bushels of seed about one pound of the copper salt is used with enough water to cover the grain. As a preventive, this seldom fails. Can any of your readers tell us how to remove the smell and taste of smut, by a method practicable with considerable quantities of wheat? We have heard that quicklime is used. Is that the best deodorizer, and if so, in what proportions and how ought it to be applied? We have machinery which removes all visible smut.

Answers to Correspondents

H. M. says: In view of the fact that light will preserve the original color of white paint inside a house, while its exclusion will turn it a deep yellow, we asks you for a solution. Answer: The action of light is to bleach all colors which are not of fixed mineral origin. White lead being already white remains unaffected in the light, but in the dark it gradually absorbs sulphur from coal gas or other sources in a room and turns black. Zinc white is not so readily changed in color.

D. B. asks: Would the sulphuric acid in plaster applied in any quantity liberate phosphorus where it is combined with iron in the soil? Where and at what price can Fresenius' "Chemical Analysis" be had? Answer: Sulphuric acid in combination with lime in plaster cannot liberate phosphorus. Free sulphuric acid decomposes phosphates and is employed for that purpose. Wiley and Son, New York, are the publishers of Johnson's translation of Fresenius' "Chemical Analysis."

C. J. K. asks: What chemicals will keep water as near as possible to freezing point without going much below it? What work on chemistry would give me the most instructions on freezing and thawing? Answer: Ice floating in water is the only "chemical" that will keep the water as near as possible to freezing. When that melts, the water will assume the temperature of the room in which it is placed. Good books on chemistry have been written by Towne, Barker, and Eliot and Storer.

J. W. B. asks: How long will human bones, the skull for instance, preserve their form in the open air, or buried in moist earth? Answer: The precise time cannot be stated. Human skulls have been found in caves associated with the bones of extinct animals, in such a way as would indicate an antiquity of many thousand years. The skulls in the catacombs of Rome are known to be very ancient.

C. T. S. says: I have a fine scale, enclosed in a glass case. What shall I place in the case to absorb the moisture, to prevent the steel parts from rusting? Can you tell me the cheapest way of making sulphurous gas in large quantities, and what would be the best manner of keeping it, and how long does it remain in fit condition to use as pure gas? Would a bladder or india rubber bag answer for a gage, attached to the vessel in which the gas is stored, to indicate what quantity was always on hand? Answer: To prevent chemical balances from rusting, put a lump of quick lime in the box containing the instrument, in a saucer. It will absorb the moisture and finally swell up and become air slaked; it must then be renewed. We give elsewhere a process for the manufacture of sulphurous acid on a large scale. It is difficult to store it in anything but glass vessels.

P. M. asks: What is the rule for finding the sag of a belt, passing over two pulleys, with their centers say 100 feet apart? The belt is to stand on the rake, the center of the upper pulley being 10 feet out of plumb with the center of the lower one. The lower pulley is 2 feet and the upper one, 4 feet diameter. The belt is of four ply rubber, and 22 inches wide and tightened in working order. In some cases it is important that this should be known. The late lamented, long-winded Rankine, gives the rule, but the hieroglyphics in which it is given are all Greek to me. Now I have a pretty fair knowledge of theoretical and practical geometry and arithmetic, and Irish, English and French, but I am puzzled with nearly everything in Rankine's works. Answer: The rule referred to may be translated thus: Divide the square of the distance between centers by eight times that length of belt which would give, by its weight, a strain equal to the tension on the belt, and the quotient will be the deflection below the straight line joining the centers of the two surfaces carrying the belt. If our readers desire to accomplish much in mechanics, and to avoid the troubles of our correspondent, they will find it well worth their while to devote a good share of leisure time to mathematics and the principles of natural philosophy. They would also be better prepared then to appreciate the labors of Professor Rankine, who has earned a splendid fame by pursuing just such a course.

W. H. G. is making a toy engine and boiler and says: The size of boiler is 3x5 inches; it is made of tin; now would I gain anything by fixing 3 or 4 half inch tin tubes or flues in the bottom of boiler four inches long, or is a common flat bottom better? The tubes are to be closed at one end. How would air work, pumped into a boiler at bottom or top (in steam space) or will it not work at all? How much does air expand? Answer: The proposed tubes will be likely to increase the power of the boiler as they increase the heating surface. Tubes closed at one end are sometimes used, and where the fire is not forced, do well. If the fire is forced, they are defective in not allowing free circulation of water. Introducing air in so small an apparatus would probably not pay for the trouble involved. Look in a recent number of the SCIENTIFIC AMERICAN for answer to last question. We hope to be able to help thousands of others among our young readers as we have aided W. H. G.

J. McC. says: How can I measure a coal barge according to the government measurement? The barge is 124 feet long, 24 feet wide and 5 feet deep. Answer: The tunnage of a barge is legally measured by multiplying the length, breadth and depth together, to obtain the cubic feet of contents, and dividing by one hundred to obtain the burden in tuns (tunnage law of U. S. 1865; "open vessels.") for registry. Thus, a barge 124 feet long, 24 feet wide and 5 feet deep would register 148·80 tuns. Such a barge would carry, of "dead weight," about 400 tons, if loaded down to the water's edge. It would have storage capacity for about 300 tuns of Cannelton coal, or for, say, 8,400 bushels.

A. B. S. says: I wish to use exhaust steam for heating or for boiling water. Can I immerse the end of exhaust pipe in water without any very great detriment to power of engine? The length of the exhaust pipe is 60 feet. Answer: For each two feet of depth of water, above the opening of the exhaust pipe, the engine will be subjected to an increase of one pound back pressure.

A. G. K. says: I have a boiler with 3 inch flues, which does not make steam as fast as I would like. Do you know of any objection to putting in 1¼ or 2 inch flues between those that are in? Answer: The most serious defect of the tubular boiler, as frequently constructed, arises from the endeavor of the builder to increase its power by crowding too many tubes into it, and thus checking the circulation of water. It often happens that removing tubes is found to increase the steaming capacity of a boiler. We should doubt if the introduction of additional 1¼ inch or 2 inch tubes into a boiler fitted with 3 inch tubes would afford advantages commensurate with the risk, which it might produce, of burning some of the tubes, even if it were to slightly increase the steaming capacity.

J. H. P. says: Will you let us know if there is any patent method of turning an engine off from the center without the use of a tackle? Please write what would be the cost of such a patent. Answer: Many devices are in use, but we know of no purchasable patent which covers one generally adopted.

NOVELTY GLASS CUTTER.—Letters of enquiry for this article come to us from all directions. We know nothing of it, or who sells it.

E. M. B. says: I want to know the simplest and surest manner of putting up long lines of shafting correctly; also, commencing at the engine, how to calculate the speed of pulleys of various sizes. Machines come from the maker with a driver pulley of a certain size, marked to run so many revolutions per minute. I want to know how to calculate the size of pulley on main shaft by which the machines shall be run. I suppose the speed of main shaft must be known. How can I find out that? Answer: Dub off the under sides of the beams to which the hangers are to be attached, or pack them up, until a stretched cord, or sighting along their line, shows them to be accurately in line. Put up the hangers in their places, and again try whether the center line of bearings is a straight and level line, adjusting any that are found out of place. Finally put up the shafting and set up the couplings. The best makers use swivel bearings that will adjust themselves to any slight deviation from line, and the couplings are made with an eye to the same contingency. The speed of shafting is, to some extent, determined by the character of the work driven. For heavy work a speed of 180 revolutions a minute is common, and for light work the speed rises often to 300, or even higher. The tendency is continually to higher speeds, in consequence of the fact that it allows the use of lighter belts and pulleys. The size of driver pulley is determined by multiplying the diameter of the driven pulley by the fraction obtained by dividing the speed of the driving line of shafting by that of the driven shaft.

W. S. B. The use of the common sewing machine treadle is not productive of special illness or discomfort if intelligently used. But there several forms of improved treadles that are claimed to have advantages, and they are on sale in your city of Boston. You will there also find, doubtless, sewing machines operated by springs, without treadle. In this city you may procure sewing machines which are operated by electricity. If you wish for devices not advertised in our columns, you might insert a few lines under "Business and Personal."

J. H. asks how much space there should be between piston and cylinder head of an engine with an 8 inch piston and 16 inch stroke. Answer: The space between piston and cylinder head, when the former is at either end of stroke, should be as little as possible where economy is aimed at. In a direct acting engine of the size given, a clearance of one eighth inch at the back end and three eighths at the forward head is a fair allowance with those whose workmanship is first class. Ports are made of from one tenth to one twentieth the piston area, being given the greater proportional area for high speeds of piston. Clearance, including space in steam passages of cylinder has, in rare cases, been reduced to 2 per cent of the cylinder capacity. In good engines, 5 per cent is a usual figure.

W. H. M. says: Is there any rule for estimating the thickness of material required to be used in constructing cylinders of certain diameters to withstand certain pressures? Of what kind of material and how heavy should a cylinder 18 inches diameter by 3 feet in length be to withstand internal pressures of 18 and 24 pounds per square inch respectively? Does the length effect the strength of the cylinder? How do copper and brass compare with iron for this purpose? Would the same cylinder withstand the same pressure externally? Answer: Any work on the strength of materials will give the desired information. We gave a list of such works at page 106 of our current volume. A cylinder of sheet iron, with single riveted joints, 18 inches in diameter and 3 feet long, would be made of about No. 22 or 24 iron, measured by wire gage, if intended to bear safely a pressure of 16 pounds, and of No. 20 or 21 for a pressure of 24 pounds. The length does not affect the power of resisting internal pressure, but it does influence greatly the power of resisting collapse. Copper and brass cylinders, with joints perfectly made with hard solder, have a strength about equal to single riveted iron cylinders, but the joints are rather more inelastic. Copper and brass are weaker than good iron. Expending a small amount of money in standard books will often save, in cases like this, considerable outlay in experiments which may have been already made with far greater accuracy and completeness by others. The first step to be taken, before commencing experimental research, is always to ascertain what has already been done by others.

B. says: A friend thinks the small steamers plying on the Thames (England) submit to the useless cost and complexity of having the wheels constructed for vertical position of the paddles. Answer: Some, not all, of the steamers alluded to have feathering paddles, and gain in speed by the adoption of that system.

T. N. asks: Will the reports of the Patent Office, which are to be printed every month, be for sale in the book stores? If not, where can they be got, and what is the price? Answer: The publication referred to by our correspondent is the *Official Gazette* of the Patent Office, issued weekly. It can only be obtained at the Patent Office, Washington, D. C. Subscription, $6 per annum.

F. A. S. asks: Will you tell me how to make "Coumarin"? It is prepared from "sweet vernal" grass (*anthoxanthum odoratum*) and is used for giving stronger aroma to other flower essences. Answer: Cut up the herb, and macerate in hot alcohol; strain through cloth, and distil off the greater part of the spirit. The sirupy residue deposits, on standing, crystals of coumarin, which must be purified from fat oil by pressure, and then crystallized from hot water.

A. C. says: Enclosed please find specimen of ore, of which I would like to have the name and value. Answer: It is not an ore, but a variety of hornblende.

G. S. Y. sends a mineral specimen and asks our opinion of its quality. Answer: If the article is as homogeneous as the fragment sent, it will undoubtedly prove an excellent fire-clay. But "trying," on a large scale, "is the naked truth."

L. C. M. has read our article on pickles, published on page 145 of Volume XXVII., and would like to know how to make bright green pickles, free from suspicion of copper and sulphuric acid. He asks for a description of the method produced in manufactories. Answer: In a pickling establishment of wide renown the boiling is done in copper vessels, thickly coated internally with silver, and a very strong *malt* vinegar, prepared for the purpose, is used. The pickles are perfectly wholesome and pure, but they have not the bright green color, for which many foolish people sacrifice the quality and genuineness of what they eat.

J. G. B. says: On January 2, I sent you eight small rough stones, requesting you to inform me what they are, and their value. If you have received them, and No. 6 or No. 8 is a diamond, I would like to sell them, if you would be so kind as to send them to a diamond dealer in New York and take out $200 for your trouble, sending me the rest by express. Answer: J. G. B.'s quartz-diamonds are at his own disposal.

J. S. and D. P. N. say: A., B., and C. wish to carry a stick of timber, 12 feet long and 12 inches square. A. and B. are in front with a hand spike, and C. brings up the rear end alone. Where should A. and B. be under the log, so that each man will have an equal share of the weight? Answer: 3 feet from the end of the bar opposite to C.

S. R. K. says: I have a small lead pipe leading down from a tank in the second story of my house into the cellar, to feed the water pan of my furnace. The lower end of the pipe is so much in contact with the furnace that the water there is a good deal heated. Will this heated water rise, and cold water from the tank pass down, in the same pipe? If this pipe does not pass down from the tank to the furnace by a regular descent, but runs for some distance horizontally, with several small rises and falls in the horizontal part, will that prevent the circulation of hot water up and cold water down, in the same pipe? Answer: The circulation of water in the manner described cannot occur where the pipe undulates as supposed, and in a straight pipe of a small diameter, as we presume *this to be*, such circulation could only take place very slowly indeed. A very moderate downward current would, we suspect, effectually prevent the ascent of the warm water. In a large pipe leading directly from top to bottom, a circulation would undoubtedly be likely to take place, the warm water being displaced by the heavier cold water, the latter settling at the bottom, the former rising to the top.

C. W. K. says: Imagine a body moving in one direction, *then its course to be* suddenly changed 180°, returning, in the same line it proceeded in, from the point of reversion. What I wish to know is whether a reciprocating body must necessarily stop when it changes its direction; for instance, a piston head in an engine? Is it a self evident fact that it must stop before returning, or is the following reasoning cogent, and a proof to the contrary? From A to B, two points of conceivable distance apart, are projected two bodies, C and D (one body from each point, towards the other) with sufficient force to carry them through the intervening space between A and B. C weighs ten times as much as D. They meet between the *points*, both running in the same line. As a natural consequence both bodies are found near B as C, having the preponderance, would convey D backward. Now according to the law of the inertia of matter, C could not have stopped intermediately, if found at B. Then did D stop when it changed its direction when met by C? Answer: It matters little practically whether it is considered that a body, whose direction is reversed, stops during an infinitesimal space of time, or does not stop at all. The question is too nearly a metaphysical one. In the case given, an indentation would be produced in the one or the other, or both bodies, C and D, and, so far as the argument is based upon natural facts, it is not conclusive. D might be brought to a stop while indenting C and then take up its reversed movement, finally moving backward with C. This is one of many examples, frequently presented, in which an argument is based on false premises.

A. L. asks: Will an ordinary local telegraph battery make platinum wire red hot; and if so, how can I attach it? How can I make a galvanic battery out of the same? The telegraph battery is composed of two glass jars, copper, zinc, and blue vitriol. Answer: Why not disconnect the local battery and try the experiment? If you find that two cups won't answer, try more until you accomplish the result.

J. C. C. sends a specimen of boiler scale and asks why it is so hard. "I had it in a bottle of oil of vitriol for five hours, but it would not dissolve. We use about two hundred barrels of water per twelve hours, half of which is sulphur spring and the rest surface water, the largest portion of which runs through sewers accumulating all kinds of filth (human deposits) which makes the water in boilers foam very badly, so much so that the engines suck it up five feet and into the cylinders; but it does not make the pistons pound like some water does. I have put in surface cocks to draw the foam off, but they clog up with mud in two or three days. This scale formed on the boilers before I took charge of them, two years ago, and I have tried nearly everything that will loosen scale, with no effect. About nine months ago, the firm put in a heater and filter, by which I can get the water so hot as to require a small stream of cold water to condense the steam in the feed water, so that a No. 3 Cameron pump will force it into the boilers. There is not much new scale forming, but the old scale remains as fast to the flue as ever. We have hammered as much off as we could, but the boilers are so built that it is hard to use a hammer. They are four feet in diameter, twenty-eight feet long, with 2 twelve and 2 thirteen inch flues in each. We blow out every two weeks, and find the mud drum full of mud, very black and thin. We filter through hay packed tight. I have tried everything except taking the flues out of the boilers, and a steel square linked chain to take scale off. Answer: The boiler incrustation is sulphate of lime or gypsum, discolored with some organic matter. Oxalate of baryta is sometimes sold to purify water, but is too expensive for use on a large scale. If the water could be filtered through alternate layers of gravel and charcoal, it would help. When you are obliged to use such dirty water, the best way is to blow off more frequently, otherwise the deposit of gypsum in the flues will become unmanageable.

F. I. says: I have been reading the lectures of Professor Tyndall in your valuable paper, and am very much puzzled regarding his explanation of the complementary colors. I heretofore understood that the mixture of two primary colors was the complementary of the third. The Professor says that the mixture of the yellow and blue ray produces white light; if so, I would be very glad to know what is the use of the red ray as a component part of the illuminating power of the sun or any other white light. Answer: Professor Tyndall showed by experiment that the yellow and blue rays of the sun when combined produced white light, but he expressly stated that the same result did not follow when yellow and blue pigments are mixed. It was to illustrate this difference that he introduced the experiment.

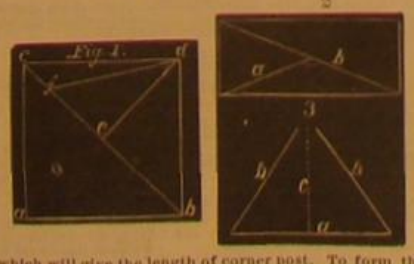
O. A. B. says: In your article on balancing machinery, on page 33 of the current volume, you give a formula, and proceed to compute the centrifugal force of a crank, weight 500 pounds, with its center of gravity revolving in a circle of four feet in diameter, at the rate of fifty revolutions per minute. Correcting a clerical error, you would have: centrifugal force $=500(4\times3{\cdot}1416\times\frac{5}{3})^2 \div(16\frac{1}{12}\times4)=852$ pounds. A few lines below you say: "We see it attempted to effect a balance by a piece placed opposite, at a double distance, but of half the weight, the counterbalance would have a double centrifugal force, and hence, although a standing balance would be obtained, it would not give a running balance." Let *us try* it: $F=250\times(8\times3{\cdot}1416\times\frac{5}{3})^2\div16\frac{1}{12}\times8=852$ pounds. Just the same, instead of double, and because it is just the same, it will of course give a perfect running balance, as well as a standing balance. It is thus shown that, in this instance, a standing balance and a running balance are secured by the same conditions, without regard to the *vis viva*. And this is equally true in all cases, as may be shown in any case by applying the formula as above, or it may be proved algebraically in general. This conclusion is of course based upon the supposition that no "couple" is produced by what I may call a diagonal balance. Answer: The erroneous calculation here corrected and the deductions therefrom have been pointed out and the proper statement of the laws of centrifugal force has already been given at page 81 and in an earlier issue of the SCIENTIFIC AMERICAN. No better proof that our paper has a circulation among the most intelligent of readers than the fact that this problem has attracted such prompt attention, and has elicited so many accurate statements of the principles involved, could possibly be offered.

J. O. says: Seeing, in your paper for January 8, a drawing of a "perpetual motion," I will state that I made one, on the same principle but different in construction, several years since. I do not believe in perpetual motion, but I thought I could gain more

power than I should use. I found that the power gained in going down one side was used in going up the other side.

J. R. E. says: Here are two of your subscribers and three or four others in trouble about the velocity of falling bodies. Some would have it that large and small will fall through the same space in the same time, without regard to the resistance of the element they pass through, air or water, and they take Parker for their authority. The others admit this all, theoretically, in vacuum. But they say that there is difference in passing through the atmosphere, and more through water, in favor of the large bodies, owing to the resistance. These last take Comstock for their authority. We would like to have you settle the question. Answer: The abstract laws of falling bodies have been determined with perfect accuracy, both by experiment and by logical deduction from known conditions. When the falling body is uninfluenced by forces other than that of gravitation, when falling freely as if in a perfect vacuum, the velocity can be predicted with perfect certainty and precision. From this fact, it results that astronomy, its calculation being based upon these well established principles, is an exact science, and that astronomers determine the motion of the heavenly bodies, calculate the perturbations produced by their mutual attractions, and even discover, as did Leverrier and Adams, a new member of the solar system whose distance is so great as, despite its tremendous magnitude, to have been previously undetected by the telescope. In all familiar examples of the effect of the force of gravitation, however, we find the motion of bodies, moving under its influence, to be affected by the action of other and retarding forces, as the resistances of the air and of friction. In any given case, when these resisting forces can be exactly determined, in magnitude and direction, the motion of the bodies can still be determined precisely. In some cases, as that in which the air resists the motion of a body moving with very great velocity, it is difficult, or even impossible, to calculate the resultant motion with exactness, in the present state of our mathematical knowledge. Where no resisting forces occur, the velocity of any falling body can be determined by the following rule: Multiply the hight, in feet, from which the body has fallen by 64⅓ and extract the square root of the product. The result is the velocity acquired, measured in feet per second. Or, multiply the time, in seconds, that the body occupies in falling by 32⅙ and the product gives the velocity acquired. For all cases other than that just supposed, the velocity will be modified to an extent which will vary with each individual case. Generally, it may be stated that falling bodies of equal size but differing densities will fall through any resisting medium with differing velocities, in consequence of the fact that the lighter materials offer greater extent of surface to the resistance of the air or other opposing fluid, and, therefore, were retarded to a greater extent than are the denser substances. Where bodies of similar material, but of different sizes, are allowed to fall through a resisting medium, the larger will fall most rapidly for a somewhat similar reason. As an illustration, a sphere of two inches diameter contains eight times as much matter as does a sphere of the same material an inch in diameter, but it only has four times as much surface, and four times the cross section of the smaller ball. It therefore is less retarded and will be found to reach the limit of its fall first. In the air this difference is seldom noticeable; in the water it is more frequently observed, and it is for a similar reason that a large vessel requires less proportional steam power than does a small one driven at the same speed.

C. H. D. says, in answer to T. who asked how to construct a flaring vessel, such as a hopper: Fig. 1. Draw a square a b c d, the size of hopper at the top minus the desired size of hole to be left at the bottom, then draw the diagonal lines c b e d; then measure from e the depth of hopper; from thence draw the line f d,



which will give the length of corner post. To form the square, Fig. 2, take the lines e f and f d (Fig. 1); draw the diagonal lines a b, which will give the correct bevel for corner post line a. Fig. 3 is the full size of hopper at the top. Take the length of line f d (Fig. 1), for the lines b b, which gives the angle on which to cut the boards, and dotted line c is the required width. If it is not desirable to use corner posts, cut the ends of the boards to the bevel a b (Fig. 2), and set out the dovetail square from the end.

T. M. says to A. H. S., who asked for directions for building a warm and rat proof house: If you use sand to fill the space between the weatherboarding and plastering of your house, the pressure upon both plastering and weatherboarding can be lessened by inserting pieces of inch board between the studs, like shelves, a foot or two above each other, fastened with nails "toed in" at each end. They should extend to within one inch of the weatherboarding so as to allow space for the sand to run down and fill up. The liability of the sand to run out through cracks or warps in the weatherboarding may be obviated by tacking on to the studding, before the boards are put on, coarse wrapping paper, which can be had in rolls of great length and width at a cheap cost. Nail pieces of board vertically between the ends of the joists to keep the sand from running between the floor and ceiling.

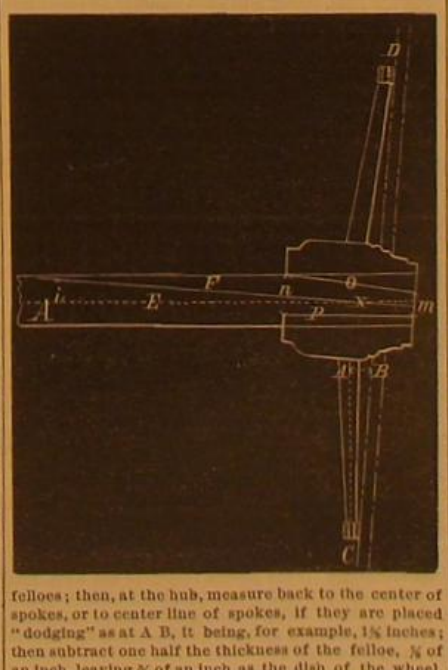
T. M. replies to D. M.'s question about a leaky roof: Your tin roof leaks, probably, because it is so steep that the solder runs down from, instead of up under, the lap; in that case the bond is but slight, and the remedy is a plentiful use of solder. Cover your parapet walls with a tin trough, inverted, (of convenient length), the inner side or flange being deep enough to extend over the roof tin where it reaches up the side of the parapet, and nail it to the joints between the bricks.

H. M. W. says: J. asks for a simple method of detecting explosive oils. The following *is* about the simplest method extant, and is sufficiently accurate: Pour into a cup about 2 inches of the coal oil to be tested; light a match and, when fairly in a blaze, throw it into the oil. Standard oil (say of 150 degrees) ought to extinguish the burning match, as would water or any fixed oil.

J. E. G. says: The best mode of analyzing such questions as the balance wheel controversy is to take the two extremes *into* consideration. One would be a perfect and true wheel and the other would be a wheel with the rim lying on the shaft at opposite points of the circumference, which would be no balance wheel at all, and could not be kept in its bearings because of its unequal distribution of weight from the center.

G. B. D. says, in answer to H. & B. who asked how to draw water 400 feet horizontally and 60 feet vertically without a pump; If a pipe or any suitable conductor be placed horizontally with its thickness below the surface of the water, it will naturally fill to the distance of 400 feet as required; at this point a reservoir should be sunk entirely below the pipe; then at the highest point (60 feet) put in an old fashioned wooden pump running its pipe down into the reservoir. The plunger of this pump should work at a point not to exceed 20 feet above the reservoir, and the valve should be near the bottom, so as to be always below the water in the reservoir.

A. B. says, in reply to H. C. K., who asked for a rule for laying off wagon axles, that the length of the spindle should be 3¼ times the diameter of the butt. The length of the hub should be nearly one and a half times its diameter. The spindle should taper just so that the bottom side of axle may be straight throughout its whole length, when the wheel stands on a plumb spoke; and every wheel should stand on a plumb spoke whether the bottom side of spindle is level or not. The product arising from multiplying one fifty-sixth by the diameter of the wheel will give you the proper amount of dish for your wheel; then the spindle should taper one inch in twelve. To lay off wooden axles, first obtain the dish of wheel by laying straight edge, C D, against face of



felloes; then, at the hub, measure back to the center of spokes, or to center line of spokes, if they are placed "dodging" as at A B, it being, for example, 1⅝ inches; then subtract one half the thickness of the felloe, ⅝ of an inch, leaving ⅜ of an inch as the dish of the wheel. Then measure the diameter of wheel, it being say 42 inches; then the length of hub, say 12 inches; then the distance from center of spoke or line of spokes to back end of hub, 6 inches, the diameter of large end of back box being 3¾ inches; then the small end of front box, which, in this case, should be 2¾ inches. Then on axle stick A, make a line, E, the whole length of stick; then measure from end of stick the distance from center of spokes to front end of hub, in this case being six inches, and make point x, then from x measure half the diameter of wheel, or 21 inches, to t on line E. Then measure up the dish of wheel or ⅜ of an inch; then draw line F from point last obtained through x; said line will be perpendicular to the face of the wheel, thus bringing the spoke on a plumb line. Now on line F measure each way from x, six inches to points n and m. Then with compasses set at 1¾ inches lay off from n, the butt of spindle, and 1⅝ inches from m, lay off tip of spindle; then draw lines O and P, which will be the top and bottom of spindle. Then on line E from x, measure the track you wish, and then lay off other end of axle in same manner as described above. If a linch pin is used, allowance must be made for it on end of spindle. Give as little gather as possible, only be sure and give a little. After the wheels are on the axle, they ought to measure not more than half an inch farther apart on back side than on front, measured at the rim on a level line with center of axle. By following these rules you can make wheels track every time and be sure of an easy running wagon. Iron axles may be set by the above rule by using a straight edge with some screws in the ends, one set for either end of spindle.

T. H. C. says that if P. S. will wash his ether, that is, put in a bottle with water and shake it up; then pour off the ether after settling, he will find it will dissolve pure rubber. Perhaps he may be trying to dissolve the vulcanized rubber; if so, he might as well give it up. Washed sulphuric ether will dissolve pure rubber, unwashed will not.

J. E. S. says, in reply to J. W.'s answer on transmission of motion: I saw the thing tested in the summer of 1854, with the result stated in the communication to which J. W. takes exception, however new it may be to him.

A. O. says in answer to L. H. W., who asked how to temper small steel wire, one sixteenth of an inch in diameter and less, and one inch long: You may follow the method in vogue for small screws, pins and needles. Put them upon an iron plate which can be heated from below, or place them in a sheet iron drum, to be turned on a fire like a coffee roaster. With regard to the heat required, it necessarily differs according to the degree of tempering you want to impart to the steel. A yellow tempering color, in its various tints, is imparted to instruments that are to remain hard, such as razors, surgical instruments, lancets, pen knives, etc. Articles that are to possess elasticity and the hardness of a spring, need a violet or dark blue color, and in some cases, especially when a particular hardness is required, as is desirable for the edges of astronomical and physical instruments, it may be proper to conduct the tempering at such a low temperature that no color appears at all.

J. F. says, in reply to M. D. K., who asked for statistics of presses for printing cards, circulars, etc., that he uses a card *printing* machine that will print at the rate of 6,000 per hour. This is possibly true; but our answer referred to a press for all kinds of work, even printing on the thinnest tissue p per.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Correlation of Forces. By W. R. S.

On Certain Instances of Combustion occasioned by Superheated Steam. By E. R. D.

On the Secrets of a Kernel. By F. R. R.

On the Creeping Railway Problem. By C. T.

On Fast Printing Presses, and on an Improved Galvanic Battery. By J. F.

On the Recent Boiler Explosions By T. L. L.

On the Rupture of Cylindrical Steam Boilers. By B. W.

[OFFICIAL.]

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January 28, 1873,

AND EACH BEARING THAT DATE.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

23,820.—Watch Case.—J. Boss. April 16, 1873.
23,862.—Cotton Press.—H. W. Randle. April 16, 1873.
24,032.—Sewing Machine.—J. Gray. April 30, 1873.

EXTENSIONS GRANTED.

22,839.—Baker's Oven.—G. C. Jennison.
22,885.—Harvester.—W. K. Miller. (r) 2,266.
22,885.—Harvester.—W. K. Miller. (r) 2,267.
22,885.—Harvester.—W. K. Miller. (r) 2,268.
22,885.—Harvester.—W. K. Miller. (r) 2,269.
22,885.—Harvester.—W. K. Miller. (r) 2,270.
22,890.—Carpet Sweeper.—N. B. Pratt.

DESIGNS PATENTED.

6,368.—Monument.—W. T. Cross, Kewanee, Ill.
6,369 to 6,372.—Stoves.—C. Harris *et al.*, Cincinnati, O.
6,373.—Iron Fence.—M. Krumm, Columbus, Ohio.
6,374.—Governor Base.—W. B. Le Van, Philadelphia, Pa.
6,375.—Sewing Machine.—G. Rehfuss, Philadelphia, Pa.
6,376.—Cover Handle.—R. B. Wardin, Philadelphia, Pa.
6,377.—Cooking Stove.—H. A. Wood, Bangor, Me.

TRADE MARKS REGISTERED.

1,107.—Writing Paper.—A. Beach, Iowa City, Iowa.
1,108.—Pruning Shears.—Christy & Hughes, Clyde, Ohio.
1,109.—Cigars.—F. De Bary & Co., New York city.
1,110.—Spoons, etc.—Hall, Elton & Co., Wallingford, Ct.
1,111.—Cigars.—S. Jacoby & Co., New York city.
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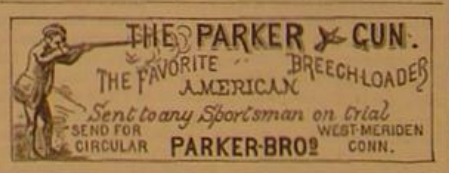

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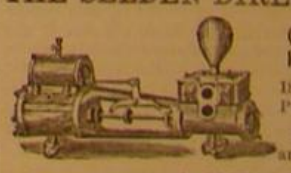
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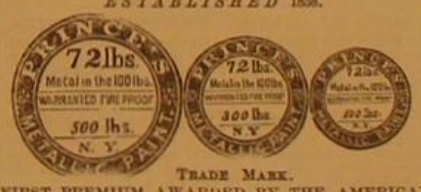

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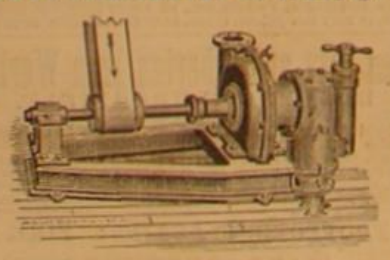

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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IMPROVED SELF-ACTING FIRE TANK.

The alarming frequency of fires within the last few months has awakened an unusual interest and provoked a deal of newspaper discussion as to the best means for the prevention and extinguishment of conflagrations. The lesson of the Boston fire is one that has often been pointed out, but seldom heeded, namely, that when a fire has reached a certain stage, it gets beyond the control of any apparatus whatever, and takes, for the most part, its own course. Any improvement in our present systems should be in the direction of a greater promptitude in extinguishing incipient fires before they reach the dangerous stage.

The point aimed at in the construction of apparatus heretofore has been the projection of the largest possible bulk of water upon the fire. The result has been an enormous increase in the item of water damage, without a proportionate gain in the celerity of action which is the real element of success at fires.

Considerable attention has been given, within the last few years, to the perfecting of devices which should take advantage of the extinguishing properties of carbonic acid gas. This material seemed to promise the condensed power requisite to portability in the transportation, with the utmost expedition in generating pressure and manipulation, while possessing the additional recommendation of quenching fire without water damage. Coupled with these advantages, there seemed to be a certainty of action and a marvelous power over flame, unattainable by any other known method.

The only system in which this principle has been made practical is that in which chemical action is used, not only to impregnate the stream with the desired extinguishing quality, but also to propel it, and in which water is used to dissolve the chemicals, to hold the gas in mechanical combination, and to give momentum to the projected stream.

The small machines called "extinguishers," which combine the points enumerated, have made a splendid record, and in scores of instances have put out fires that were apparently out of all proportion to the means used. The limit of the extinguisher is in its capacity. As the operator must carry on his back the engine, hose and material, the weight is restricted to 85 lbs., and the stream to a diameter of one eighth of an inch and a duration of perhaps five minutes. The principle was perfect, but its full development seemed to call for a continuous stream of such volume as would control a fire in the more advanced stages. The first practical success in this direction is found in the street engine of the Babcock Fire Extinguisher Company. The engine is constructed with two copper tanks of a capacity of 120 gallons, tested to a pressure of 500 lbs., and mounted on wheels. The hose is connected and ready for instant action, and the stream, of thirty times the volume of that of the "portable," is thrown 100 feet from the nozzle. On arriving at a fire, a pressure of 200 lbs. is raised in ten seconds, and so ready is the manipulation that the stream is on the fire in less than a minute. This celerity of action is due not merely to the instantaneous generation of pressure, but to the fact that no suction hose has to be connected, and no leading hose laid, preparatory to playing. The result of this promptitude, together with the marvelous extinguishing power of the stream, is, in a large proportion of instances, the putting out of the fire before it is fairly started. Statistics prove that fires are, eight times in ten, discovered in the earliest stage, and the fate of the building is usually decided by the action of the first five minutes.

Thus far the engine has been introduced into the departments of some fifty cities and towns, and has already made a history such as no other apparatus has ever approached. At Chicago the engine puts out fifty per cent of the fires within its range, without the aid of the steamers. The mayor, in a late communication to the fire commissioners, recommends the purchase of fourteen more of these engines for the department, at a cost of $2,000 each. At Boston the single engine that was ordered since the fire there has been in the department two weeks, during which time it has put out four fires in advance of the steamers, and has made so favorable an impression that the chief engineer recommends the purchase of four more. At Holyoke, Mass., the engine extinguished 13 fires, out of the 19 that have occurred in the last two years, before the steamers could get a stream on. At many of these fires, the engine has shown an efficiency little short of the miraculous.

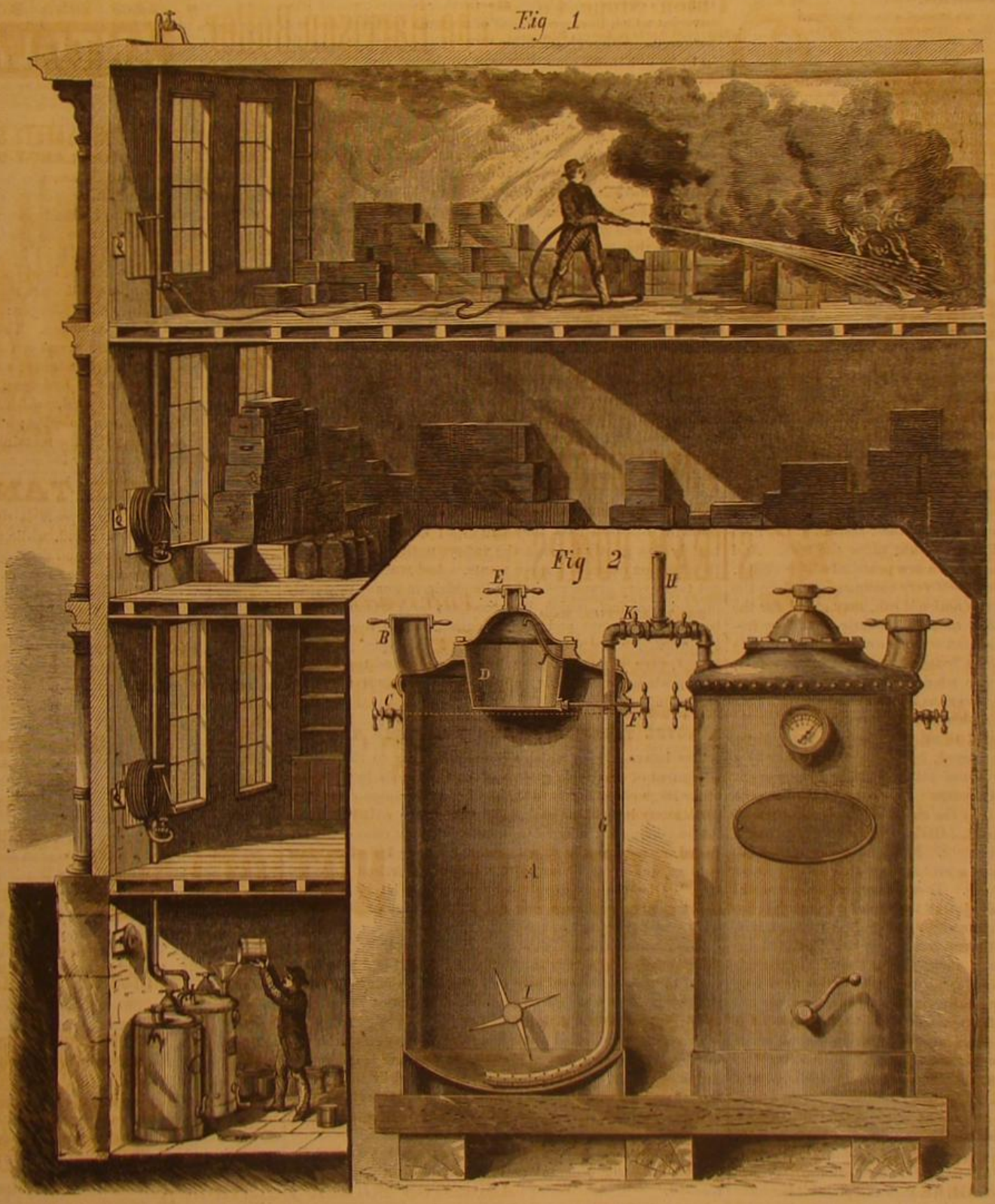
Every town that is supplied with these engines has reduced its fire and water losses materially, generally to less than fifty per cent of the average before its adoption. At Holyoke the loss at three fires, in the five months previous to its introduction, was $375,000. During the remainder of the same year (seven months), the loss in six fires was $1,665. In nearly every instance the first building is saved, and often almost without damage. A still more astonishing claim is that, out of 300 fires heard from, in only three cases has a second (detached) building burned. At Westfield, Mass., the engine handled four fires at once, and saved all the buildings. It has been used under every variety of circumstance, and has never failed to throw its stream.

The wonderful success of the forms mentioned has led the company to the development of the same general principle in a form particularly adapted to the protection of the interior of large buildings, factories, theaters, sailing vessels, etc. By reference to the accompanying illustration, the construction of the apparatus will be readily understood.

A is one of a pair of tanks holding from 50 to 100 gallons each, and filled with soda solution to the level of the gage cock, C, through the opening, B. D is the acid chamber which is filled through the opening, E, and discharged by the valve, F. On discharging the acid the pressure is shown by the pressure gage, and on opening the gate, K, the stream flows up through the exhaust pipe, G, into the main, H, finding vent through the hose on every floor where a cock is opened. The agitator, I, is for stirring the fluid to facilitate the dissolving of the soda in re-charging. The practical working is admirably illustrated by the picture in the background, and will be comprehended at once. The plan is virtually the same as was lately presented before the Polytechnic Association, by Mr. D. J. Tapley, where it attracted much attention.

The peculiar advantage of this form is that it gives an instantaneous stream of a sufficient volume to control any fire that can be built in an ordinary interior. In theaters and churches it will throw a stream to the highest part of the ceiling, and even from the roof a stream can be used to protect from fires in adjoining buildings. The power of the tanks is sufficient to force a stream through 300 feet of per-

Fig 1



THE BABCOCK SELF-ACTING FIRE TANK.

pendicular pipe, or any length of horizontal hose or pipe. The stream seems to possess the wonderful property of clearing a room of smoke almost instantly, though filled to suffocation. The gas also seems to interpose a wall of non conducting vapor between the hoseman and the fire, which protects him from the heat. In fact, experience is developing every day new advantages for this system.

Scientific American.

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HONOR TO WHOM HONOR IS DUE.

There is a large figure on a house in Center Street, New York city, which at most hours of the day may be seen vigorously engaged in turning a crank. Pedestrians on the street jostle each other while vainly trying to make out what the wooden man is about, and passengers in the cars stretch their necks to obtain a clearer view. The residents of that locality seem to take it as a matter of course and attend to their affairs as if nothing uncommon was going on; but the mystery still remains unsolved. We have caused an investigation to be made and have learned that, instead of the man turning the crank, it is the crank that turns the man. And upon this fact we wish to found a few practical observations. The sturdy figure, making itself very conspicuous before the world and attracting all the notice it can, may stand for the lucky appropriator of other men's discoveries. It very frequently happens that the man who discovered the principle upon which an invention is founded, and which is, in fact, the engine that moves the whole apparatus, is forgotten; but the noisy speculator who runs about the streets and gets up stock companies and makes a fortune, and, in the minds of many persons, is entitled to all the glory, is really little more than the lay figure moved, by an invisible crank, by a power discovered after years of toil and study by some unknown and forgotten personage. The man who reaps the fame and money is turned by the crank which, in his conceit, he fancies he moves himself. Giving honor to whom honor is due is a very rare occurrence. Mankind looks at results and cares very little for the secret springs that have proved the fountain head of success. There is nothing so successful as success; and under the glow of triumph and the applause of men, the money maker accepts the public testimonials, goes to all the grand dinners, has his portrait painted for some public institution, and finally claims the whole credit of a grand enterprise. There is no doubt that the men who furnish the capital and push inventions to practical use are entitled to a fair share of credit for what they have done; but they cannot be accused of unselfishness in the matter or of acting upon purely patriotic motives. "Rich fields and pastures new" are all that this class of persons demand; and if the dividends are all right, they ought to keep quiet. What shall we say for the silent worker who discovers a great principle from which springs a grand progeny of inventions? The misfortune is that we frequently lose sight of such a benefactor. Just as the sources of the Nile are hardly yet known to the world, while in the plains it becomes a grand river and flows through numerous mouths into the sea, so with the fountain head of discoveries: we often fail to trace the precise source, but in the results we have a mighty river of applications, known to the whole world. The rill which has its rise among the snows and rocks of the mountains finally flows quietly past smiling meadows and the haunts of men; and while it sings its pastoral, we forget the ice and snow and beetling crags whence it had its origin.

Professor Tyndall in his eloquent plea for original research has in mind the devoted band of workers who, in poverty and reproach, in the chill atmosphere of neglect, often amidst persecutions and opposition, have made the discoveries which are the pride and boast of our present civilization. He cautioned us to protect and foster all such persons, and he proved the sincerity of his motives and the strength of his interest by leaving in the hands of trustees all the net earnings of his laborious lecturing tour in the United States, for the support of needy students who wish to devote themselves to pure science.

Any one who is willing to accept a career of this kind must be imbued with the true missionary spirit and not be actuated by anticipations of reward or desire for fame. Sooner or later, true honor may be accorded to the person to whom it is due; but this is rather the exception than the rule, and he who keeps public opinion before him as the spring for action will ask for bread and receive a stone. It is rare indeed that any great discovery has been made when sought with a view to immediate practical results. Nearly all of the grand principles upon which are based the leading applications of the age were discovered and worked out by men who never thought for a moment of the possibility of applying them. It would almost appear to be with original discovery as with humility: the moment it looks upon itself, it is gone. Let us glance at a few of the leading discoveries of modern times, and see if this statement be not true.

The doctrine of the correlation of forces—that force is not lost any more than matter—which in its importance is not inferior to the discovery of the law of gravitation, was first enunciated in a modest paper by Dr. Mayer, a practising physician in a small city in Germany. He could not possibly have foreseen the results that are likely to grow out of this law. Newton's analysis of solar light, Volta's battery and Oersted's electro-magnetism are further illustrations of discoveries which have grown out of a search for truth and not for fame. Although scientific writers have given due credit to these illustrious men, it cannot be denied that those who have made the applications have run away with popular favor and have gained all the prosperity. The great engines, propelled by the forces which were made known to us by Newton, Volta, Oersted and many others, keep in motion the crank that turns the busybodies of the world, and gives them a name for enterprise which they scarcely deserve. It would aid very much if the real benefactors could have due credit in their lifetime. There is little else that they desire, and sympathy and praise costs nothing, while it is often rich in the fruit that it may help to bring to maturity.

Professor Tyndall has set us a noble example of unselfish liberality. He had every right to carry with him to his home all the money that had been cheerfully given by those who were instructed and enchanted by his lectures; but instead of doing, so he prefers to hand it back for the benefit of those who gave it, and in aid of the common cause of scientific learning in which the whole world takes an interest. This is an example worthy of imitation. The trustees who have charge of the Tyndall fund will no doubt be glad to have the amount increased as largely as our wealthy citizens may desire. They cannot have too much money for the promotion of original research, and it is equally certain that no investigation founded upon correct scientific reasoning can be made in vain. Let us start as many rills of discovery as we can, knowing full well that they will swell to torrents and ultimately flow gently through the valleys until they empty into the common ocean of human wants. And we must not forget that every grand result had its origin in some apparently insignificant fact, which, by accretions and accumulations, becomes important and finally culminates in a successful application. Keep the fountains of discovery pure and bright, give honor to those who deserve it, and the streams of knowledge will not dry up and the world will not want for inventions.

A NOVEL TRACTION ENGINE FOR RAPID TRANSIT.

The interest, with which all plans leading to the accomplishment of a suitable system of rapid transit in this and other large cities is regarded, has been the means of calling forth many inventions designed to meet the existing need. An engraving of a novel apparatus of this class was published in the SCIENTIFIC AMERICAN on page 118 of our last volume, under the heading of "Lamm's Fireless Locomotive." One of these novel locomotives has lately been put in practical operation in our neighboring city of Brooklyn, with very flattering and interesting results.

The machine consists of a strongly made cylindrical reservoir, enclosed in a very thick clothing of felt and other material to prevent loss of heat by radiation. Connected with the reservoir is a steam engine which actuates the axle of the driving wheels. Before starting the reservoir is charged with very highly heated water from a stationary steam boiler, the heat being such that a high steam pressure is generated in the reservoir. As this pressure is relieved by the exit of the steam into the engine, a portion of the water in the reservoir is converted into steam by the heat with which it is surcharged. This conversion, continues until the temperature of the water falls to 212°, and the machine can therefore be operated during the interval until nearly that point is reached.

The experiments, which we witnessed, consisted in charging the reservoir of the machine with hot water having a temperature of 360°, which yielded a steam pressure of 145 pounds per square inch, and then running the locomotive for a distance of six miles, on the track of the Coney Island Railway. During the first half of the journey, which was accomplished in 15 minutes, the pressure fell to 90 pounds; and at the expiration of the trip, which occupied 33 minutes, the gage showed but 65 pounds, the rate of diminution being much more rapid under high pressure than when the same had become lowered. The speed attained was twelve miles per hour, the burden being a single six ton car for 35 passengers; we were assured, however, that the same time had been made with two carriages containing seventy persons. In actual use it is proposed to locate, at the termini or other points of the line, a sufficient number of stationary boilers from which the locomotive may be charged or its power renewed when exhausted.

From the results of the trials and those that have been deduced from the successful operation of the device in New Orleans and elsewhere, we are inclined to think the invention one of considerable utility. It is perfectly safe, because the steam pressure can never increase but is always steadily lowering. Being without a fire, it is free from many of the defects of the dummy. Of course there is no smoke, while the noise of the exhaust is scarcely perceptible. Its speed and tractile power are, as practically proved, sufficient for ordinary purposes; the cost of construction is not great, and as regards economy, its use can probably be made less costly than that of horses. We noted especially that the motion was regular and easily governed or stopped by the engineer, and that the radiation of heat, which, it might be imagined, would rapidly take place from the reservoir in cold weather, was almost completely prevented by the thick surrounding casings. We are of opinion that the invention is worthy of thorough investigation from parties interested in street railroads. We should think it well adapted for the elevated railroad on Greenwich Street, New York, and for transferring freight from the steam terminus of the Hudson River and New York and New Haven railroads at 42d street down to their freight stations in the heart of the city; while for the underground railway lately organized in Brooklyn, and for the Broadway underground railway in this city, it may prove to be "just the thing."

EXPLOSIONS PRODUCED BY HIGH MUSICAL TONES.

The greater number of explosive agents contain nitrogen, which retains, with a very weak affinity, the element required for the combustion of the other ingredients; it resembles a spring which, when once set free, unwinds itself totally and suddenly. The starting of this spring is, in the case of gunpowder, gun cotton, etc., the heat-giving spark; with percussion powders, nitro-glycerin, etc., simply a shock is sufficient, while it has been discovered recently that there are substances which can be exploded by merely a sound of high pitch; such is the iodide of imidogen, easily made by placing pulverized iodine in liquid ammonia. In order to explain the reaction, we will state that there are three compounds of nitrogen and hydrogen: NH_3, ammonia, NH_2, amidogen, and N H, imidogen. The two latter are only formed in combination when one or two atoms of hydrogen are displaced by a third substance; so, when placing iodine in ammonia, two atoms of hydrogen combine with the iodine to form hydro-iodic acid, which dissolves a portion of iodine, forming a brown solution; while another portion of the iodine combines with the remaining N H, in which two atoms of H are displaced by iodine, and NH_3 becomes NHI_2; this forms a black powder, which is left as residue, when, after 15 minutes reaction, the brown liquid ammonia solution is poured off. The deposit is then filtered to free it from excess of ammonia; and, while wet, the filtering paper is divided into small pieces and dried separately, in order that any accidental explosion may not involve the whole mass.

There are other methods of making this compound. According to Mitscherlich, the iodine is dissolved in *aqua regia* and precipitated with an excess of ammonia, by which operation all the iodine is changed into NHI_2. According to Serullas, a saturated solution of iodine in alcohol is mixed with an excess of ammonia; then water is added, as long as it produces a precipitation of a black powder, which is again NHI_2. In this last form of preparation it is less explosive and less dangerous; while, if prepared by one of the former methods, the least pressure or friction causes the dry powder to explode, and it is a laboratory trick to distribute small particles of it while wet, on the floor of a room or hall; if, after drying, the people walk over it, a fusillade of small explosions is heard from under their feet.

The experiments to explode such powders by the rapid vibration of a high musical tone, were recently made by Champion and Pellet, and we have described them on page 20 of this volume. They form a valuable addition to the lecture room experiments.

The bromide of imidogen, produced by pouring bromine into ammonia, explodes much more easily, and, even at a distance, by any sharp noise; it is much more dangerous than the former. But the chloride of imidogen, produced by passing chlorine gas through liquid ammonia, is a liquid oily substance, and perhaps the most dangerous combination in existence. A single drop will explode most violently, on being merely touched with a greasy solid body. Berzelius gives a list of the bodies, upon the mere contact with which this formidable compound explodes. Undoubtedly it will go off by the vibration of the air produced by tones, but experments in this direction are still wanting.

POWER RAILWAY BRAKES.

The Honorable Mr. King lately introduced in the House of Representatives a bill to compel all railway companies to provide their cars with power brakes, so arranged that the engineer may, at any moment, apply power to the wheels of every car on the train. Penalties are provided against companies who fail to employ the device mentioned. The introduction of the bill was followed by an interesting speech by Mr. King, who presented many useful facts concerning railways, and railway brakes in particular, from which we take the following:

"Power brakes, operated from the locomotive, are a very old invention, although they were never adopted by any railroad company in the United States until about three or four years ago.

The Creamer brake is operated by the engineer, in case only of an emergency, by pulling a cord extending the whole

length of the train. This releases the brakes, which are wound up after the fashion of an alarm clock. The hand brakes are used at all ordinary stoppings, the spring power being reserved only for an emergency.

The electric brake of Olmstead has been in use upon one train on the Erie railroad for some time, and works well.

The steam brake has a continuous line of pipe from the locomotive to the last car in the train; under the center of every car is a common steam-tight cylinder and piston; a branch from the long line of pipe communicates with the front end of all these cylinders; so that when the engineer turns a stopcock, the steam rushes like lightning through the train, enters the cylinders, and pushes the pistons outward, and thus applies the brakes to the wheels of every car in the rain. The air brake is the same thing, except that air does the work instead of steam.

To show the state of the art, and that the material exists by which this bill can be carried into effect, tables are appended to these remarks showing the names of inventors and the dates of their patents obtained both in England and the United States. The first power brake patent granted in this country was in 1847, and the total number granted up to the close of last year was fifty-nine. More patents on power brakes were granted in 1872 than from the organization of our Patent Office to the close of 1871, which strikingly illustrates the rivalry of the inventive genius of this country.

In England, from 1840 to 1866, there were patented twenty-two electric brakes; from 1835 to 1865, twenty hydrostatic brakes; thirty pneumatic brakes from 1838 to 1866, and fifty-four steam brakes from the year 1836 to 1866.

Henry Miller's steam brake, patented in 1855, was tried on a train of cars at Detroit, about that year, in the presence of several distinguished people; and a very interesting printed report of its operation and trial at that time may be found in the file containing his original application for a patent in the United States. But, for the fruits of his genius developed almost twenty years ago, it is to be regretted that he never received either honor or competent reward.

Seven companies for the manufacture of power brakes have been organized in the United States since 1869. And of the 444 railroads in the United States and Canada, more than one sixth of them have already been equipped with power brakes operated by the engineers.

On the Chicago and Northwestern railroad, by means of these brakes, a train of six cars, going at the rate of thirty-two miles an hour, was stopped in 19 seconds; the same train, going forty miles an hour, was stopped in 18 seconds, in 370 feet, or in less than one half the length of this Capitol building. The time in which to stop is the all-important consideration. It surely would take three minutes to stop a train going at this speed with the ordinary hand brakes. A minute in railroading is a very important matter."

Mr. King is hardly correct here. With handbrakes, properly and promptly applied, the train can be stopped as quickly as by the power brake. At a speed of thirty-three miles an hour a train can be stopped by hand brakes within a distance of 57 yards. At a speed of sixty-three miles an hour, within a space of 273 yards.

COLLAPSE FROM LOW WATER IN STEAM BOILERS.

A correspondent writes from Phelps, N. Y. to tell us of a somewhat remarkable and very interesting instance of a peculiar effect which may follow the overheating of a steam boiler in consequence of a deficiency of water. The case furnishes us an excellent text for remarks on the subject of "low water." A copper still, which had been in use, was, by some oversight, completely emptied while the fire was allowed to burn with undiminished intensity. It, as a natural consequence, quickly became red hot. While in this condition a quantity of cold liquid was run into it, when it instantly collapsed, being completely crushed in by the pressure of the atmosphere acting upon its exterior.

Our correspondent asks us to explain this, to him, most mysterious occurrence. Probably a very large majority of our most experienced and most intelligent engineers, if asked what effect should be anticipated in such a case, would say that there would be imminent danger of an explosion, and that a collapse could not, under any circumstances, occur. This case, however, is described by one of our readers, who gives us his name, and we cannot doubt the authenticity of the narrative. We can readily imagine, furthermore, how such an action might take place. A closed vessel used as a still, having pipes of small diameter for inlet and outlet, would, when the contents were drained off in the manner described, be left dry, but filled with highly heated aqueous vapor at atmospheric pressure. When the cold liquid was allowed to re-enter, this vapor would be likely instantly to condense, and before the atmosphere could enter through the contracted openings in sufficient quantity to equilibrate the pressure on the exterior, collapse might occur. This we presume to have been the case in the instance considered, and we have here another reminder of the falsity of the idea, formerly so prevalent and which is by no means yet extirpated from the minds of some of even the most intelligent men having charge of steam boilers, that "low water" must inevitably produce an explosion, and even that it is the principal cause of explosions.

Sixty years ago a crucial experiment was unintentionally tried by the then well known Captain Bunker, who commanded John Stevens' steamboat, Phœnix, the craft which is celebrated as having been the first steam vessel to make a trip in the open sea. In the year 1812, just before the memorable trip from this port to Philadelphia, which the venturesome captain made with young Robert L. Stevens, the boat was lying one night at the wharf, when, by some carelessness, the boiler became completely emptied of water. On discovering this unpleasant state of affairs, Captain Bunker at once, as he testifies in the report of the Secretary of the Treasury, December 12, 1838, turned on the feed water. A crackling noise and some leakage, due to unequal contraction, were the only noticeable consequences. The same authority tells of a similar occurrence of which he was a witness which had no more serious results. Many such instances are known to have taken place, and the Franklin Institute of Philadelphia and individual experimenters have furnished ample evidence that, with low steam pressure, it is by no means certain, or even probable, that an explosion must be consequent upon a deficiency of water in the steam boiler. This prevalent theory, which was, as we have seen, disproved even before it had become a tradition, is too often made a scapegoat for those guilty of carelessness or recklessness in quite other directions.

It cannot, however, be too earnestly impressed upon those having charge of steam boilers that, although the majority of explosions are due to either ignorance or recklessness in working boilers too weak to bear the pressure to which they are subjected, low water may, and sometimes does, produce explosions. Iron heated to a red heat loses a large proportion of its strength, and at a white heat retains, practically, no cohesive force. A boiler under steam, therefore, if its heating surfaces become uncovered where liable to be overheated, will be apt to lose strength, as this overheating progresses until, at last too weak to sustain the usual pressure, an explosion takes place. It is thus that such disasters usually occur, and not, probably, in consequence of pumping cold water into empty but overheated boilers.

Where a boiler still contains some water below the line of overheated surface, the introduction of additional water may, in rare cases, by suddenly cooling a part having, a moment before, a very high temperature, produce new strains that may precipitate a catastrophe; since, in such cases the boiler cannot become, in effect, a condenser, as in the example which prompted this article. The additional quantity of steam generated under such circumstances may also result similarly. Low water may, therefore, produce either explosion or collapse, or it may cause no dangerous result, according to the peculiar circumstances of the case.

THE PROPOSED INTRODUCTION OF WATER METERS IN CITIES.

The city authorities of Brooklyn are manifesting some apprehension regarding the enormous waste of water in that city. That a vast and unnecessary drain is thus made upon the supply is fully evidenced by the fact that the amount now used averages fifty gallons per day for every individual of the population, and it is in view of the circumstanee that the present yearly consumption would soon exceed the capacity of the reservoirs, now 40,000,000 gallons, and necessitate the incurring of heavy additional indebtedness of the city, that the municipal government is seriously considering the introduction of water meters. It is estimated that the expense of these appliances, extending their use into families, would be about $1,000,000, and the yearly cost for repairs some $100,000. All manufacturing establishments in Brooklyn are metered at the present time, and are paying at the rate of two cents per hundred gallons.

We notice that the Commissioner of City Works makes reference to the fact that numbers of the water meters now in use have cost with their connections from $50 to $70 each. This sum, he justly believes, is unnecessarily high, and considers that suitable apparatus may be obtained at less figures. The subject of introducing water meters in New York has also been discussed for some time, and will eventually be adopted. It would be well for inventors to turn their attention to this matter, as there will be a large market opened for cheap and efficient forms of water meters one of these days.

THE INTERNATIONAL METRIC COMMMISSION AND ITS WORK.

The commission formed of delegates from thirty nations which met in Paris and was charged with the determination of uniform standards of weights and measures based on the French metric system has recently closed its joint labors. The countries represented were Belgium, Switzerland, Italy, Spain, Portugal, Prussia, Greece, Turkey, the Spanish-American republics, and English India, in which the French system is already in use; Austria, where it has been adopted since January 1st of this year, and England and the United States, which, without rendering the use of the metric standard obligatory, have admitted its legal employment in connection with the older method.

The Commission devoted its labor to the most exact examination of the standard in the French archives. The model was a platinum bar of one meter in length from end to end. It remained to determine whether the shocks to which it had been submitted during its repeated use in verifying other standards, or changes which might have taken place in its molecular construction, had not slightly altered its length, and whether its faces were absolutely true.

M. Fizeau, by a series of accurate investigations, showed that, while rules of iron and copper have varied in their construction in course of time, no similar property exists in iridiated platinum, which is analogous to the metal composing the bar in question; nor does this alloy ever vary in dilatability. This point was therefore first established. Attention was next directed to the extremities of the standard. Microscopic examinations were made, and, by the reflection of a filament of cobweb almost in contact with the polished surface, it was found that the latter was regular and had suffered no change. On the faces, the microscope showed among the circular lines, which proved the work to have been done by the processes of the lapidary, one apparently differing from those around it. In order to discover whether this facet had had any influence on the length of the meter, which it was necessary to be sure of to the one ten-thousandth fraction of a thousandth part, a very delicate microscope was constructed; and in order to measure this infinitesimal distance, the dust forming the globulous silica of the geysers of Iceland, and composed of little spheres perfectly regular to the hundredth of a millimeter in diameter, was employed. Through such accurate means as we have outlined, the length of the bar was determined not to have changed.

The Commission then decided that to constitute the international meter, of which a copy should be sent to the government of each nation represented, the meter in the French archives should be reproduced in exact *fac simile*, and made of iridiated platinum, that is, platinum containing one tenth part iridium, with a margin of two per cent more or less of the latter metal. The standard will be constructed as a line one meter long traced on a rule of 102 hundredths of a meter in length.

Investigations similar to those already detailed led the commission to adopt, for the type measure of weight, the kilogramme of the archives in its actual state. This standard will also be of iridiated platinum and a *fac simile* of the old one. The copies will be executed by the French section of the commission with the assistance of a permanent committee, who will minutely follow all operations to their completion and final verification by the conference.

THE SEWING MACHINE MONOPOLY.

To the Editor of the Scientific American:

Heaven bless you for opposing the reissue of patents to the great sewing machine combination! In our little hamlet of only a score of laborers' cottages, there are three cases which are eloquent petitions against it. In one, a soldier's widow with one crippled foot patiently uses the other to earn the exorbitant price of $87 which her Wheeler and Wilson has cost her. In another, a sad eyed young mother, deserted by a cruel husband, is at work by the week to pay the same price for a machine, assisted by her noble young brother of twelve years, for her wages alone are not equal to making the required monthly payments and clothing herself and child. In the third, is a young girl who has finished paying for her machine by daily labor in carrying off brick and making flower pots in a pottery which is the nucleus of our little cluster of humble homes. That her eyes were bright and her smile ever cheerful while earning the machine which was to assist in doing the sewing in her father's large family is no reason why she should spend weeks of toil in adding money to the purse of a millionaire.

These cases are not exceptional; there are thousands even worse all over the land, and in using your powerful influence against this grinding, pitiless monopoly, you take a position in the foremost ranks of philanthropists.

MRS. SARAH S. THOMAS.

Carbon Cliff, Ill.

The above is a fair sample of the results of the work of the monopoly known as the Sewing Machine Combination, the future existence of which depends upon the grant of new patent extensions by Congress. It is, as our correspondent demonstrates, from poor women that the greater portion of the profits are made.

We earnestly hope that Congress will refuse to entertain the extension. Poor people will then be able to buy sewing machines at reasonable rates.

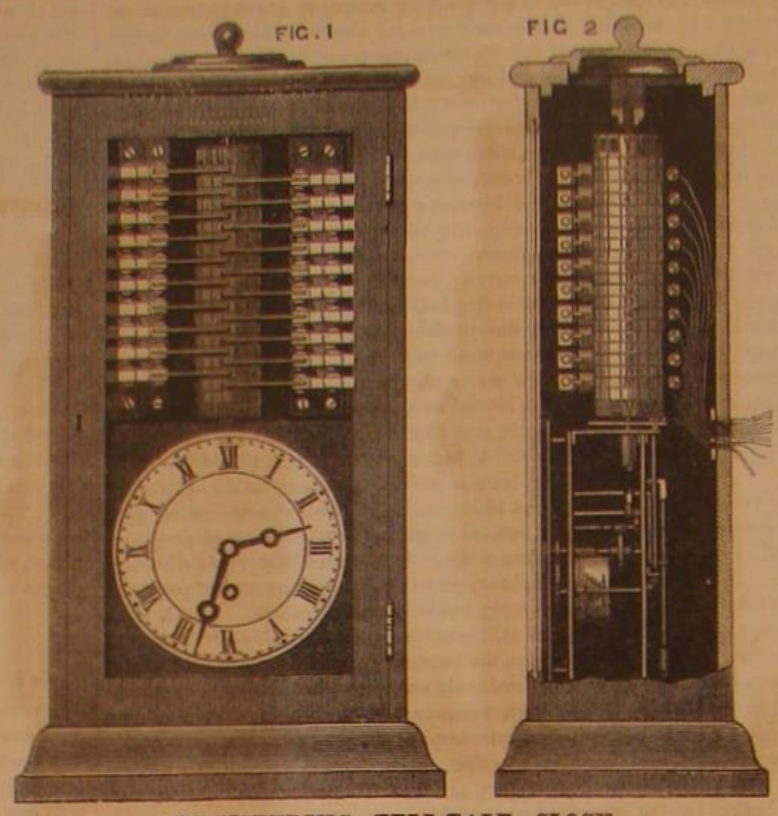
THE Springfield *Republican* says: "The sewing machine ring is made up of the two Howe companies, the Willcox & Gibbs and the Wheeler & Wilson, Grover & Baker and Singer. The first three are all controlled by Mr. Stockwell, the new king of Wall Street, President of the Pacific Mail, Atlantic and Pacific, Samana Bay, etc. The ring are reported to have pooled up nearly half a million dollars to carry through a renewal of one of their representative patents. But it is a bad year for jobs at Washington. The members are becoming painfully virtuous or, rather, terribly scared. One of the sewing machine makers out of the ring predicts that, if the monopoly doesn't succeed in extending their patents, first class sewing machines will be down to $12 apiece within a year." The Troy *Times* adds: "We suspect that machines will not soon sell for a dozen dollars each. All the best machines cost more than that. But there is no sort of doubt that the most approved sewing machines might be sold, with reasonable profit, for $20 to $25. It is one of the heaviest taxes now imposed on the industry of the country, to lift the price of sewing machines by royalty from $30 to $60 or $65. We believe that nothing short of bribery will carry the proposed extension, of the patents about expiring, through Congress. Let the people watch their representatives upon this question."

THE ANNEXATION OF BROOKLYN TO NEW YORK.

The consolidation of Brooklyn and New York under a single municipality is being discussed in both cities. The union would prove of material advantage, as the business relations of Brooklyn are so closely connected with those of New York that it appears essential that both should be under the same government. The annexation of Brooklyn would probably be but the precursor of the absorption of other suburbs within the State into the corporate limits of the metropolis, thus giving to New York that vast increase in area, wealth and population to which, as the outgrowth of her prosperity, she is justly entitled.

REGISTERING TELL TALE CLOCK.

This is an apparatus for checking a watchman on his rounds. Fig. 1 is a front elevation, and Fig. 2 a vertical section. A vertical revolving drum is placed in the center and is driven by the mechanism of the clock. To it is attached a sheet of paper divided perpendicularly into hours, and, by means of horizontal intersecting lines, into as many divisions, counted vertically, as there are localities to be visited. Each vertical division has a marker actuated by an electro-magnet placed on either side of the cylinder. The wires are led through the back of the clock to the different stations, at each of which is a knob which must be pressed at the time of the visit. A circuit is thus completed, the armature of the electro-magnet attracted, and a vibrating motion imparted to the marker, the point of which impresses a dot on the paper through the medium of a piece of carbonized ribbon. If, says *Engineering*, the watchman fails to visit any point on time, the cylinder in the interval will be carried on, so that a blank space will appear on the sheet and thus prove the neglect. Fresh paper can be substituted when required. The clock is placed beyond the reach of the watchman, and inspection in the morning reveals the fact as to whether he has been negligent or punctual in his rounds.



REGISTERING TELL-TALE CLOCK.

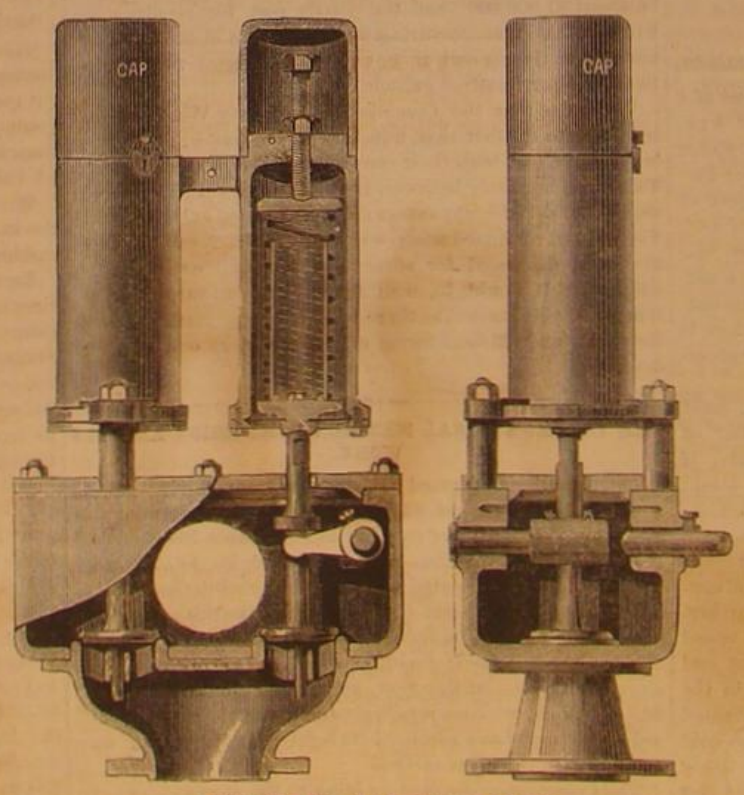
Camphor Wood.

Mr. J. Meldrum, Managing Director of the Johore Steam Saw Mills Company, at Johore, India, forwards to us various interesting particulars regarding the use of camphor wood, which, he states, may be applied to all purposes for which teak is used. The camphor tree belongs to the order *guttiferæ*, and grows without cultivation in the woods near the sea coast. It is frequently found upwards of 15 feet in circumference, and high in proportion. For carpenters' work the wood is much esteemed, being easy to work, light, durable, and not liable to be injured by insects; and it retains a pleasant and agreeable smell. It is especially suitable for shipbuilding and for the construction of wharves and jetties, as it is not destroyed by sea worms. Piles of this wood, in a comparatively good state of preservation, exist on the site of the old town of Johore, which was abandoned upwards of 100 years ago.

Our correspondent forwards a detailed report of tests made of this material, as regards strength, weight, etc. The breaking strain of a piece 3 feet long by 1¼ inches broad, and 1¼ inches wide, was 1,344 pounds. Its weight is 70 pounds per cubic foot. Large saw mills have been erected in Johore for the purpose of preparing this valuable timber for exportation.

IMPROVEMENT IN SAFETY VALVES.

Our engraving shows an arrangement of spring loaded safety valves for marine boilers, designed by Messrs. Pollit and Wigzell, of Sowerby Bridge, England, and lately applied by them on board a steamship which they are fitting with engines. It will be seen from the illustrations, says *Engineering*, that the valves are of the ordinary form, and are fitted with the usual lifting gear; but on the top of the valve box are fixed two cylindrical casings, each containing a helical spring which bears upon a disk carried by the spindle of the corresponding valve. The lower ends of these spring casings are kept air and water tight by india rubber disks secured as shown, while at the upper end, each casing is fitted with a cap secured by a bolt and padlock, this cap preventing the spring from being tampered with. The valves are quite free, and can be turned round by the two flat places formed on the spindles just above the valve box cover. The arrangement is a very simple one, and the plan of protecting the spring by means of an india rubber disk, which closes the mouth of the spring case, and at the same time does not interfere with the play of the valve, is, we believe, novel.



IMPROVED SAFETY VALVE.

The Hoosac Tunnel Mineral Water.

Large pockets of water have been opened at the west heading of Hoosac Tunnel during the past week, keeping the miners completely drenched. More than a year ago it was discovered that the water at the west end possessed medical properties, so that the workmen have avoided using it as a drink, choosing to be provided from a clear spring nearer the shaft and next to the mule stables. One tumblerful of this water proves an active cathartic; it leaves the skin soft and pliable when applied for washing without soap. A plentiful deposit of a soft substance is found in the crevices of the rocks, and when dried is an impalpable powder. Since the gushing out of this water in such quantities, it is proposed to have an analysis of it, and to make some further experiments to ascertain its virtues.

The Creeping Rail Question.

A correspondent, J. S., suggests that one rail of a track may be extended beyond the other by the trains in one direction being the heavier, as coal trains, which are loaded from the pits and empty when returning, usually are. But as this fact would apparently affect both rails of the track, J. S. says that a diurnal side strain, produced by the rotation of the earth, would cause trains in both directions to press on one rail more than on the other, on a single track. C. T. and others have also written their opinions, and they attribute the phenomenon to the motion of the earth. But none of them recognize the fact that this is the first instance of the kind on record, and that the two rails of a track are not sufficiently far apart for any such cause to lengthen one and not the other.

A Singular Railway Accident.

Recently, on the Hudson River Railroad, at Yonkers, N. Y., a freight train came in collision at the depot with an engine which was on a side track. The engineer of this engine jumped off just previous to this collision, having, as he says, shut off steam. No sooner had the collision occurred than off started the said engine northerly, with no one on board. It soon acquired a fearful velocity and at the next station, three miles distant, plunged into the rear car of a passenger train standing at Hastings depot, and made sad havoc. The car was split half open, telescoped upon the next car, etc. Two persons were mortally hurt, and others injured. The engineer of the runaway engine says that the shock of the collision must have opened the throttle; but it seems more probable that the gear was reversed by the engineer and steam let on before he jumped off. The collision was due to the non-observance of the danger signals by the engineer of the freight train.

A GOOD trade is always a comforting companion to travel with, a something that a man can fall back upon in time of need, and yet it does not preclude him from entering upon some profession, if his inclinations or genius develope the proper capacity. In fact, our most successful business men in almost every capacity are from the workshops and farms.

THE best linseed oil is yellow, transparent, and comparatively sweet scented, and has a flavor resembling that of the cucumber.

New German War Ship.

The Imperial German Admiralty recently decided to build three armor-clad vessels, the Grosser Kurfürst, the Friedrich der Grosse, and the Borussia; the two former are being built at the Imperial docks of Wilhelmshaven and Kiel, whilst the latter vessel, the Borussia, has been ordered of the Vulcan Engineering company, at Bredow, near Stettin.

The Borussia is an armored-turret ocean-going ship, and has a length between perpendiculars of 308 feet 6¾ inches, the greatest length being 318 feet and 2 inches, with a breadth of 53 feet and 6½ inches, and a depth of 34 feet 10 inches, from upper deck to keel. The displacement of the vessel, completely armed and fitted, will amount to 6,748 tuns. The draft of water in sea-going order has been fixed at 23 feet 8 inches amidships. An armored casement surrounds the two turrets, which project 6 feet 2 inches above the upper deck; this casemate is separated from the fore and aft part of the vessel by armored transverse bulkheads, whilst these parts are protected only between wind and water by an armored belt reaching from about 6 feet 2 inches below water up to the battery deck.

The turrets, the port sills of which are 13 feet 5·4 inches above the water line, will be armed each with two 10·23 inch naval guns of the newest construction, and are to be moved either by separate engines placed between the decks, or by manual power. Besides the four guns in the two turrets, both in the forecastle and in the stern a 6·69 inch gun will be placed. The funnel is situated between the two turrets, and is thus protected, by the latter and the armor plates of the casemate, to the hight of the turrets, against the enemy's fire.

The bow forgings, with the spur in two pieces connected by a joint plate, will weigh about 18 tuns, whilst the stern post, which, welded together with the rudder post, forms a large frame, will have a weight of about 30 tuns.

The arrangement of the connection between the various parts of the Borussia will give her a great strength with a comparatively small weight of hull. She will be constructed with a double and watertight bottom.

During action the chief protection will be offered to the vessel by the armor, which rests with its lower edge upon the armor framing about 6 feet below the full load water line; the thickness of the armor will be 18·50 inches. The armor plates at the water line are 9·25 inches thick, below the water line 7·28 inches, and above water 8·26 inches; these thicknesses decrease towards the ends to 4·13 inches. Before the fastening of the armor plates, the inner skin is covered with a backing of teak about 10·23 inches thick, but varying with the thickness of the plates; angle irons are used for fastening this layer of teak to the outer skin. The armor plates are fastened by means of strong bolts 2½ inches diameter with conical heads fitting exactly in corresponding holes of the plates. The nuts of the bolts of the armor plates are provided with double washers, between which a thickness of rubber is placed in order to prevent as far as possible the tearing off of the bolt heads when the armor plates are struck by shot. The armored cross walls have plates 5·11 inches thick with a backing of teak 8·26 inches thick.

The two turrets, each of 26 feet 9 inches diameter, will be constructed of plates and angle irons; they extend, as already stated, from 6 feet 2 inches above the upper deck to the battery deck, and are covered with armor at the parts only exposed above the upper deck. The plates of these turrets are 8·26 inches thick, with the exception of those through which the porthole for the gun are cut, and which have a thickness of 10·23 inches; the backing of teak in the turrets is only 8·26 inches thick.

The following are the weights of materials used for the hull of the vessel, the masts, and the turrets:

	Tuns.
Plates	1,375
Angle iron	600
Bar iron and large forgings	330
Iron for rivets	115
Cast iron	100

It is expected that the Borussia will be launched during this month.

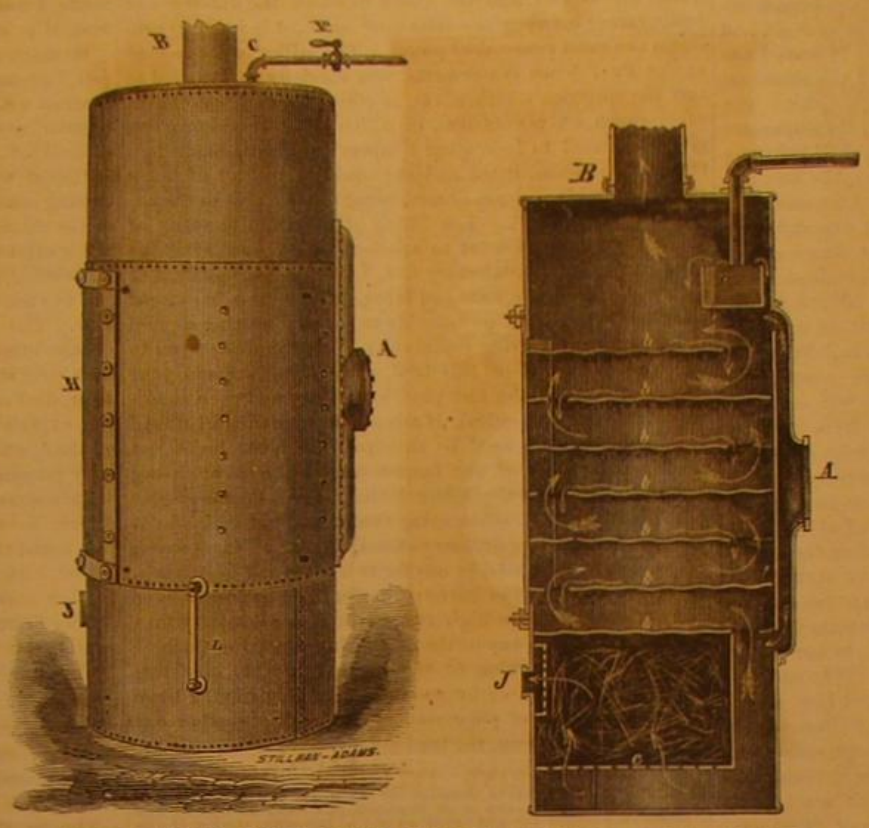
Street Architectural Laws of Paris.

The hight of the facade of buildings on the public streets of Paris is determined by the width of the streets. This hight measured from the sidewalk and taken in every case in the center of the facade cannot exceed, including entablature, all stone and all construction pertaining to the front wall, the following rules, namely: 38 feet in hight for streets less than 26 feet wide; 48 feet in hight for streets 26 to 32 feet in width; 58 feet for streets exceeding 32 feet in width; and for boulevards, and streets exceeding 65 feet in width, the municipal authorities shall be able, for the sake of proportion and harmony in the lines of construction, to permit the hight to be carried to a maximum of 65 feet, upon condition that in no case shall the building have more than five full stories above the first story. The outline of the roof on the street front shall not project beyond a line drawn at an angle of 45° from the cornice of the facade.

STILWELL'S LIME EXTRACTING HEATER AND FILTER.

The object of the invention, which we illustrate herewith, is to remove all foreign substances which produce scale from feed water before it enters the boiler, so that the water is supplied to the generator in a perfectly pure condition. The operation of the heater will be readily understood by reference to the sectional cut. The escape steam coming from the engine is divided and enters the apparatus in two currents. The upper current meeting the cold water as it flows in a thin sheet over the edges of the overflow box, dashes it into spray, and sets free the earthy salts held in solution, which are deposited upon the shelves. The lower current of steam enters beneath and meets the descending water as it passes from shelf to shelf, completing the work of thoroughly boiling the water. The water in passing over the large area of surface contained in the shelves deposits upon them all that portion of the salts held in solution that will crystalize. It then descends to the bottom of the heater and up through the filtering material contained in the chamber, *c*, which relieves it of all mud, sand, and other impurities, the water leaving the heater, at J, boiling hot and pure. The door, H, is held in place by rabbeted bars and can be taken off in a moment and the shelves all drawn out, thus giving ready access to every inch of the heater, and rendering its cleaning a short and easy task.

The device is claimed to be an established success, over 3,000 being now at work. We are informed that it has been fully tested over a period of nine years, and that it is guaranteed by its makers to completely prevent incrustation. It is considered especially suitable for use in southern and western sections of the country, where the water is almost uniformly impure. Several patents have been granted upon this invention, the latest of which is dated August 3d, 1869. Further particulars may be obtained by addressing the Stilwell & Bierce Manufacturing Company, Dayton, Ohio.



STILLWELL'S LIME EXTRACTING HEATER AND FILTER.

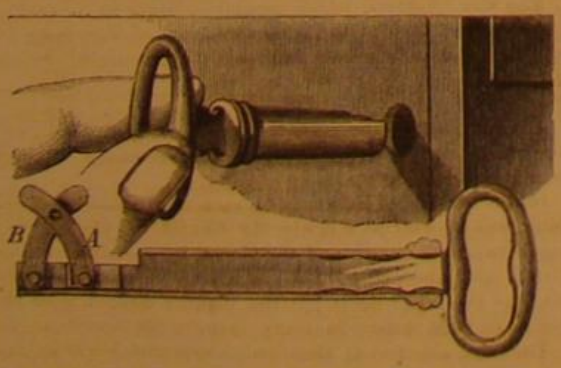
LOCAL BOILER INSPECTION.

In our paper for February 22, a correspondent, Mr. T. Leon Chester, asserts that the State law for boiler inspection has been repealed. But notwithstanding the repeal, some of the deputies, so our correspondent alleges, are going about in Westchester county, inspecting boilers and demanding six dollars for such inspection. Is it not a fraud, he asks, to make manufacturers, brewers, etc., pay for inspection under a law which is not in existence?

Mr. John Worthington, who is the deputy inspector for the tenth Congressional district, which embraces Westchester, Rockland and Putnam counties, calls our attention to the fact that Mr. Chester has made a gross mistake. The law has not been repealed but is still in force, and Mr. Worthington is regularly engaged in the discharge of his duties as inspector, which we have reason to believe are faithfully and skillfully performed. Of course no one who knows Mr. Worthington would for a moment suppose him capable of being a party to the practice of a fraud. We think that our correspondent was very culpable in not looking to see whether the law had been repealed before making so positive an assertion in respect thereto, and in casting an aspersion upon the inspector of the district. It appears that a bill was introduced into one of the branches of the legislature looking to a repeal, but the bill failed to pass.

A NOVEL FORM OF KEY.

The key represented in our illustration is composed of four pieces of metal so combined as to form a perfect device, and to be used in any lock constructed with reference to its peculiar form. The bow or handle is attached to a stem which slides freely in a sheath. Pivoted to the latter by a rivet is the curved piece, A, while the similar piece, B, is secured in



like manner to the stem. Both pieces are connected together by a pin, and form a movable bit, which is thrown out or in as the handle of the key is pushed from or drawn toward the operator. By this means, when the bolt of the lock is properly constructed, it will not be necessary to turn the key at all to unlock the door, as the bolt is forced back simply by an inward pressure of the key bow. This novel device is the invention of Mr. Addison A. Stuart, of Cedar Rapids, Iowa.

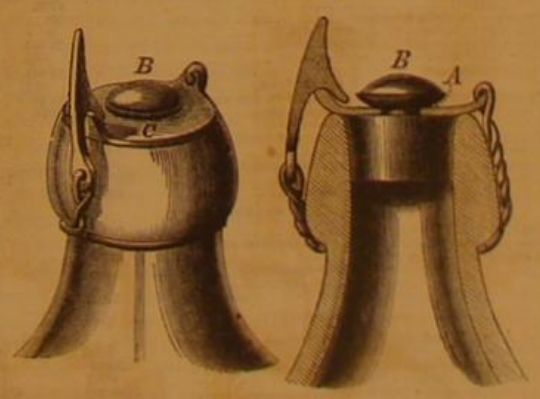
THE Western Union Telegraph Company has purchased the control of the telegraph cable between Florida and Cuba.

A Variety Manufactory.

In the city of Buffalo, N. Y., there is a large manufactory devoted to the construction of a remarkable variety of useful and curious machines and novelties. We allude to that of Mr. Parr, whose labor saving machines, tool chests, carpenters' and gardeners' implements, mathematical and artists' appliances, and a great variety of other articles are described more fully in our advertising columns. In addition to the above, he has recently added to his stock small stationary, marine, locomotive, and fire engines, and steamboats; also all the various implements used in fabricating Sorrento work, which has become quite a fashionable employment among amateurs and ladies of industrious and mechanical proclivities. Boxes of assorted chemicals, with directions for performing amusing and instructive experiments, are among Mr. Parr's latest novelties. One of the larger boxes contains some 150 different chemicals, making quite an extensive portable laboratory for simple experiments. To enumerate and describe all of the articles of utility and novelty made and sold at this manufactory would occupy several columns of newspaper space. We would recommend parties to send 25 cents to Mr. George Parr, Buffalo, N. Y., and obtain a copy of his illustrated catalogue. They will find it entertaining, even if they do not wish any of his goods.

A NEW BOTTLE STOPPER.

Mr. William Morgenstein, of New York city, is the patentee of the ingenious device, for closing the mouths of bottles,



represented herewith. The stopper is made of india rubber, cork, or other elastic material. Around its upper portion a recess or groove is cut, as at A, so that when the head, B, of the stopper is pushed through a hole in the supporting plate, C, the latter, engaging in the recess, firmly retains the stopper in place. The wire represented is passed through an eye on the plate and made into two loops, opposite to each other, to one of which is attached a cam-shaped catch. The latter presses over a raised lip on the plate, C, holds the same down and thus securely closes the bottle. By forcing the catch back, the supporting plate is released and the stopper can be readily withdrawn.

What Our Friends Think of the Scientific American.

An esteemed correspondent, writing from Mound City, Ill., sends us a variety of useful items and says: "I send these items partly to gain instruction, and partly to instruct others; you will read them and give place to such as are worthy to be in the SCIENTIFIC AMERICAN, the 'paper of papers.' I do not like to run any risk of doing without a single number, because this paper helps me to support my family. True, it does not bring greenbacks tacked to its edges, or family groceries in its folds; but by carefully reading the valuable matter in its columns, I am better able to manage, operate and control the machinery with which I earn my livelihood."

SELF-LIGHTING SIGNAL LANTERN.

In 1871 we described a signal lamp, invented by Holmes, which, on immersion in water, was self-lighting, and produced a brilliant illumination. Its principle rests upon the use of phosphide of calcium which, in contact with the water, developes spontaneously combustible phosphureted hydrogen gas. A German engineer has recently been experimenting with this lamp. A long tin tube, firmly closed, in which were contained 900 grains of phosphide of calcium, was kept afloat upon the water by being fastened to a piece of board. Before putting it into the water the bottom of the tube was perforated to allow the water to enter, and the upper point cut off so that, on the entrance of the water, the self-lighting phosphureted hydrogen gas was developed.

A flame, four or six inches broad and 24 inches high, lighted up the steamboat and pilot boat, which had gone out four miles on the sea with a party to witness the experiments, so brilliantly that the vessels and men upon them were distinctly visible from the lighthouse at that distance. In a tolerably heavy swell the flame was preserved for three quarters of an hour, and appeared at the distance of one or two miles like a strong signal fire. In the immediate vicinity, for a distance of 28 yards, the light was strong enough to allow of any work being done. For pilot and wrecking service, this signal fire can be highly recommended.

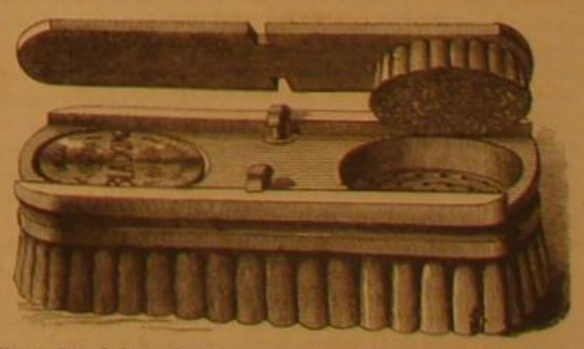
The preparation of the phosphide of calcium can be accomplished as follows: In the lower part of a narrow deep crucible, a hole is drilled for the reception of the neck of a flask, which is luted into the aperture; a quantity of dry phosphorus is placed in the flask, and the crucible is filled with quicklime broken into fragments of about the size of a hazel nut; a lid is then luted upon the top of the crucible. Time having been given for the luting to become dry, the upper part of the crucible is raised to a red heat as quickly as possible by surrounding it with ignited charcoal, the lower part of the furnace having been filled with cold charcoal to prevent the heat from reaching the phosphorus too rapidly; the phosphorus becomes gradually volatilized as the heat reaches it.

If the heat be too high, the phosphorus distils over without combining with the calcium. The phosphide of calcium, when procured in this manner, forms an anhydrous mass of a dull red color, hard enough to strike fire with steel; it experiences no change in dry air or in oxygen at the ordinary temperature. At a high temperature it becomes partially decomposed by oxygen, chlorine, or hydrochloric acid; in a moist atmosphere it slakes, emits phosphureted hydrogen, and crumbles to a brown powder. The phosphide of calcium, in its insulated form, is decomposed when thrown into water; phosphuretted hydrogen gas is evolved, which takes fire spontaneously. It is necessary to keep the preparation in hermetically closed vessels. Where the phosphide is required to be attached to life preservers or signal buoys, it can be inclosed in tubes which are stoppered with some salt that will dissolve off in contact with water. In case of a man overboard in the night, his position could be detected by the employment of floating grenades of phosphide of calcium thrown from the ship.

It has been stated that, by fusing magnesium filings and phosphorus together, a compound results which can be employed as a substitute for the phosphide of calcium in the evolution of phosphureted hydrogen gas. As magnesium can now be procured in considerable quantity, this method may be worthy of a trial.

COMBINED BLACKING BRUSH, BOX, AND HOLDER.

This device is especially adapted to the needs of travelers, as it enables two blacking brushes and box of blacking to be stowed in very small compass, without danger of soiling any article which may be near them. The handle of an ordinary brush is made into a case, in which are cut two circular mortises, one of which receives the box of blacking and the other the bristle portion of the dip brush. The handle of the latter closes the recess, forms a cover, and is secured in place by the two buttons shown. The dip brush is reversible, and fits on either of the circular mortises. To Mr. E. W. Woodruff, of Washington, D. C., is due the credit of this useful little invention.



THE rate of telegraphing between this country and Europe is one dollar a word; but the price is to be reduced on the 1st of May, next, to 75 cents per word.

Correspondence.

The Recent Boiler Explosions.

To the Editor of the Scientific American:

We notice, in your issue of February 22, an article on boiler explosions at Conshohocken, Pittsburgh, and elsewhere. The information in regard to our lamentable catastrophe appears to come from Mr. Le Van, of Philadelphia, and as we know you well enough to believe that you do not wish to misrepresent or injure any one by a false report, we give you the facts in the case: The boiler was ordered and made in 1853, and was put in use in 1854. It was of the best charcoal flanged iron, the shell being of the thickness of No. 2 wire gage, and the flues were ¼ inch thick. The boiler was 54 inches in diameter, 18 feet long; the flues were 16 inches in diameter, and not 18 inches; the shell is fully ¼ inch now, and the flues are very little under the original thickness. The quality of the iron has been pronounced, after testing since the explosion, to be very superior, and not poor and crystallized. It will bend or flange either when hot or cold, without showing the smallest fracture, and it will stand a tensile strain of 70,000 lbs. to the square inch, which is 20 per cent stronger than ordinary shell or cylinder iron, now used for boilers, is. Your informant also says: "It exploded whilst the steam gage showed only 53 lbs." The fact is that there was no steam gage attached to the boiler, as it was shut off from the rest, having been stopped for repairs. The engineer, who had had charge for 10 years, was under the impression that the steam was not high enough to open the valve to equalize with the other boilers, as it was not blowing off at the safety valve; and he was preparing to open it when the explosion took place. The boilers that were at work at the time were carrying 70 lbs. as indicated by the steam gage. We cannot see how Mr. Le Van arrives at the conclusion that the boiler exploded at a pressure of 53 lbs., or how he or any one could say it was 53 or 153 or more. Who can tell whether the safety valve was stuck or not, or how much pressure was on it, or what was the real cause? We would give a good deal to know. We are under the impression that this boiler would have carried 150 lbs. pressure without exploding, and, from the terrible results shown, it must from some cause have had more on it. The manner of firing and starting in this case was the same as had been followed for 20 years, without a single accident or the loss of a single life. It really seems unaccountable to us. Many flying reports and rumors have been put in circulation by the reporters of some of our sensational newspapers, who catch at every thing without knowing anything about the facts. It would be foolish in any man to suppose that we would risk our lives, the lives of our workmen and our property by running a boiler that there was the least reason to suspect of being unsafe.

I. WOOD & BROTHERS.

Philadelphia, Pa.

Ignition by Steam Pipes.

To the Editor of the Scientific American:

In your issue of February 8, you publish a communication from A. F. Nagle, Mechanical Engineer of the Providence Waterworks, which, although true in every fact stated, does me great injustice by not stating all the facts; and it must lead to the conclusion that the Miller boiler is dangerous, as it will set buildings on fire when other steam generators would be perfectly safe. I would therefore request the insertion of this communication as an act of justice, as well as for the further light it may throw on the question of superheated steam.

The pumping engines at the Providence Waterworks, as Mr. Nagle states, are covered with felting and black walnut lagging; this lagging has been repeatedly saturated with linseed oil, rubbed down till it had acquired a fine finish. The engine is one of Worthington's compound cylinder engines, in which two cylinders are placed horizontally side by side; the steam chest is situated between the two cylinders and above the same; and the lagging generally, conforming to the cylindrical shape of the engine, forms here a square box with a level top. In this top was a trap door; and in the square box, below this door, the fire originated. The engines were new, the lagging was new and had not yet reached the perfect finish which the engineer expected to see on it when it would be more thoroughly saturated with oil and rubbed down. The level top of the steam chest and the joints of the door certainly facilitated the admission of oil to the felting; and when you consider that this felting was over the level surface of the steam chest (where the effect of heat would be greatest) and that this level surface was a convenient place for a temporary deposit of oily waste when wiping up the engine, it is evident that here spontaneous combustion would be most likely to take place. That the higher temperature of the steam from the Miller boiler may have facilitated the ignition, I am ready to concede, but must object to the inference that it caused the ignition of the felting. The steam generated in the Miller boiler, before reaching the steam chest, had to ascend the main steam pipe four feet, thence, pass on a level through the said main over the tubular boilers (some sixty feet), and then descend 8 or 10 feet to the steam chest. The whole length of this pipe is felted and well lagged, and the temperature of the steam in this pipe must, of necessity, be greater than in the steam chest, being from 8 to 10 feet higher, and from 40 to 80 feet nearer the source of heat; and yet this steam chest, with every provision for spontaneous combustion and every probability of a lower temperature than the steam main, is the place where the fire originated.

But unfortunately, to most of your readers, the ugly fact still remains, that the steam of the Miller boiler was superheated beyond the temperature at which saturated steam would have been at this pressure; and this is the difficult part of my defense. You, Mr. Editor, and most of your readers, are aware that I have frequently, in your columns, expressed my conviction that the amount of water, passing through a steam boiler per pound of coal burned, is no criterion as to its value as an economic generator of steam. We do not want to evaporate water; we want to get the largest amount of power from the smallest amount of coal, and it is a well known fact that the motor in which the difference of temperature between the inlet and exhaust is greatest produces the most economical power. The Miller boiler erected at the Providence Waterworks was specially constructed to test the question whether it is, in reality, economical to generate steam on my system, in which the water is progressively exposed to increasing temperatures until made into steam, this steam, dried and superheated, instead of being stored up in large steam domes, being at once sent to the engine to do its work. The lifting of a certain quantity of water from a given level to another higher one being the most perfect and satisfactory test, I spent a large amount of money, besides time, care and labor, to settle this important question, which must be valuable to the engineering as well as to the manufacturing community. I therefore ask you to publish the results of this trial, sent herewith; and your readers will see if the test proves that dry and even superheated steam is economical. If asbestos be used instead of fet,l no danger from fire need be anticipated. In conclusion, let me say that many of our largest establishments are using steam generated by the Miller boilers; and a Corliss engine will cut off at 65 lbs. when using this steam, but will not cut off with 85 lbs. using ordinary steam, doing the same work. These boilers have been in use for two years and over, varying in power from 75 to 500 horse power; and in no case have they suffered from the high temperature, nor have any fires ever been caused in any of the establishments using them.

Whether the burning of the lagging in this case was caused by the steam or by spontaneous combustion, I leave to the intelligence of your readers to decide; whether dry steam is a desideratum, the trial must establish.

JOSEPH A. MILLER, C. E.

TRIAL OF THE COMPARATIVE ECONOMY OF TUBULAR AND MILLER STEAM BOILERS, DOING THE SAME WORK THROUGH THE SAME ENGINE AT THE PUMPING STATION OF THE PROVIDENCE WATERWORKS, AUGUST 14 AND 22, 1872.

Date.	*Tubular.*	*Miller.*
Elevation of center of engine	28·062	
Mean elevation of water in river	7·993	8·878
" " " inlet chamber	179·420	179·660
Steam pressure in lbs. per square inch	61·75	63·30
Water " " "	70	70
Vacuum, inches	26·5	26·5
Temperature of river water Fah	60°	77°
" " hot well "	122°	120°
" " feed water "	131°	128°
" " flue to chimney, Fah	357°	247°
Weight of a cubic foot of river water, pounds	62·19	62·22
" " feed water, "	61·55	61·57
DUTY BY CORNISH RULE.		
Volume swept through per minute, cubic feet	337·355	483·600
Resistance, lbs. per square foot	10·731	10·753
Work done per minute in foot pounds	3620·157	4662.501
Coal consumed per minute, pounds	9·866	7·667
Work done per 100 lbs. of coal in foot pounds	38652·000	60815·000
" " combustible	46254·000	72257·000
Water evaporated per minute, pounds	78·113	72·174
Work done per lb. of water evaporated, foot pounds	46·345	64·601
DUTY BY WEIR MEASUREMENT.		
Volume swept through per minute, cubic feet	306·002	422·844
Resistance, lbs. per square foot	10·731	10·753
Work done per minute in foot pounds	3283·707	4546.844
Coal consumed per minute	9·866	7·667
Work done per 100 lbs. of coal, foot pounds	33060·000	59,306·700
" " combustible, foot pounds	41955·000	70,952·000
Water evaporated per minute, pounds	78·113	72·174
Work done per lb. of water evaporated, ft. pounds	42·038	62·998
COMPARATIVE RESISTANCES.		
Pressure in pump by indicator, lbs. per square inch	68·25	
Calculated resistance of delivery valves " "	0·55	
Pressure in main by indicator, lbs. per " "	67·70	
Correction for difference of levels	0·69	
Pressure in main, by indicator, corrected by level of gage	67·01	
Pressure in main by gage	70·	
Discrepancy, lbs. per square inch	3·	
Hight of indicator above river, feet	15.819	
Calculated friction in suction main	·046	
Total resistance " "	15·865	
" in lbs per square foot	·587	
Pressure in main by indicator, in lbs. per sq. foot	97·49	
Total resistance in lbs. per square foot	107·36	
Hight of water at inlet chamber above river, feet	171·427	170·782
Calculated friction in mains	1·004	1·907
Resistance in check valve in force main, feet	0·12	0·15
Total head	172·551	172·819
" lbs. per square foot	10731	10753
COMBUSTION AND EVAPORATION.		
Area of grate, square feet	55·00	57.5
Coal consumed per hour per square foot of grate	10·217	8·00
Water evaporated per lb. of coal	8·34	9·41
" " " combustible	9·98	11·26
" to and from 212° per lb. of coal	9·25	10·47
" " " combustible	11·07	12·53
CAPACITY.		
Net area of plunger in square feet	2·60965	
Average length of stroke, feet	3·895	3·875
Number of strokes per minute	39·18	42·88
Speed of piston per second	1·077	1·3845
Gallons pumped per 24 hours	3296·000	4554·640

REMARKS BY THE EDITOR.—When we published the letter of Mr. Nagle, we stated in our comments that the combustion which he attributed to the steam pipes was probably due to the presence of oil, either in the wood casing or the felting. Mr. Miller's statement confirms our supposition, and conclusively shows that the case is properly to be classed among examples of spontaneous combustion due to the presence of oil in combustible materials.

We do not think that any of our readers would be apt to regard Mr Nagle's letter as in any sense damaging to Mr. Miller's boiler. If so, any such idea will be removed from their minds on examining the very full and satisfactory report of the boiler trials, which Mr. Miller gives above.

Sulphite of Lime in Cider.

To the Editor of the Scientific American:

Your correspondent, William A. Barnes, on page 4 of the current volume, says that if I will study the chemical effect of sulphite of lime, I will see that it has no disposition to appropriate the oxygen already combined. If I understand the philosophy of breathing, free oxygen is absorbed by the blood in its passage through the lungs, which afterwards, while passing through the capillaries and other blood vessels in all parts of the body, combines chemically with fatty and other combustible matter, producing heat and carbonic acid. Or, in other words, the oxygen absorbed through the lungs supports the combustion that furnishes the animal heat, at the same time burning out from the blood certain waste products which would prove injurious were it not for this means of purification. As most substances, after being digested in the stomach, are carried by the lacteals to the blood vessels, I thought the sulphite might rob the blood of a portion of its free oxygen, but from an experiment that I have since made, I think that it does not do this to any considerable extent, if at all.

So much for theory; now I will give my experience. Last fall, I procured a pound of sulphite of lime in three packets, marked with the name of a well known chemist, and said to contain the proper quantity for one barrel. I treated several gallons of new cider with the quantity of the sulphite indicated by the directions. It did keep the cider from getting sour, but it in a great measure destroyed the flavor of the cider, beside imparting a disagreeable taste of its own. After exposing some of the cider in an open tub for about six weeks, it has nearly lost the taste of sulphite of lime, but has not in my opinion half the flavor that it had when new. The sulphite was marked neutral, and it did not change litmus paper. A mouse, fed on dough made of Graham flour with one part of the sulphite to three or four of flour, died in about thirty-six hours; and on a repetition of this experiment, another mouse died in about the same length of time, while a third mouse in another cage fed on a similarly prepared mixture of *sulphate* of lime remained healthy.

I attempted to test the excrement of one of the mice for starch, to find if the sulphite interfered with digestion, but found that the sulphite would mask any reaction with iodine, even after the addition of boiled starch. And on further experiment, I found that the sulphite would instantly destroy the blue color of iodide of starch. Can you explain this reaction?

HENRY A. SPRAGUE.

Charlotte, Maine.

REMARKS BY THE EDITOR.—Where an excess of sulphite of lime is used, some of it dissolves and imparts a disagreeable flavor, and may prove dangerous. If pure sulphite is taken in proper proportions, it prevents fermentation by absorbing free oxygen, and is changed to the sulphate, which settles to the bottom. The blue iodide of starch was bleached by the sulphurous acid of the sulphite; and to prevent this, only minute quantities must be taken. The same reaction takes place when we liberate iodine from iodide of potassium by means of chlorine. The blue color will disappear in an excess of chlorine. The experiments of our correspondent seem to show that sulphite of lime is fatal to lower animals and to indicate the necessity of using no more to keep cider sweet than will be at once converted to sulphate.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes (which give only approximate places), I am indebted to students.

M. M.

Position of Planets for March, 1873.

Mercury.

On the 1st of March Mercury rises at 7 A. M. and sets at 6h. 20m. P. M. On the 31st it rises at 5h. 53m. A. M., and sets at 7h. 12m. P. M.

According to the *American Nautical Almanac*, Mercury has its greatest elongation on the 18th. It souths at that time an hour after noon, and should be visible after sunset.

Venus.

On the 1st Venus rises at 8h. 12m. A. M., and sets at 9h. 48m. P. M. On the 31st it rises at 6h. 57m., and sets at 9h. 57m.

According to the *American Nautical Almanac*, its greatest brilliancy is on the 29th of March.

Mars.

Mars rises on the 1st a little before 11 P. M., and sets at a little after 9 A. M. On the 31st it rises at 9h. 5m. P. M., and sets at 7h. 20m. A. M.

Mars has become more conspicuous from its increasing diameter, and is a very noticeable object in the early morning.

The star *Antares*, which resembles Mars in its reddish light, is well seen at the same time, east of Mars some 24° and south of it (when on the meridian) about 12° on the 1st of March.

Jupiter.

Jupiter rises on the 1st of March at 4h. 16m. P. M., and sets at 6h. 6m. A. M. On the 31st it rises at 2 P. M., and sets at 4 in the morning.

On the evening of February 4th, the fourth satellite of Jupiter was seen to pass across the disk of the planet. Being between the earth and the planet, it seemed to be projected upon the planet, as a grayish brown spot, not quite circular in shape; as it left the planet's disk, it seemed, for more than three minutes, to hang upon the limb.

The third satellite, at about its greatest distance from Jupiter, showed, through the large telescope, a disk irregular in shape and hazy in outline.

The broad central belt of Jupiter was slightly reddish.

Saturn.

Saturn is increasing in apparent size. It rises on the 1st at 4h. 44m. A. M., and sets a little after 2 P. M. On the 31st it rises at about 10m. before 3 A. M., and sets a little after noon.

Uranus.

Uranus rises at 2h. 23m. P. M. on the 1st, and sets about 5 A. M. On the 31st it rises 20 minutes after noon, and

sets about 3 A. M.

Neptune.

Neptune rises at 8h. 26m. A. M. on the 1st, and sets at 9h. 23m. P. M. On the 31st it rises at 6h. 30m. A. M., and sets at 7h. 30m. P. M.

Sun Spots.

About February 18, a long chain-like group of spots could be seen on the sun. Although some of them have already passed the center of the disk, the last of the group may be seen for some days.

SCIENTIFIC AND PRACTICAL INFORMATION.

IRON YELLOW AND IRON GREEN PIGMENTS.

It is desirable to have yellow and green pigments free from lead and arsenic, as both of these metals are the occasion of much mischief. An iron yellow, called *siderin yellow*, has been introduced to the trade: it is prepared by adding a saturated solution of bichromate of potash to neutral chloride of iron. A bright yellow precipitate forms, which, after thorough washing, proves to be a basic chromate of iron of a fixed chemical composition. This pigment, known as siderin yellow, can be used as a water color, also with drying oil, and, when combined with soluble glass, makes a fine yellow cement that sets rapidly and is insoluble in water.

If siderin yellow be mixed with ultramarine blue, fine green results, which can be also mixed with soluble glass, and could be substituted for the dangerous arsenic green in many arts. In the preparation of iron yellow, the following are the proportions to be taken: 433 parts of weight of crystallized chloride of iron, in which there are 325 parts anhydrous chloride, require for complete decomposition 1,473 parts bichromate of potash. After mixing and boiling the aqueous solutions of the above salts, 378 parts by weight of basic chromate of iron, siderin yellow, is precipitated. There remain in solution 1,049 parts chloro-chromate of potash and 389 parts yellow chromate of potash.

PROTECTING PETROLEUM FROM FIRE.

Charles A. Jordery of Paris has discovered that a small quantity of soap wort (*saponaria officinalis*) powder produces in combination with petroleum an emulsion of the consistency of lard or, rather, thick glue. This mixture flows with difficulty, and does not infiltrate into the fissures of leaky vessels. When ignited, it burns with a weak flame, easily extinguished and having no resemblance to the fierce deflagration of the light oils in their ordinary state. A small quantity of an aqueous extract of the powder is necessary, to which about thirty times its volume of petroleum is added little by little, and continually stirred. The result is very much the same as mixing salad dressing, the oil gradually thickening until a pasty mass is obtained. In this condition it is suggested that petroleum may be stored for any length of time or transported long distances with little danger from fire.

To regain the oil in its limpid condition it is only necessary to add a few drops of carbolic acid, or a somewhat larger quantity of crystallized acetic acid. The reaction takes place instantly, and in a very short time the petroleum appears pure and clear with all its properties intact floating above the soap wort extract. It is stated that the augmentation of the price of the oil through the use of this process would not exceed one quarter of a cent per quart.

This saponine process for giving to petroleum the consistency of thick gum was patented in the United States May 7, 1872, No. 126,552. The specimen we have seen resembles closely the paste employed by bill posters, and could be transported in ordinary wooden tubs, and would not be likely to take fire unless exposed to great heat; but the cost of treating petroleum on a large scale in this way would put the article on a par with sperm oil or paraffin. In fact, we should think that paraffin candles would be more economical than the patent oil. The whole thing is too much like combining butter with lime, to be subsequently set afloat by sulphuric acid after it reaches the city. Neither process is feasible on a large scale.

USES OF BISULPHIDE OF CARBON.

From a new work of Dr Rudolph Wagner, "*Die Chemische Fabrik-Industrie*," we extract the following: Until 1850. the only technical application of bisulphide of carbon consisted in vulcanizing and dissolving caoutchouc. Since that time, however, this substance has been applied to a good many purposes. 1. For the complete extraction of fat from bones for the preparation of bone black. Ten or twelve per cent of fat can be obtained. 2. For the extraction of oil from seeds and olives; large quantities of olive oil, rape oil, linseed oil, hempseed oil, palm oil, and cotton seed oil are obtained in this manner. 3. For the extraction of sulphur from sulphurous earth (according to Moussu) and of bitumen from bituminous rocks. 4. For separating fat from wool, woolen tissues, and rags from machine shops, by Seyferth's patent. 5. For the extraction of the soluble principles of spices, according to the process of Bonière of Rouen, France. 6. For the manufacture of yellow prussiate of potash according to Gélis, and of sulphocyanide of ammonium for the fabrication of the toys called Pharoah's serpents. 7. For the preparation of the Fenian or liquid fire, a solution of phosphorus in bisulphide of carbon, with which projectiles for rifled guns are filled. 8. In silver plating a small quantity of bisulphide of carbon is added to the silver bath, so that a brilliant deposit may at once be effected. 9. For killing rats, mice, moths, ground worms, and other vermin. 10. As a motor for steam engines; all systems of steam engines, with or without expansion, can be run with bisulphide of carbon, which, as well known, boils at 115° Fah. The construction requires no essential alteration, but, since bisulphide of carbon dissolves fat and oil with ease, water must be used for lubricating.

ENAMELING PUMP CYLINDERS.

Cast iron cylinders can be enameled in the following manner, according to Amtmann: To separate the graphite, they are laid for two or three hours in an acid bath, and then well washed off with water and brushes. A mass, consisting of 34 parts quartz, 15 parts borax, and 2 parts carbonate of soda is then uniformly spread on; the pipes are then heated for ten minutes in a muffle of a semicircular cross section of the width of 36 inches, and 9 feet in length. They are then withdrawn, cooled, and coated uniformly with a glazing composition consisting of 34 parts felspar, 19 parts quartz, 24 parts borax, 16 parts oxide of tin, 4 parts fluor spar, 9 parts carbonate of soda, and 3 parts niter. The mass is prepared by melting the materials together in a crucible and then grinding them in a mill, with the addition of water. After the cylinders have been covered with the glazing, they are heated in a muffle to a white heat for twenty minutes, whereupon they are withdrawn and coated with coal tar before they are quite cold. In practice, they have been subjected to a pressure, and showed no cracks, proving that the combination of the materials was thorough and complete. Attempts to glaze lead pipes have hitherto been unsuccessful.

CAUSTIC SODA.

An important improvement has been effected in the manufacture of caustic soda by the introduction of a blast of air through the melted mass. The caustic soda, as prepared from from soda ash by means of lime, is contaminated with carbonate of soda, cyanides, and sulphur compounds; the latter are particularly deleterious in numerous operations, and much attention has been bestowed upon getting rid of them. Formerly some saltpeter was added to the lye and the sulphide of sodium was oxidized to Glauber salts, which was less objectionable, but the process is expensive and the result not satisfactory. W. Hebig, of Gera, Germany, has modified the operation by blowing air through the fused soda, by which the sulphides are oxidized and the cyanides decomposed. The operation is conducted as follows: The soda lye is evaporated in iron kettles, and a point is reached at which the cyanogen and ammonia compounds are decomposed and graphite swims on the top. Finally the contents of the kettle are heated to redness and melted to a thin liquid; while in this condition, a current of air is passed through. Graphite floats on the top which is sometimes saved but, owing to its crystalline texture, is not adapted to paint or pencils and is often burned up as useless. The air blast is made so strong as to keep the mass in agitation, and is continued until all of the sulphur is oxidized. The operation is then suspended, the air tube is removed, and the soda poured off the sediment and allowed to solidify. A good product is secured in this way more cheaply than by the saltpeter process. The graphite obtained as an incidental product is quite large in some establishments, and is made up into refractory crucibles.

A GOOD OIL TEST.

Inquiries have been made for a good oil test, and all sorts of nostrums of the "magic," "lightning," and other brands are to be found in the market. It is not easy to find a simple test that will prove decisive on all occasions, but an approximation can easily be made. A convenient test to those about a factory or workshop is the nitrate of mercury. To prepare this reagent, dissolve metallic mercury in an excess of nitric acid; after all the mercury is dissolved, evaporate the liquid over a water bath to sirupy consistence and add a little nitric acid, and store in a glass stoppered bottle. The nitrate of mercury must not be permitted to come in contact with the skin or clothes, as it will stain and destroy both. Pure standard samples of oil should be kept on hand for making comparative tests. Take one part of the nitrate of mercury and three parts of oil and pour them into a test tube; protect the thumb with a piece of india rubber, and shake well and notice the appearance of a specimen of pure oil as compared with a sample suspected to contain impurities. We can in this way soon learn by experience how to detect a poor article. After making the observation with the nitrate of mercury alone, add a few drops of oil of vitriol and note the changes. Some persons use watch glasses, into which they put 10 or 15 drops of oil, and test with bisulphide of carbon, oil of vitriol, chloride of zinc, and chloride of tin. The oil test usually sold under a variety of names is the nitrate of mercury prepared as above.

POISONING OF A HORSE BY THE PAINT ON A CRIB.

According to a communication of Professor Bollinger, of Zurich, Switzerland, a hitherto healthy Wallachian horse, of five years age, was subjected to veterinary treatment on account of a slight nasal catarrh. To effect a cure he was fed with boiled barley, which was given him in a painted cast-iron crib. Soon, however, he lost his appetite, became very feverish, and got a violent diarrhœa, which, in spite of all the medicines administered, could not be alleviated; and he died nine days after the feeding in said crib. A post mortem examination showed small discharges of blood into the lungs, a considerable swelling and fatty degeneration of the liver, and catarrhal inflammation of the intestines. No abscesses, however, were found in the latter. In general, the dissection gave the impression that the animal had died from either phosphorus, arsenic or lead. Accordingly a chemical examination of the milt, the liver, and of the contents of stomach and bowels was undertaken, in all of which small quantities of lead were discovered. The oil paint, moreover, yielded sulphate of lead and chromate of lead in abundance. It was of a blackish green color, and adhered to the iron in a loose, lamellar condition. There was no sure indication of arsenic, antimony, zinc or barytes. From the results of the examination, there is no doubt that the animal, being fed with the boiled barley, had taken large quantities of the lead in the oil paint of the crib.

REGENERATION OF BONE BLACK OF SUGAR REFINERIES.

Elsfeldt and Thumb have introduced for this purpose exhaustion with ammonia, in place of the heating process hitherto employed. The animal carbon or bone black is first subjected to fermentation or boiling with soda; and, after being washed, it is placed in an iron cylinder with a perforated bottom, and boiled therein, with ammonia of two per cent, by the introduction of steam. This operation is repeated thrice, each time for an hour, until a sample of the lye, on being evaporated and heated with soda lye, yields no color. The ammoniacal vapors are condensed in the cooling worms and re-conveyed into the treating cylinder. This process is said to cost one third less than the ordinary one. The ammonia dissolves not only the organic substances, but also the gypsum and caustic lime, so that there will be much less muriatic acid required to keep the amount of lime constant. The waste of the carbon is greatly decreased, and much which otherwise would be consumed by combustion is saved.

The Resources of Richmond, Va.

A correspondent, A. S., says that Richmond, whose name, but a few years since, was on every tongue, being made famous by the active part she took in the late bloody struggle, is now an example worthy to be followed by any sister city, and more especially by those who stood by her in days of yore. Here swords have been turned into plowshares, and scarcely had the cannon ceased its deadly firing when the hammer and anvil struck their sweeter notes, and have made Richmond what she is, and have placed her where she is, with but few visible traces of the war.

This grand old city, capital of the State which has produced intellect, unsurpassed in the world, to represent her in Congress and elsewhere, when brains, honesty and virtue were the noblest traits of man, stands, as Rome does, on seven hills; but unlike Rome's ragged crags, her hills are beautiful terrene waves whose slopes are just adequate to afford the most perfect drainage, as the least fall of water cleanses her streets as a swept floor. Her climate is always comparatively mild, and she is noted for her salubrious situation, and many spend much time here seeking the greatest earthly boon, health.

The picturesque river James, whose current rushes madly over the rapids above, along half the length of Richmond, here settles into deep water, affording unlimited and unequalled water power, with a clear course to the sea for the largest vessels. Indeed, Nature seems to have spent some time in nestling here all the requisites for a manufacturing and shipping town, and to-day Richmond presents to the capitalist and mechanic inducements scarcely to be found elsewhere. Already have her manufacturers won for themselves high praise as to the quality and quantity of their wares. And while much capability lies dormant, the day is not far distant when she will laugh at the rivalry of her sister cities. The blaze of the furnace and the clash of the miner's pick are now seen and heard in her great storehouse, the valley of Virginia, where lie inexhaustible supplies of economic minerals: that is to say, of minerals in common use in the mechanic arts. And on January 30, 1873, the Chesapeake and Ohio railroad trains made the first through passage to the Ohio, and will in future transport to Richmond the heretofore untouched supplies of gold from the belt of Louisa, the roofing slates of Albemarle, the kaolin of Augusta, hydraulic cement and marble from Rockbridge, besides iron, limestone, coal of all kinds, granite, marl, copper, fire clay, salt and products of the soil lying along three hundred miles of this road.

Indeed, a new era has just opened upon Richmond. Labor is cheap and plentiful, but capital she much needs, as her merchants, reduced by the war, cannot enter much into the new undertakings which should and will soon adorn her. But let capitalists consider her offers and invest here, where eventually the continent will look for many of its supplies.

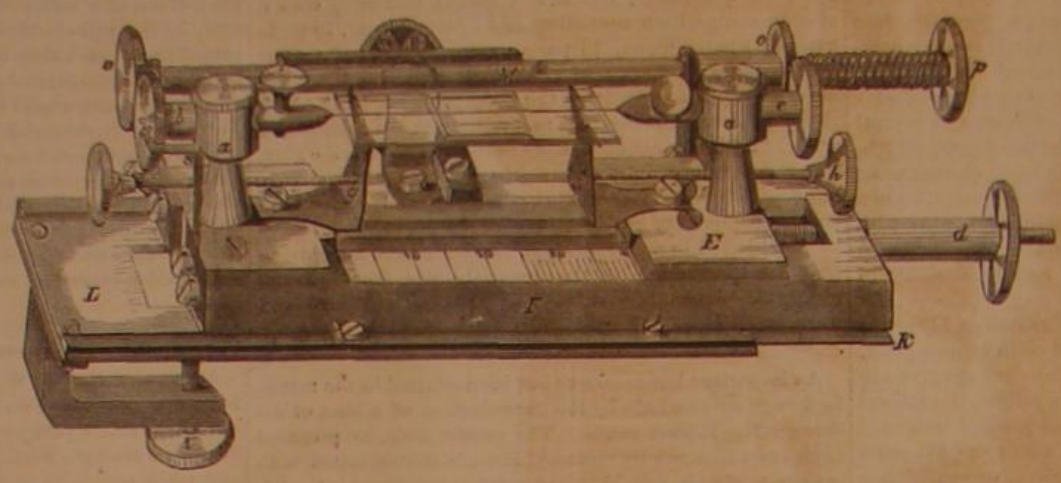
Philadelphia Academy of Natural Sciences.

The Academy now possesses more than 6,000 minerals, 700 rocks, 65,000 fossils, 70,000 species of plants, 1,000 species of zoophytes, 2,000 species of crustaceans, 500 species of myriapods and arachnidians, 25,000 species of insects, 20,000 species of shell-bearing molluscs, 2,000 species of fishes, 800 species of reptiles, 21,000 birds, with the nests of 200 and the eggs of 1,500 species, 1,000 mammals, and nearly 900 skeletons and pieces of osteology. Most of the species are presented by four or five specimens, so that, including the archæological and ethnological cabinets, space is required now for the arrangement of not less than 400,000 objects, as well as for the accommodation of a library of more than 22,500 volumes. A new building to cost half a million is now in process of erection.

ASSAYING LEAD ORES.—Previous to reducing the galena or other lead ore to the metallic state, A. Mascazzini converts the lead present in the ore into sulphate, by igniting it in a porcelain crucible with sulphate of ammonia, after which the ore is treated in the usual manner. The flux preferred by the author is that recommended by Plattner, consisting of 13 parts of carbonate of potassa; 10 of dry carbonate of soda; 5 of previously fused borax; and five of well dried starch.

INSTRUMENT FOR MEASURING FIBERS.

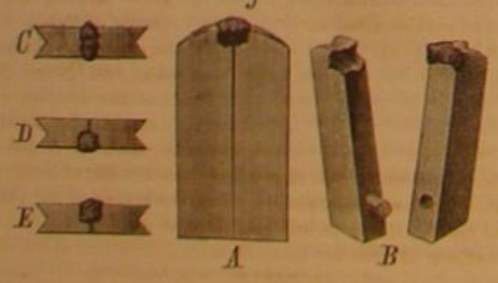
J. Bohm communicates to the *Industrie Blätter* particulars of an instrument invented by him for measuring the diameters of fibers of wool, silk, and substances of a similar nature. The method of cutting across the fiber cannot be relied on, as it is almost impossible to make the cut perfectly vertical, and the slightest deviation towards obliquity will give an erroneous result. A better mode is to stretch the fiber to get rid of the kinks, and to turn it on its axis, as it were, under a microscope, so that the variations in its diameter may be distinctly observed, and measured with the micrometer; its whole length, also, should be passed under the object glass. For this purpose, an ingenious little instrument has been constructed by Mr. Bohm, of which we give an illustration. The inventor states that it not only has answered all the purposes for which he designed it, but has been useful in ways that he did not expect. It was found, for instance, that a hair ordinarily appeared to be unequally thick in various parts of its length; this was owing to the long and short diameters of its oval section coming alternately under the vision, and the cause of the appearance was at once revealed by the instrument. And, again, the uniform decrease in the diameter of a hair towards its point, and the irregularity and inequality of fibers of wool from sick sheep, have been rendered visible. It has been found, too, that swellings and knots in otherwise straight fibers are produced by overstretching in the instrument, and the value of the arrangement for untwisting the fibers was here shown, for the knots began to uncurl the moment one end of the fiber was turned.



INSTRUMENT FOR MEASURING FIBERS.

In the engraving, *a a* are two columns, provided with the tweezers, *b* and *c*, which can be turned independently of each other. The object to be examined is fastened into these tweezers. It is evident that the hair must be attached exactly to the points, for otherwise, by turning both tweezers uniformly, an eccentric rotation of the fiber would be the result. The manipulation is facilitated by gumming each end of the object between two pieces of stiff paper, which can be easily adjusted between the two jaws, by sliding to and fro until the fiber is exactly in the center. This being the case, the hair is stretched by turning the screw, *d*. On the support, F, there is a scale, by which the degree of tension over the whole length is indicated. When stretched, a glass plate, carried by *g g*, is laid under it. It is necessary that the object to be examined lie flat on the glass, and that it is not strained over its ends, which would be the case if the points of the tweezers were lower than the upper surface of the object-supporting glass. To this end, the two adjusting screws, *h h*, are provided, which press the steel support, *g g*, downwards or upwards, as desired. The object being adjusted, it is immersed in glycerin, and covered from the air. The instrument is now placed under the microscope by fastening it on the table thereof. The screw, *i*, must previously be turned down, sufficiently to be conveniently slid under the stage of the microscope; and if the instrument is properly placed under the field of view, it is screwed on. The object is first examined with a low magnifying power (if not perfectly stretched, this may be done now); then the untwisting may be proceeded with by turning the tweezers in opposite directions. In order that the object may be viewed in its whole length, the instrument is made to slide to and fro; it rests with its sliding bed, K K, on bed, L. By turning the screw head, *d*, towards the left, the whole instrument follows in that direction, and *vice versâ*. If it is seen, on examining the object in its whole length, that the fiber is straight, rod, M, is engaged, by carefully turning the screw, *n*, until the two driving disks, *o o*, are in gear with the heads, *b c*, of the tweezers. This being the case, the latter may be turned uniformly around on their common axis, and the object may be thus examined on all sides. The head, *b*, of the left tweezer is divided on its outer surface into six equal parts; the pointer, *s*, works them.

Fig. 3



The instrument described is adapted not only for wool, but for other animal or vegetable fibers; and in many manufacturing operations, such an implement will be found useful. The adjustability of all its parts in every direction will particularly recommend it to experts and investigators, and, as our engraving shows, it is a very neat and elegant tool, made with all the finish necessary to insure accurate working and to facilitate minute observation.

EMERSON'S DIAMOND STONE SAW.

The use of diamonds or carbons for the drilling and dressing of stone has suggested their employment for sawing the same material. It is for the latter purpose that the invention herewith illustrated is designed.

Fig. 1

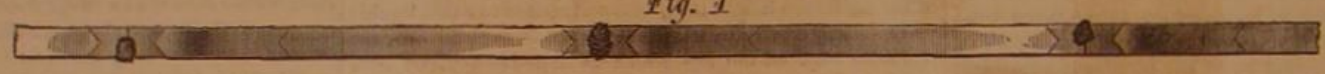
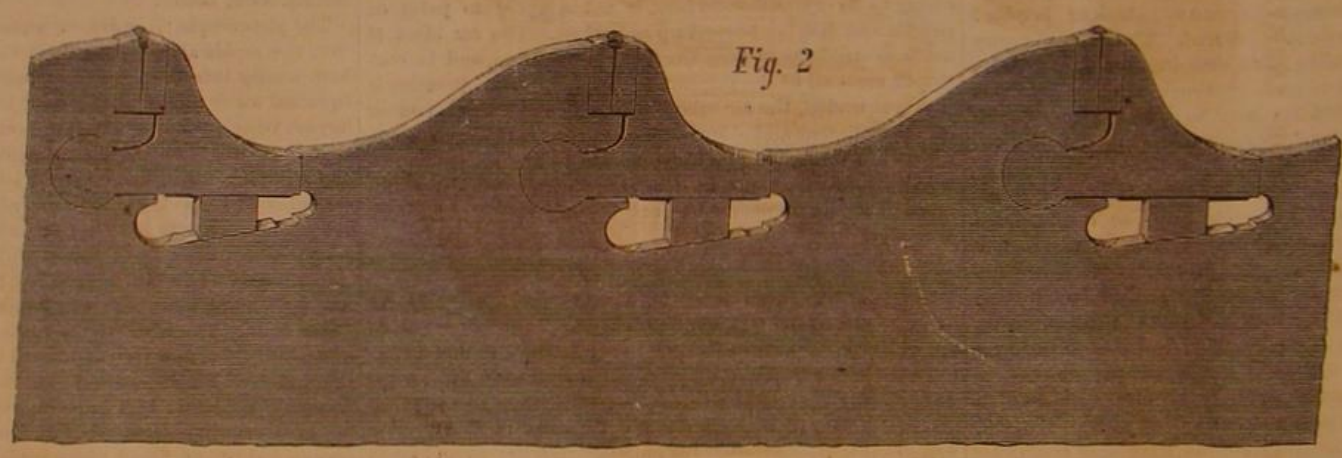


Fig. 2



EMERSON'S DIAMOND STONE SAW.

Our engravings afford a very clear idea of the device, rendering detailed explanation unnecessary. Fig. 1 gives an edge view of a saw in its full size. Fig. 2 is a section in perspective. Fig. 3 represents the diamond holder, of which A exhibits the appearance of a side, B a perspective view, and C D and E the different shapes of diamonds used. The solid steel holders are made adjustable and interchangeable in the saw. It is claimed that, in griping the diamond, they hold its jagged shape imbedded with such firmness that the cast steel will be torn asunder before the carbon will work loose. The mode of confining the holders, it is also asserted, does not in any way tend to chain or buckle the blade or affect its proper working.

The device is equally applicable to circular and reciprocating saws, and is, without doubt, an important and valuable improvement. It is now owned by Messrs. Emerson, Ford & Co., of Beaver Falls, Pa., from whom further information may be obtained, and was patented April 25, 1871, by Mr. J. E. Emerson, the inventor of inserted-tooth saws for lumber.

TOOTHACHE.—A new remedy consists in the employment of injections introduced into the gum near the diseased tooth. Dr. Dop has tried these injections in about one hundred cases. In twenty cases he made use of morphia, which succeeded very well, but only for a time. Chloroform was far more successful, and is now exclusively used by Dr. Dop. It was eminently successful in 62 cases out of eighty. The injection is made with the small syringe commonly used in France for subcutaneous injections. Only two drops are put in at a time. The needle is introduced gradually, and must remain *in situ* a few seconds. On withdrawing it, pressure must be exerted on the gum with the finger. In by far the greater number of cases, one injection is quite enough to stop the toothache.

Preparation of Light Drying Varnish.

Twenty-five pounds of pure linseed oil are poured into an enameled iron pot, which holds about forty pounds weight; the pot is then placed on a moderately strong charcoal fire, and the linseed oil heated for about half an hour to the boiling point. In the meantime four ounces of pure oxide of manganese are to be rubbed down in linseed oil. This mass is then put into a small vessel provided with a spout, and poured in drops into the boiling linseed oil, while being gently stirred with a wooden spatula.

During the rising and effervescence of the heated oil, the dropping in of the manganese preparation must stop.

As soon as the oil has settled the dropping in is continued to the last. The vessel is washed out with linseed oil, which is poured into the boiling oil. The varnish is now boiled slowly for an hour, but if a stronger or more quickly-drying varnish is desired, it should be boiled for half an hour or an hour longer.

The finished varnish is then removed from the fire, covered with a clean plate, and left to rest for about twenty-four hours, then carefully poured off into clean vessels. The sediment and other residue are generally used for ordinary ground colors.

The pure linseed oil varnish poured into glass bottles can be perfectly bleached by selecting a suitable spot where the sunlight and moonlight penetrate. According to Dr. Gromann, moonlight bleaches quicker than sunlight. The clear bleached linseed oil varnish is used only for the finest white oil and lac colors, and for dissolving the copal lacs, as well as a drying medium for all fine oil colors.

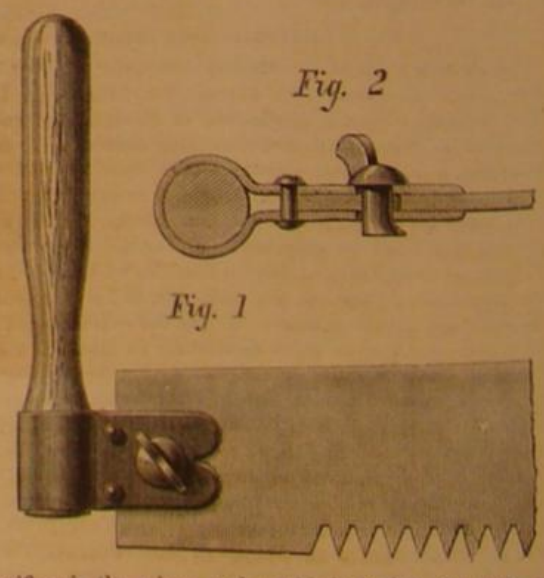
NEW METHOD OF ATTACHING HANDLES TO SAWS.

Mr. James E. Emerson, of Beaver Falls, Pa., has recently devised an ingenious means of attaching saws in their handles, an engraving of which we herewith present.

The invention consists in an irregularly shaped cam bolt, the body of which is a little longer from the shoulders than the combined thickness of the wings attached to the handle socket and the saw blade inserted between them, in order that the clamping cam may have a hold upon the outside of one of said wings. This projection increases in thickness from the end. As the bolt is turned in one direction, it forces that wing of the socket toward the shoulder of the thumb bolt and clamps the saw blade firmly between the wings. At the same time the enlarged diameter of the body, in turning, is hard against the side of the hole through the saw blade, forcing the latter endwise against the rivets. By this means a solid end bearing for the blade is obtained. The bolt can enter the orifices in the wings and saw blade in but one way, so that no mistake can be made by not placing it in its proper position.

Fig. 2

Fig. 1



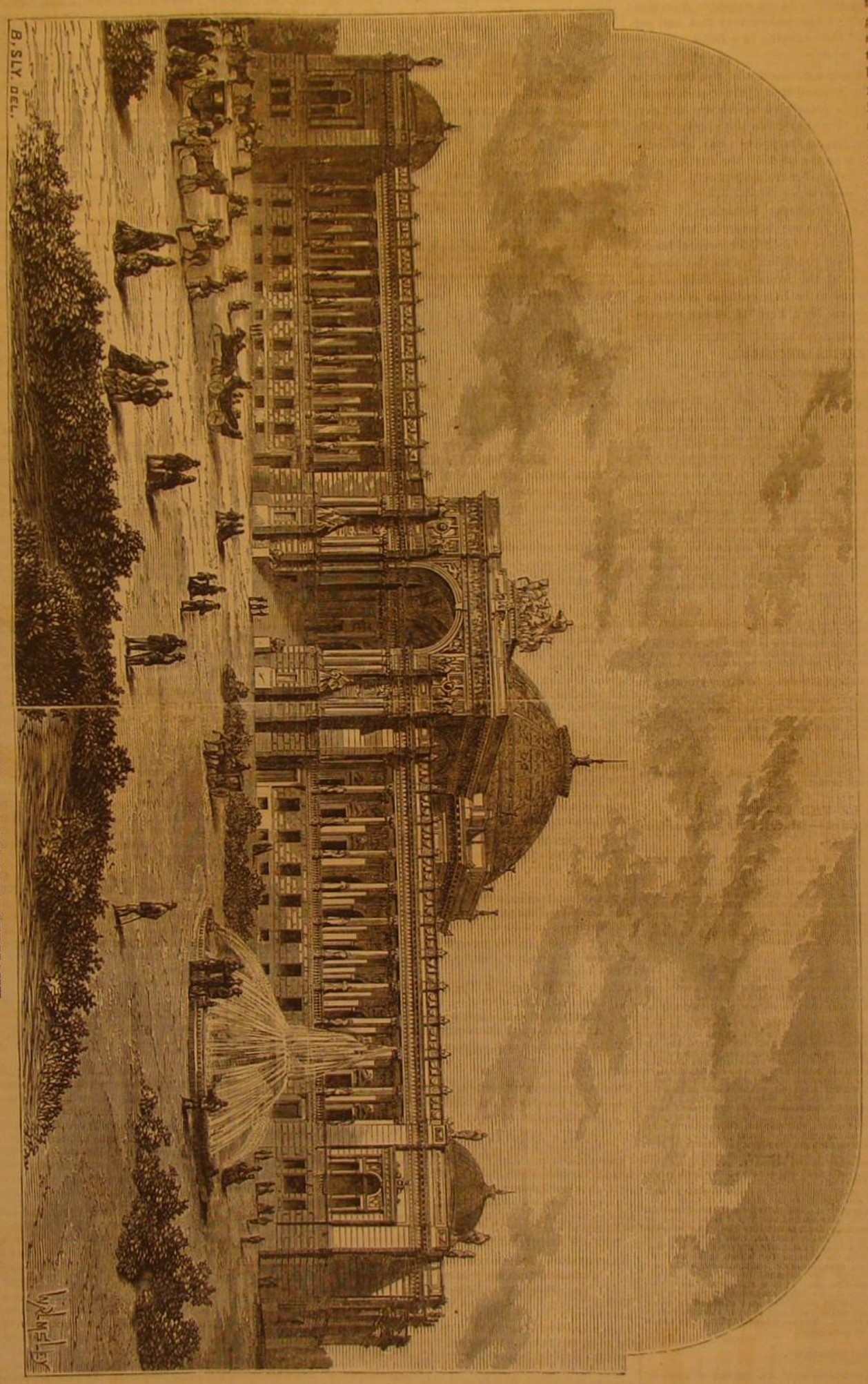
Mr. Emerson is also the inventor of the diamond stone saw illustrated and described on this page, as well as of many other improvements in saws and sawing machinery. For further particulars address Emerson, Ford & Co., Beaver Falls, Pa.

THE NEW PARLIAMENT HOUSE IN BERLIN.

Our illustration represents the proposed Parliament House in Berlin, the design of which is the work of Mr. L. Bohnstedt, of Gotha, and was selected from the plans of a large number of competitors. The building is intended to be of a monumental character, and will be richly provided, outside and intside, with sculptures and paintings. It is divided into two parts, the substructure (the basement and ground floor being treated as one mass) and the main story. The latter will contain the chamber offices of the high government officials, the official residence of the President of the Parliament, together with the necessary committee rooms, halls, etc. The chamber, by the large surface it occupies, its hight and dome, is characterized, even in the exterior, as top and chief part of the whole edifice. The two main courtyards within are connected with elaborate gateways with the adjacent streets. All the rooms are covered with vaults between iron girders.

The rich sculpture work on the exterior of the structure required simplicity in the architectural work and its groups. The main entrance, leading up to the principal story, is the prominent part of the west front, formed like a triumphal arch, and crowned with a bronze group of figures representing Germany, the North and the South guiding the steeds of her victory car. Sculptures on both sides of the central entrance bring to mind the deeds of 1812, 1815, and 1870 and 1871. The inside of the hall is decorated with large semicircular fresco pictures. The open balcony or colonnade is provided with historical bas-reliefs, and on the balustrade in front of the columns with statues of worthy men. The parapet is intended to show the arms of the chief places or provinces, executed in colored mosaics. Brass plates with inscriptions are enlaced in the walls.

Corresponding to the exterior, the architecture of the interior is treated so as to allow a rich decoration, principally with pictures. The walls of the chamber above the floor of the galleries show panels in dark colored marbles and projecting pillars bearing large marble statues representing the German provinces. The vaults there are decorated with colored ornaments on a gold ground. The chamber is lighted by a rich skylight, the upper part of its dome being constructed of metal and glass.



THE PROPOSED PARLIAMENT HOUSE IN BERLIN, GERMANY.

The design, as a whole, is of great architectural beauty, and the false theatrical effect generally gained in such buildings, by erecting unsuitably high towers or vast useless domes, is notably absent.

How to Clean Greasy Vessels.

At a recent meeting of the Lyceum of Natural History, Dr. Walz suggested a method for cleaning greasy beakers and photographic glass plates, which must at once commend itself to all practical chemists and photographic operators. He takes a dilute solution of permanganate of potash (kept on hand in a large stock bottle), to which a few drops of hydrochloric acid are added when used; and he pours in enough to wet the sides of the vessel to be cleaned. The greasy impurities are at once oxidized and removed. The method is preferable to the employment of bichromate of potash and sulphuric acid. The permanganate of potash solution can be saved and used repeatedly until, by the exhaustion of its oxidizing power, it ceases to act.

Incendiary Rats.

Not long ago a four story brick building, occupied by a dealer in teas and coffees, in Vesey street, New York, was found to be on fire. The fire was discovered shortly after midnight on Sunday night, and originated between the ceiling of the first floor and the flooring above. The space above the fire, on second floor, was covered with a large quantity of coffee in bags; upon removing this, and cutting away the floor, it was found that rats had made a nest upon the girder, using oily waste dragged from the engine room in the basement, and this had ignited spontaneously. Had this evidence been destroyed, it would have been an impossibility to arrive at any positive conclusion regarding the origin of the fire. The stock was large and the insurance very heavy, and, had the fire proved disastrous and the origin been unexplained, suspicion might have been cast by the uncharitable upon some person connected with the establishment.

A Good Year for Iron Workers.

The direct connection between the use of iron and the advances of civilization gives a general interest to a review the iron industry at the present prosperous time. High prices having ruled at home and abroad, the production of iron in this country has been greatly stimulated the past year. Since the war and the change in the relations of labor in the Southern States, the tendency in that section to the development of varied industrial resources has added largely to the iron-producing area. The chief difficulty has always been in respect to the means of transportation; and the growth of our railroad system, greater last year than ever before, has been more than ever directed toward internal improvement—to speak specifically, toward developing coal and iron industries. This was true last year of many States, but chiefly of Virginia, Alabama, Missouri, Indiana, and Michigan, if the proportion of new railroads to those previously existing be made the basis of estimate. But many of these new enterprises are scarcely yet completed, and the production of last year affords but little indication of the work that has been actually begun. We may expect, for various reasons, a great increase in the production of iron during the present year. The demand for it has very largely increased. It never was so largely used as now for architectural purposes, and the recent experience of the danger of great fires will increase its use in place of wood. The public is even inclined to the belief that iron fronts are safer against fire than stone; the fact being that safety depends less upon material than on construction. It will give an idea of the extent to which specialties in industries are carried to mention that there is near this city a large manufacturing establishment which confines itself to making the iron work of gas houses The demand for rails increases with the increasing growth of railroads. There are also many circumstances to occasion a large supply of iron, aside from the stimulus of high prices. We have many inventions to dispense with costly labor. The method in use by our rolling mills turns out one third more rails to a set of rolls than that employed abroad. The Danks puddling machine, which has just gone into use, is destined to dispense with the services of the puddler, and very greatly hastens as well as cheapens the operations that produce wrought iron. The discovery of coal that can be used without preliminary conversion into coke provides another means of saving time and labor. Great improvements have also been made in the American process for manufacturing Bessemer steel, so that the works already existing turn out considerably more rails than formerly, and several new works of great capacity are projected or have come recently into operation. The iron makers reasonably anticipate a busy and prosperous year.—*New York Tribune.*

U. GAYOU comes to the conclusion that the main cause of the decomposition of eggs is the presence of small organisms which must have formed in the eggs while in the oviducts of the fowl.

Grindstones not Extinct.

Some persons may be impressed with the idea that the turning lathe and modern emery wheel have entirely superseded the grindstone; but it appears from a statement from J. O. Mitchell, an extensive grindstone dealer in Philadelphia, that such is not the fact. He says that, at the Baldwin works, no less than 6 grindstones, of 2 tuns weight each, are kept constantly running on locomotive work; not only are all the rough castings ground, but 41 of the working parts of an engine are finished in this way. Grindstones are also used for finishing pulleys, which are caused to revolve against the stone, running rapidly in an opposite direction; this grinds down the face of the pulley very fast and perfectly true, and at less cost than turning in a lathe.

PROFESSOR AGASSIZ defends his rejection of the Darwinian theory of evolution on the ground that "his opponents are presenting views on scientific principles which are not even based on real observation; that they have not shown evolution, or the power of evolution, in the present day, and hence are not entitled to assume it in the past." He further characterizes the theory as a "mire of mere assertion."

PRESERVATION BY COLD.—Professor Boussingault states that a quantity of beef tea, having been submitted some eight years ago to a temperature of —20° for several hours, has remained in perfectly good condition up to the present time. Sugar cane juice was at the same time subjected to this treatment, and was found to be in excellent condition. Both substances had of course been kept in closed vessels.

PATENT OFFICE DECISIONS.

TRADE MARKS.—C. E. RICHARDSON ET AL.—APPEAL.

LEGGETT, *Commissioner:*

Applicant petitions for the registration of the words "A. Richardson's Patent Union Leather Splitting machine." It appears that the leather splitting machine he proposes to manufacture and place this alleged trade mark upon has been patented, manufactured, and put upon the market under the above caption during the past twenty years, and that the patent has expired. The Examiner has therefore held that the word "Patent" cannot properly be sanctioned as part of this trade mark, because it would tend to deceive the public and perhaps induce a violation of section 29 of the Patent Act. Applicant then proposes to drop this word, and asks that the words "A. Richardson's Union Leather Splitting Machine" be registered, if, in the opinion of the Commissioner, the words as originally submitted must be rejected. This does not relieve the case of another objection. The words presented have become the generic name of these machines by which the public now know them. They have been before the country under this caption as patent devices. The right to make them has now fallen into the hands of the public, and why should not the public have the right to use the name by which they are known and which they have acquired by virtue of the patent? When a device becomes public property its name must also. If the word "Union" were now adopted for the first time, it would no doubt in this connection render the words presented registrable. But it has become a part of the name of the device to which it is proposed to be applied, and therefore registration must be refused.

TRADE MARK.—STERNBERGER VS. THALHEIMER & HIRSCH.—INTERFERENCE.—ADMISSIBILITY OF EVIDENCE.

Parties who employ a word in an experimental way in five or six instances, and take no further steps with it for three months, do not thereby gain a title to it as a trade mark as against one who has in the meanwhile adopted it and put it into general use.

Neither will the latter lose his right to it because the others procure it to be registered.

Upon an interference between an application for the registry of a trade mark and a trademark already registered, evidence was adduced tending to show that the applicant had admitted in conversation that he had not previously made use of the trade mark: Held, that it was competent for him to prove, although upon the rebuttal, that he had been in the use of it prior to the conversation.

THACHER, *Acting Commissioner:*

The decision of the Examiner of Trade Marks is affirmed, and the right to a certificate of registration awarded to Sternberger.

DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

TAN BARK EXTRACTS.—PINGREE'S PATENT OF OCTOBER 25TH, 1865.—ABEL E. BRIDGE ET AL. VS. RUFUS H. BROWN ET AL.—INFRINGEMENT.

[In Equity.—Before Shepley, Judge.—October Term, 1872.]

A patent for an apparatus for making extracts from tan bark by means of exhaust steam, which claims in combination an exhaust steam pipe, a leach and intermediate boxes in which the steam is condensed, and also expands so as to avoid back pressure on the piston, is not infringed by a similar apparatus in which there is no exhaust pipe nor provision for avoiding back pressure, but the steam is taken directly from the boiler.

SHEPLEY, *J.:*

The patent is for an apparatus for making extracts from tan bark and other material not for the process of extracting the tannin, but for an apparatus consisting (first) of the boxes with perforated sides, applied in combination with (second) the exhaust pipe and (third) leach or its equivalent, (fourth) in the manner and (fifth) for the purpose substantially as set forth.

In the state of the art at the date of the invention of Pingree, there was nothing new in the form or structure of his leach, nor in the mode or purpose of its use, apart from the introduction into it of steam from the exhaust pipe of an engine instead of from a steam pipe taking its supply directly from a boiler. The boxes with perforated sides are not claimed except as combined with the exhaust pipe and leach, in the manner set forth in the patent, and for the purpose set forth. This purpose was the utilization of exhaust steam and the consequent saving of fuel in making extracts from tan bark and other materials. There is no evidence in this case that the defendants use the complainants' combination. They do not use the boxes in combination with the exhaust pipe in the manner or for the purpose set out in the patent, that manner and purpose being in the patented apparatus that the exhaust pipe should conduct the exhaust steam to the leach in such manner that the steam is free to expand, and made to condense partially as it passes from the exhaust pipe into said box, and all back pressure on the piston is avoided, and at the same time the full benefit of the action of the steam on the bark is obtained. Respondents do not use their boxes to conduct exhaust steam to the leach, nor for the purpose of condensing the steam and avoiding back pressure on the piston. They do not use exhaust steam, but take their steam directly from the boiler. They do not use their boxes in combination with complainants' exhaust pipe, for they do not use any exhaust pipe or any equivalent for it. The pipe used by them is not like the exhaust pipe of a steam engine, and is not capable of being used for that purpose. The dimensions of the pipe are such as would effectually prevent its use for any such purpose, in connection with the process for which it is used by the respondents. It is contended by complainants that, although the apparatus patented by Pingree is designed for exhaust steam, their patent would cover its use for any cognate purpose. It is a sufficient answer to this position that it has already been shown that respondents do not use all the elements of their combination as described and claimed in their patent. Respondents' steam pipe is not the exhaust pipe or the equivalent of the pipe described in Pingree's claim. No case of infringement is made out, and complainants' bill must be dismissed.

T. L. Wakefield, for complainants.
Ives & Lincoln and *G. L. Roberts*, for defendants.

STONE BREAKING MACHINES.—ELI W. BLAKE ET AL. VS. GEORGE W. RAWSON

SHEPLEY, *J.:*

This bill in equity is brought for an alleged infringement of the reissued patent of January 9, 1866, to Eli W. Blake, for a new and useful machine for breaking stones for road and other purposes.

The principal points relied upon in the present case, by the learned and able counsel for the respondents, are those which are also set up in the answer in relation to the alleged prior inventions of James Hamilton, as described in letters patent of the United States issued to him on the 3d of January, A. D. 1854, for "Improvements in machinery for crushing and grinding quartz and other hard substances," and also of one Samuel Forward (or Forwood) of Louisville, Kentucky, who constructed a machine for breaking stones for roads in Louisville, in the year 1847.

The essential characteristics of Blake's stone crusher are two jaws between which the stones are to be broken, having their acting faces so nearly in an upright position that stones to be broken will descend by force of gravity between them, and convergent downward one toward the other in such manner that, while the space between them at the top is such as to receive the stones to be broken, the space at the bottom is only sufficient to allow the fragments to pass when broken to the required size.

Although he describes a crank, lever, and toggle-joint as one mode, and the mode adopted by him, of communicating a definite motion to the movable jaw from the revolving shaft, no construction can properly be given to the patent, such as is suggested by respondents, which would limit it to the toggle-joint mechanism, which is described by the patentee as the particular form in which one element of the patented combination is constructed and embodied in one form of his machine. The machine patented frequently has a broader scope than the particular *form* of the machine described as the form used by the patentee. The question of novelty is to be settled by a comparison of prior machines with the machine patented rather than the form of the machine in use.

The Hamilton quartz crusher, relied upon as an invention antedating the complainants', is a combination of certain elements which, separately considered, do not materially differ from the elements of the combination as described in the Blake patent. All the elements of the combination are old in both machines. The novelty in both consisted in the *peculiar* mechanical combination of the members of the contrivance and the resultant mode of operation.

A careful examination of the evidence in the case, and close comparison of the working models of the two machines, has resulted in forcing upon my mind the same conclusion arrived at by Mr. Justice Nelson, in the case of *Blake* vs. *Stafford*, when he says: "Hamilton's quartz crusher neither embodies the arrangement nor mode of operation of the plaintiff's machine, but operates upon a different principle and embodying a different set of ideas."

The Forwood machine is not in existence, and no such machine is proved to have been in existence within twenty years. There is no evidence tending to show that more than one Forwood machine was ever made or used. Only two persons testify to having seen that machine. Only one witness testifies to anything which can possibly be claimed to have been any other than an experimental use.

It is difficult to see how Blake could have been aided in the development of the ideas embodied in his structure by any suggestions he could possibly have received from Forwood's machine, if that had been in existence and known to Blake when he was developing his invention.

The infringement by the Rawson machine is obvious.

Decree for complainants.

H. T. Blake, G. W. Baldwin, for complainants.
Shepley & Drew, for defendant.

United States Circuit Court---District of Maine.

COPYRIGHT IN TITLE.—TRADE MARK AND INVASION THEREOF.—JAMES R. OSGOOD ET AL. VS. EDWARD C. ALLEN.

[In Equity.—Before Shepley, Circuit Judge.—Decided December, 1872.]

A title separate from the publication which it is used to designate is not protected by the copyright law. It is only as a part of the copyrighted book and as the title to that particular literary composition, that the title is within the provisions of the copyright act.

The office of a trade mark is to point distinctively to the origin or ownership of the article to which it is affixed.

Generic names and those merely descriptive of an article or of its qualities or ingredients, and geographical names which point out only the place of production and not the producer, are not the subject of trade mark.

In all cases of invasion of rights to the exclusive use of a trade mark, the essence of the wrong consists in the sale of the goods of one manufacturer or vender as those of another.

A suit in equity brought by the complainants, proprietors and publishers, at Boston, Massachusetts, of an illustrated copyrighted monthly magazine, entitled "Our Young Folks, an Illustrated Magazine for Boys and Girls," against the defendant, publisher at Augusta, Maine, of a semi-monthly paper, also copyrighted, entitled "Our Young Folks' Illustrated Paper." The two publications were in no respect similar, excepting in the use in the title of each of the words, "Our Young Folks."

Upon bill, founded upon alleged copyright and trade mark right in the words "Our Young Folks," filed to restrain the defendant from continuing the publication of his paper: Held, 1. That the complainants had no copyright in the words "Our Young Folks" separate from the copyrighted magazine. 2. That the cause should be referred to a master to ascertain whether the public had been deceived, or was in danger of being deceived, into the belief that the respondents' publication was, in fact, that of the complainants', and thereby led to purchase the same.

E. M. Morse, Jr., and *R. Stone, Jr., Butler & Fessenden*, of Portland, for plaintiffs.
Causten Browne and *J. S. Holmes, A. R. Strout*, of Portland, for defendants.

NEW BOOKS AND PUBLICATIONS.

MYSTERIES OF THE VOICE AND THE EAR. By Professor O. N. Rood, of Columbia College, N. Y. C. C. Chatfield & Co., 460 Chapel Street, New Haven, Conn.

A neatly gotten up edition of Professor Rood's excellent lecture. The pamphlet forms No. 10 of the well known "University Series" which the above named publishers have been issuing for some time past.

THE PRACTICAL MAGAZINE; an Illustrated Cyclopædia of Industrial News, Inventions, etc. London. James R. Osgood & Co., Agents, Boston, Mass. Monthly. $1 per copy; $10 per annum.

We have before referred to this mammoth English monthly, and have given our readers a general idea of the abundant supply of useful, valuable, and interesting matter with which its pages are replete. The printing is far above the level of our ordinary industrial monthlies, and the illustrations, several of which are selected from our own columns, are of uniform excellence throughout. We welcome the new comer in the field of industrial journalism, and cordially wish for it every success.

We are in receipt of the February number of the PEOPLE'S MONTHLY of Pittsburgh, printed in new type, and on tinted paper. It has no less than eight engravings, some of them being very beautiful. The two famed poems, the "Wonderful One Horse Shay" (O. W. Holmes) and the "Barefoot Boy" (Whittier), are both illustrated in this attractive number. The "People's Monthly" is a pure, wholesome, and attractive *home* paper, and well deserves a generous western support. Charles McKnight, publisher, 84 Fifth Avenue, Pittsburgh, Pa. Price $1.50 a year.

PROCEEDINGS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION at the Twentieth Annual Meeting, held in Cleveland, Ohio, September, 1872. Philadelphia: Sherman & Co.

This volume is of interest and importance to the pharmaceutical profession, and many of the papers contained therein are of permanent value, containing much information.

THE CHICAGO RAILWAY REVIEW makes its appearance in quarto form, with new and elegant typography. It is a valuable journal, ably edited and always interesting.

GEORGE P. ROWELL & CO.'S GAZETTEER, containing a Statement of the Industries, Characteristics, Population, and Location of All Towns in the United States and British America, in which Newspapers are published.

This well compiled work will be useful to all who want to advertise (and who does not?), and trustworthy information as to different localities will be found therein.

THE ADMINISTRATION OF JUSTICE UNDER MILITARY AND MARTIAL LAW. By Charles M. Clode, of the Inner Temple, Barrister at Law. London: John Murray, Albemarle Street. New York: Scribner, Welford and Armstrong, 654 Broadway. Price $6.

The author of this work has for many years been the legal adviser of the British War Department, and has published several works on cognate subjects. The book now before us is an exhaustive treatise on the relations between military and civil authority, and on the constitutional considerations involved in the arbitrary administration of affairs necessarily resorted to in time of war.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 18 to February 3, 1873, inclusive.

ANIMAL TRAP.—R. E. Dietz, New York city.
BOOT SEWING MACHINE.—L. R. Blake, Fort Wayne, Ind.
BREECH LOADING FIRE ARM.—J. Broughton, Brooklyn, N. Y.
CARBONIC OXIDE, ETC.—L. Stevens, Washington, D. C.
CLOTHES WRINGER, ETC.—S. G. Corliss, New York city.
DRESSING MILLSTONES.—S. Dean, La Crosse, Wis.
FIREPROOF SAFE.—J. W. Warren, Oneida, N. Y.
FIRE ALARM, ETC.—A. F. Johnson, Parkville, N. Y.
FIREPROOF VAULT.—J. W. Warner, Oneida, N. Y.
HINGE, ETC.—F. W. Nichols, Lynn, Mass.
FORCING LIQUIDS BY STEAM.—W. Burdon, Brooklyn, N. Y.
LAMP.—R. Hitchcock, *et al.*, Watertown, N. Y.
LECTURER'S APPARATUS.—R. G. Wells (of New York city), London, Eng.
LOCK WASHER.—J. Purdie, Buffalo, N. Y.
MAKING STEEL.—T. H. Alexander, Washington, D. C.
MOTIVE POWER, ETC.—O. J. Backus, A. F. Sawyer, San Francisco, Cal., A. M Loryea, East Portland, Oregon.
RAILWAY BRAKE, ETC.—J. Y. Smith, Pittsburgh, Pa.
REFRIGERATOR.—S. B. Martin, J. M. Heath, San Francisco, Cal.
RIFLING GUN BARRELS.—H. Berdan, New York city.
SCOURING WIRE, ETC.—G. Broomhead, Paterson, N. J.
SIFTING SHOVEL.—G. W. Dean, New York city.
SPINNING MACHINERY.—H. T. Potter, J. G. Lamb, Norwich, Conn.
TORPEDO LAUNCHES.—H. J. Smith, Boston, Mass.
WHITE LEAD, ETC.—A. P. Meylert, New Britain, Conn.

Recent American and Foreign Patents.

Improved Cotton Press.

Peter K. Dederick, Albany, N. Y.—This invention consists of a press so contrived that the bale is sacked at the same time it is pressed, by having the prepared sack gathered on the open end of a short pressing case, or on a holder of any kind, in connection with the pressing devices, so that the pressing and filling are accomplished simultaneously. This invention also consists of a movable press head against which the pressing is accomplished and which recedes from the follower as the pressing progresses under the control of a friction brake which regulates the measure of the compression.

Improved Mechanical Movement.

Charles W. Carr, Paola, Kansas.—This invention consists of a cam with three or five leaves or tappets and a connecting rod with a toe on each of two opposite or nearly opposite points across the axis and fronting the face. It is arranged in such manner that while the tappets or leaves act upon one toe the other is clear of them, and *vice versa*. Each toe is alternately acted upon, one being driven one way and the other the other way, so that three or five double movements of the connecting rods are obtained to one revolution of the cam. The contrivance is designed more particularly for operating the cutter bars of mowing machines and harvesters, but it is applicable to other machines.

Improved Cover for Pitcher.

Walter Bradley, Providence, R. I.—The object of this invention is to provide means for keeping pitchers or cups for containing milk, water, sirup, or other substance closed when not in actual use, and it consists in a cover which is automatic in its action.

Improved Door Check.

Alexander Hanna, Dover, Ky.—This invention consists of a double hooked plate pivoted to a bracket projecting from the base or mop board, both so arranged as to receive the edge of the door between them when it swings back, and to swing back a little with it and drop into a notch, by which the door will be prevented from striking against the wall and held from swinging shut. The invention also consists in having this bracket jointed together near the breast plate to swing up and be supported out of the way of sweeping the floor, etc., when required.

Feeding Screen for Bran Dusters.

George S. Cooper, Baraboo, Wis.—This invention consists in the arrangement of the shoe of a bran duster, the same having a perforate and imperforate portion, or spring supports, to be actuated in a forward and backward direction by an eccentric on the duster shaft, the said spring supports and the actuating apparatus being arranged to allow the shoe to be adjusted vertically either at one or both ends.

Improved Railroad Rail Joint.

James M. Clem, Opelika, Ala.—This invention consists of a flat pin or bolt with a slot near it through the point, which is used in place of the ordinary screw bolt to fasten the fish or joint plates, the bolt being fastened by a key and spring washer instead of the ordinary nuts and fastenings therefor, the key having a notch in the outer edge, so that a shoulder above and below the bolt becomes locked when the key is driven in, so that it cannot work loose.

Improved Spool Box.

Julius C. Bohn, Centralia, Ill.—This invention consists of a small box with several partition plates within and supports, for the ends of said partitions adapted for dividing the inner space into narrow spaces of different widths, suitable for containing several spools lying end to end, so as to roll when the thread is pulled. One side of the box, parallel with the rows of spools, has a number of notches in the upper edge, through which the threads from the spools may be drawn as required for use, the ends being left hanging out sufficiently to afford a hold for pulling out when thread is wanted.

Improved Screw Propeller.

Newton A. Patterson, Athens, assignor to himself, McKendrie F. Miller and Landon N. Miller, Rheatown, Tenn.—The invention relates to screw or spiral propellers, and consists in making the blade concavo-convex, with pointed extensions on the inner sides, and adapted to be arranged some distance from shaft and in planes oblique or spiral thereto. By this construction and arrangement the centrifugal tendency of the water is claimed to be overcome, while it is packed and forced out at the kite tail toward the axis of motion.

Improved Music Portfolio.

Frank C. Schumann, New York city.—This invention has for its object to furnish an improved portfolio for sheet music, which shall be so constructed as to adapt it for use as a rack for supporting a piece of music while being used, and it consists in the combination of a bracket with the side plates of an ordinary portfolio.

Improved Street Car Coupling.

John Stephenson, New York city.—This invention relates to a new and useful improvement in cars for street railways, and consists in the construction and arrangement of the draw pin and extension thereof, the draw head, and the keeper and spring. The pin is at all times under the control of the driver, so that it can be drawn at pleasure, and much more readily than in the ordinary manner. The shoulder stop above and below the keeper, with the spring on the opposite side, retains the pin in its proper position whether it is up or down.

Improved Angling Reel.

Charles L. Noe, Bergen Point, N. J.—This invention consists of a fan regulator with gearing connecting it with the reel gear combined with the reel, to prevent it from overrunning the line by its momentum when the hook is cast.

Combined Horse Rake and Tedder.

Geo. L. Ives, Rome, N.Y.—This invention consists of a hay tedder attachment to the truck of a hay rake for which a patent was granted to the same inventor August 13, 1872, No. 130,431. Said attachment includes a shaft (with arms attached for stirring or turning the hay) journaled in bearings or boxes swiveled in the rear ends of arms, whose forward ends are jointed to the wheeled truck shaft, and also to an intermediate frame, which latter is adapted to be readily connected to and disconnected from the truck, so that it may be made to alternate, in practical use, with a common wire rake attachment, which the truck is otherwise constructed to carry and operate.

Machine for Sharpening Gin Saws.

Jasper M. Bailey, Meridian, Miss.—This invention has for its object to furnish an improved machine for sharpening gin saws while on their shaft. The invention consists in constructing a file holder having a turned up end, which is connected by a link with the crank of a drive wheel, so as to give a reciprocating motion in the smallest space and without friction.

Improved Hand Planter.

Sidney S. Stults, Cedar Bluffs, Neb.—The invention relates to improvement in the class of walking corn planters. A staff is arranged with a handle at the top for carrying in the hand of the operator walking along the ground. In the bottom of the grain box is a grooved piece, in which a curved dropping slide, with a pocket for receiving the seed, works to draw it out of the grain box under a brush into the tube through which it falls to the space between the jaws. The latter make the hole in the ground by the staff being forced down, and they are opened by swinging the upper end of the staff forward so that the foot strikes the ground to arrest the forward movement of a lever, which carries one jaw. A spring throws the lever and slide forward and closes the jaws when the planter is raised out of the ground after one operation to be swung forward for the next.

Improved Rocking Chair Fan.

Alois Nissle and Josef Schöberl, New York city.—This invention relates to a new manner of connecting a rocking chair with a fan, so that the latter may be rotated alternately in opposite directions by the oscillating motion imparted to the chair, and consists in the application of a weighted lever to one of the chair rockers, and in its connection with an endless cord which passes over a pulley on the spindle of the rotary fan. The lever rests with its weighted end upon the floor, and remains thereon; and, consequently, as the chair is rocked, the relative positions of the rocker and lever will be changed, and the cord, which passes over the friction roller hung on the rocker, will be drawn over the roller and pulley, so as to rotate the latter and revolve the fan.

Improved Animal Trap.

Frank Flora, Pierce, O.—This invention has for its object to furnish an improved animal trap, which shall be so constructed that the animal can not have his foot thrown from the trap in springing it, and so arranged that the animal can not draw his leg out of the jaws of the trap by eating off his foot. The invention consists in the jaws made with a rabbet or flange upon their inner sides, and in a toe formed upon the shank of the bait pan to catch upon the jaw in setting the trap.

Improved Lumber Chute.

William Van Name and James A. Wakefield, Chippewa Falls, Wis.—This invention consists in the construction and arrangement of a log chute with a double gate hinged together. It is arranged upon the bottom of the way between the side pieces with a water space under it, to which a passage is provided from the head of the chute to admit water under the hinged gate in order to regulate the hight of the dam, which the hinged gate constitutes when raised by the water below it. There is a passage to let the water escape from under the hinged gate when the dam is to be lowered. The invention has already been in operation, a chute having been erected with a slide 130 feet long, with a timber apron 45 feet, and fingers, or bars, projecting on to the surface of the water 40 feet, making a total distance of 215 feet. The apron allows the water to escape at the sides, and thereby deadens the force with which the lumber descends; and the fingers deliver the sticks horizontally on to the water, preventing their submersion. These operations are regulated by the amount of water let into the slide by the gate, and the inventor claims that the control of the descending lumber is perfect.

Improved Bedstead Fastening.

Joseph F. Manchs, Ridgely, Md.—This invention has for its object to furnish an improved fastening for bedsteads which shall hold the parts of the bedstead securely and shall enable the bedstead to be easily put together and taken apart. The invention consists in a fastening, formed of the casting for the post having a slot formed in its closed lower end, and shoulders formed upon the upper ends of the sides of its open upper end. The top casting for the side rail has shoulders formed upon its side edges, and the bottom casting for the side rail has a downwardly projecting flange formed upon its forward edge, said parts being constructed so that the strain comes upon all the screws laterally, which greatly increases the strength of the fastening.

Improved Spindle Bolster for Spinning Machines.

Charles F. Wilson, Northbridge, Mass., assignor to himself and Jesse E. Folk, Brooklyn, N. Y.—This invention relates to lubricating bolsters for spindles of spinning frames, and consists in an arrangement of a sleeve or box bearing having a reservoir on its upper end for receiving the oil, and central perforations and tangential plates or lips for co-operating with an inverted conical or tapered tube secured to the spindle to cause the lubricant to maintain a constant circulation, not only from the reservoir downward until the same is empty but subsequently in contact with a portion of the spindle.

Improved Carriage.

Thomas B. Patten, West Amesbury, Mass.—This invention relates to that class of buggies in which the top is supported upon fixed standards above the body; and it consists of standards with branches at each end secured by bolts passing through the branches and screwing into plates or nuts attached to the buggy body or top. The plates have two holes for both the bolts of a standard, and the bolts being of square or other shape at the head are adapted for being turned by a wrench. This mode of fastening the standards to the body not only facilitates the removal of the top when required, but it greatstrengthens the body.

Improved Land Roller.

John Woolridge, Dean's Corners, Ill.—This invention has for its object to furnish an improved land roller, which shall be so constructed that it will adjust itself to the surface of the land being rolled, which shall be of lighter draft and more readily turned than rollers constructed in the ordinary manner. And it consists in the cross bar with which the rollers are connected, made in two parts and connected with the tongue. It consists, secondly, in the mode of holding the rolls so that they will have a convenient lateral end movement, and in a mode of construction for locking and unlocking automatically the two sections of connecting bar.

Improved Band Saw Gang.

Henry Sillman, Brooklyn, N. Y.—This invention has particular reference o the mode of adjusting the saws of band saw gangs. The arrangement of the saws on separate pulleys, having separate and independent shafts, allows them to be strained and adjusted separately, to suit the various purposes to which they may be applied. These saws are constructed either with or without teeth, to adapt them for sawing either wood, marble or stone.

Improved Packing Box.

Ludolph A. Fullgraff, New York city.—This invention consists of a packing box formed, as to its sides or body, of wood, and as to its top and bottom, of paper, thus constituting a new article of manufacture, cheaper and lighter than other boxes of its class, and yet equally serviceable.

Improved Weather Threshold.

John W. Kramer, Bloomsburg, Pa.—The invention relates to improvements on the door strip for which United States Letters Patent numbered 106,835 were granted to the same inventor August 30, 1870. The present invention consists in a new manner of connecting each door strip with a spring lever in the side of the door case, by means of which the strip will be raised in a more perfect manner when the door is shut.

Improved Horseshoe Nail Machine.

James Mills, Keesevlile, N. Y.—This invention relates to the horseshoe nail machine patented to H. E. and C. W. Woodford, October 30, 1866. In one machine the inventor unites the advantages of the revolving roller hammer and the intermittingly revolving anvil, by which, together with the striking hammers, he claims to make the device perform nearly double the usual amount of work.

Apparatus to be used in connection with Coal Car Elevators.

Philip H. Lamey, Wiconisco, Pa.—The invention relates to car elevators but more particularly to such as are employed in transferring coal from the bottom of mines up a slope and to a landing, from whence it is discharged The invention consists in a pivoted stop, which is operated simultaneously with a signal to the engineer, by a single topman who stands on the landing, in pushers arranged in the car to carry it forward to the beginning of the slope after the mules have been removed; in a truck arranged in a pit below the level of the car track to work the pusher; in making a longitudinal channel through the middle of the truck, to allow the rope to play vertically according to the positions of the car, and, laterally, according to the position of the rope on the drum; also on a novel catch pivoted over the rope channel, bifurcated and curved to allow the transfer of the truck to the discharge end of the landing at the same time with the car; in arranging a rising track up which the pusher is moved to take its proper position against the bumpers of cars; in pivoting the rising track which brings the pusher into proper position behind bumpers of car, to the end of the upper track, and allowing it to take its position on the lower track, so as to rise and fall automatically, and in placing a friction disk on each side of the pulley on which the rope rests, and friction slides on the bottom of the car to prevent the rapid wear which otherwise takes place on the wire ropes.

Improved Lifting Jack.

S. Spencer Eccleston, South New Berlin, N. Y.—This invention relates to an improvement in the class of wagon jacks whose lifting lever is provided with a pawl operated by a rod extending to the handle portion thereof; and the improvement consists in the arrangement of parts, whereby the hand of the operator is, in practice, applied simultaneously to both the main lifting lever and the lever for holding the pawl engaged with the toothed rack of the vertical standard. By this construction the pawl may be operated from the rear end of the lever, however long said lever may be, thus allowing the lever to be made of any required length to obtain any desired leverage.

Improved Hat Stretching Machine.

Samuel Goodman, Natick, Mass.—This invention has for its object to improve the hat stretching apparatus which is described in the patent of Rudolph Eickemeyer, issued February 28, 1865, numbered 46,553, and reissued December 1, 1868, numbered 3,217; and the invention consists in the use of a jaw for hat stretchers having a curved convexity on its working face, and on its rear face end a spring rod connecting it with an arm, so that the hat may be stretched from the tip downward.

Improved Fire Kindlers.

John Y. Marks, Rochester, Pa.—This invention relates to compositions used for igniting fires; and consists in pulverized cannel coal, melted resin, sawdust and alcohol. The resin is melted in any suitable vessel, and the powdered cannel coal, sawdust, and alcohol are added while the resin is hot, so that the ingredients may be thoroughly mixed together. When thus mixed the composition is spread out while it is in a semi-fluid state, and cut into pieces of suitable size for use. The fire kindler thus prepared emits no odor, and may be kept in any part of the house.

Improved Railroad Track.

Daniel S. Tuthill, Newburgh, N. Y.—This invention consists of a short rail alongside of the main rails at the joints, either inside or outside of the two rails of the track, and wheels adapted to transfer the weight of the cars or the principal portion of it to these short rails while passing the joints of the main rails, to avoid the pounding and jarring due to the springing of the ends of the rails as the wheels pass over them.

Improved Tug Fastening.

Jonathan Turley, Mitchell, Ind.—The invention consists in a mode of connecting the traces and whiffletree by which horses draw a vehicle, plow, or cultivator, so that no outer projection can come in contact with another object and catch thereinto. Near the rear end of the trace is applied any suitable hook. The whiffletree is provided with an end sleeve and loop, having their front edges in the same vertical plane. The snap hooks being placed in the eyes, the trace presents a smooth outside, and its rear end projects backwardly a little beyond the end of swingle tree. By this arrangement it is impossible that the end of swingle tree or of the snap hook can catch on any object whatever.

Improved Spindle Step for Spinning Machine.

Charles F. Wilson, Northbridge, Mass., assignor to himself and Jesse E. Folk, Brooklyn, N. Y.—The invention is an improvement in lubricating devices for spindles of spinning frames, and has reference to the construction of the case or holder for the spindle step. The step is placed in an oil reservoir or shell. The step box is made from a solid piece of metal, bored out for the step of the spindle and for the passage of the oil. The oil is introduced into the reservoir through an orifice in which a lip is made in punching, against which the tube of the oil can will strike instead of striking the spindle. Holes are bored from the top of the step box to a point a little below the bottom of the spindle orifice connecting with a small hole bored to the center of the spindle orifice. The step of the spindle is beveled to an angle of about forty-five degrees, so that the oil which is forced up through the small hole readily spreads and perfectly lubricates the extreme end of the spindle. The oil reservoir may contain more or less oil; it may be filled to near the orifice, so that the step of the spindle will always run in oil. The top of the oil reservoir is turned in around the spindle so as to exclude lint and dust. The step box is confined in the bottom of the shell and the latter is confined in the rail, so as to correspond in position with the spindle bolster in the rail above.

Improved Baking Pan.

Among the recent patents is that of R. D. McDonald, Jersey City, N. J., for his Excelsior Roasting and Baking Pan, which we have given a practical trial. It consists of an ordinary oven pan for baking bread, roasting meats, and other articles of food, the principal novelty being in a convex cover which fits tightly over the pan, and by its convexity forms a vapor chamber above the food. The cover is provided with a suitable fastening by which it is locked upon the pan, and also with a small valve. When bread, poultry, meat or other food is placed in the pan and deposited in the oven, the vapors arising therefrom are confined, and the cooking is carried on at a low temperature, which is essential to good cooking. Our experience is that food placed in this device is well cooked and improved in flavor. It ought to have a place in every household, for it is a valuable addition to the utensils of the kitchen.

Improvement in Feeding Sheets of Paper to Printing Presses.

By S. Schofield, Providence, R. I., and Charles E. Baker, Mt. Clair, N. J.—These inventions consist in pressing upon the top sheet of a pile of paper with a non-penetrating point or instrument while the sheet is being moved, so as to cause the instrument to tear through the sheet and retain a slight chip under the point, the friction between the top and second sheets being thereafter insufficient to move the second sheet from under the pressing point, practically holding the second sheet, through the first, while it (the first sheet) is being removed. The removal of the top sheet, after this process of separating it from the second one, is accomplished in various ways, according to the nature of the pressing points, which are made differently for different machines on which the paper is to be used. These inventions, if practically successful, will materially simplify the business of printing and do away with much of the annoyance heretofore experienced from the carelessness and incompetency of the hands employed in press rooms.

Improved Piano Agraffe.

Charles F. Chickering, New York city.—The invention consists in dispensing with the bridge which is usually placed back of the agraffe, and furnishing the required double support by two points in the agraffe itself.

Improved Track Lifter.

Aug. H. Arnot, Morristown, Tenn.—The foot piece or base of this implement, which in its general form is somewhat similar to ordinary lifting jacks, is formed of two parts, and is long, narrow, and beveled at its front end to adapt it to be thrust beneath the rails of a track. The lever is pivoted between the two parts, and a pawl is pivoted to the vertical standard to adapt it to engage with ratchet teeth formed on the handle or power end of the lever. The implement is light, strong, and efficient, saving much and severe manual labor.

Improved Ditching Machine.

William T. Hoskins, Lilvia, Ky.—In this invention a wedge-shaped ram, operating to form a drain or ditch by compression, is mounted in a traveling frame, which receives a progressive movement at the end of each stroke by devices actuated through the same mechanism which elevates the ram for a repetition of the stroke.

Improved Rotary Steam Engine.

Dr. John F. Early, near Ruckersville, Va.—The invention consists in combining, with the piston wheel of a rotary steam engine, a series of rotary valves that are brought by pistons into such a position as to admit steam and act as an abutment thereto while actuated by cams on the piston wheel to cut off steam at any desired point.

Improved Construction of Books.

John C. Bonnell, Burlington, Iowa.—The invention consists in making a blank book with one full folio, while the rest are cut out, and in filling the vacant space with a block.

Improvement in Butter Pails.

Much difficulty has been heretofore experienced in the production of what are known as return pails, for farmers' use, for want of a simple but secure mode of fastening the cover. In the transport of so weighty an article as butter, everything about the package must be very strong; and it must be tightly closed, otherwise the butter will be exposed to damage; the fastenings must be simple and strong, or they will soon become disordered and useless. These difficulties are all overcome in the improved fastenings and butter pails made under Decker's and Westcott's patents, by the Orange County Pail Company, 179 Reade street, New York, who are now supplying the market with a reliable and excellent article.

Improved Packing for Piston Rods, etc.

Leopold Katzenstein, New York city.—This invention relates to improvements of the packing described in letters patent No. 105,462, and dated July 19, 1870. The object of the present invention is to insure the proper adjustability of the rings and also to facilitate their insertion within and removal from the packing box. The invention consists in forming the cut rings with spaces between the ends of their several sections, and also in providing them with screw sockets to permit the application of screw rods for the insertion and removal of the rings.

Improved Sheep Holder.

Samuel Tucker, Wabash City, Ind.—The object of this invention is to provide convenient means for holding sheep while they are being sheared; and it consists in a frame or holder attached to the table or bench, so constructed that the legs of the sheep are secured by clamp bars confining the sheep on its side in a humane manner convenient for the shearer

Improved Lock for Sewing Machines.

Edward L. Gaylord, Bridgeport, Conn.—This invention has for its object to furnish an improved sewing machine lock which shall be so constructed as to require no second hole in the striker plate to receive a steady pin to prevent the case from sliding upon the table; and it consists in the combination of a fixed projecting plate or steady pin with the locking hook of the lock.

Improved Universal Joint Coueling.

Henry B. Whitehead, Holly Springs, Miss.—This invention consists in the use of hemispherical gears forming the contiguous ends of two shafts, which are hung in sleeves, and the combination therewith of slotted, pivoted side plates or links and adjusting screws, all suitably arranged to permit the shafts to be set at an angle to each other, and yet permit their rotary movement at said angle in like manner as when the same are in alignment.

Improved Combined Blind Opener and Slat Regulator.

Adin Ball, Milford, Mass., assignor to himself and Charles P. Nelson, of same place.—This invention has for its object to furnish improved fixtures for window blinds which shall be so constructed that the blind may be opened and closed to any desired extent without raising the sash, which will hold the blind securely in any position into which it may be adjusted, and which will close the slats automatically when the blind is closed.

Improved Device for Feeding Stoves.

Bernard Connelly, Williamsburgh, N. Y.—This invention has for its object to furnish an improved coal scuttle, so constructed that the coal may be introduced into the stove in such a way as to prevent the escape of gas. The upper part of the body of the scuttle is made in the form of an inverted frustum of a cone, and its lower part is made in the form of a cylinder and of such a size as to enter the hole in the top of the stove. The cylindrical part of the body is provided with an outwardly projecting flange, to rest upon the top of the stove and support the scuttle. The cover of the scuttle is made in two unequal parts. The smaller part is made fast to the upper edge of the body, and to its edge is hinged the edge of the larger part. The bottom of the scuttle is made in two parts, which may be equal in size. One part of the bottom is stationary, is placed in an inclined position, and its edge is secured to the body. To the lower edge of the stationary part of the bottom, is hinged the edge of the other part in such a way that the said hinged part may be swung above and below a horizontal position. To the hinged part of the bottom, near its outer or free edge, is secured the end of a chain which passes up through a hole in the stationary part of the cover, and has a cross bar or other stop attached to its free end to keep it from being accidentally drawn through. The hinged part of the bottom is supported in a horizontal position by passing a pin through a link in the chain above the stationary part of the cover. In feeding the stove, the cover is removed from the hole in the top of the stove, and the cylindrical part of the scuttle is inserted in said hole. The locking pin is then withdrawn from the chain which allows the hinged part of the bottom to drop.

Improved Coffee Pot.

Edward Heinson Huch, Brunswick, Germany.—This invention consists in the arrangement of a pot which is set over a lamp, or over a gas flame, and closed air-tight by means of a cover, the rim or flange of which dips down into water contained in a deep trough that is formed around the pot. The lid of the pot is connected with the regulator of the lamp or gas flame. When steam is generated within the pot, the lid commences to rise, and, acting upon the regulator, it causes the flame to be decreased in size until the steam ceases to be generated with sufficient rapidity to raise the lid higher. This pot has an inner vessel fitting closely within it at the upper part, and this inner vessel has a perforated bottom, covered with felt, flannel, or similar material, on which the coffee rests. A pipe descends through the perforated bottom of the inner vessel, nearly to the bottom of the pot. When the water in the pot boils, the pressure of the steam drives the water up the pipe into the upper vessel, and over the coffee. The water then comes in contact with the lid. The lid is made to enter and descend some distance into the inner vessel. When the water rises up to the lid, the lid floats. Being thus lifted, by means of apparatus connected with it, it extinguishes the flame beneath. The steam in the lower part of the pot condenses as the pot becomes cooler, and the vacuum so formed causes the water to descend through the coffee, and the infusion is then ready to be drawn off for use.

Improved Tube Welding Machine.

James Sadler, New York city.—This invention consists in a machine for facilitating the operation of welding tubes, more especially designed for the tubes of steam boilers, which have failed at their ends and been reversed. With this apparatus it is claimed that one man only is required, and he alone can weld a tube in much less time and in a more perfect and workmanlike manner. The tube to be welded is heated in the forge, resting on a bracket of the forge and on a lower die. The end of the tube is expanded and, the piece of tube being inserted previously, when a welding heat is obtained the tube and piece attached are slipped along the die so that a ball slipped on or formed on the rod will be directly under the joint. The hammer is now applied to the shank of the upper die with light quick blows while the tube is revolved by the other hand of the operator. Springs raise the upper die from the tube slightly, so that the tube may be readily revolved.

Improved Refrigerator for Preserving Butter, etc.

George B. Rohrer, Oxford, Ohio.—This invention consists of a refrigerator of double walls, with a space between packed with wool for the non-conducting substance. The interior is made in three compartments, in the middle one of which the ice is placed. The others are made of larger dimensions and contain metal pans on which are flanges which hold them in place, and cause them to fit snugly within the walls of the compartment. The sides and bottoms of the pans are provided with strengthening ribs. Three or more pans will be placed in a chamber, one above another, shallow pans being preferred. To divide the butter in small packages, in which it is preserved better than in large ones, the pans will not be filled quite full. They have a series of ventilating holes in the sides, a little below the top, for the cold air to enter, while the warm air escapes over the top.

Improved Pavement.

Milton E. Worrell, Monmouth, Ill.—This invention has for its object to furnish an improved pavement for sidewalks. Iron plates are formed of suitable size, and with cells in their upper sides to receive wooden blocks The partitions between the cells should be made to make the cells tapering, so that the wooden blocks may be driven into them. The plates are made with downwardly projecting flanges upon their side edges, and with downwardly projecting cross flanges, and are also strengthened by brace or stay rods. The sections are secured to each other by bolts passing through the side flanges, rubber or other elastic packing being interposed between them, of sufficient thickness to enable the sections to expand and contract with changes of temperature without breaking them or loosening or weakening the pavement, and always keeping a water-tight joint. The pores of the blocks should be filled with asphalt or other substance that will prevent the water from soaking in.

Improved Device for Making Cigarettes.

Hugo Gerike, Berlin, Prussia, assignor to Bruno Harrass, Böhlen, Germany.—This invention relates to a new machine for filling cigarettes without touching the tobacco with the fingers, and which can be used by smokers to make their own cigarettes, and also by manufacturers. The invention consists chiefly in the use of a spiral tobacco feed, arranged to rotate within a tube and combined with a movable guide or needle stopper thereon, all arranged to operate automatically when the spiral blade is turned. The tobacco receptacle being filled with tobacco, ordinary cigarette wrappers are next prepared, large enough to pass easily over a small cylinder. The length of the wrappers must be the length of the cylinder inclusive of the stopper. The wrapper is pushed over the stopper and down over the cylinder, an easy operation, as the stopper is somewhat conform. The pouch is next taken hold of near the bottom with the left hand and pressed slightly. A handle or crank is next turned with the right hand toward the right. This causes a spiral blade to be revolved and to screw tobacco into the tube against the stopper. The tobacco in fact is forced out of the tube and raises the stopper to which the paper wrapper adheres. Thus the wrapper is filled with tobacco. When the wrapper has been entirely filled it is automatically detached from the tube to make room for another. During the motion the wrapper is guided by a needle.

Business and Personal.

The Charge for Insertion under this head is **$1** *a Line.*

For Milling Machines, see advertisement of Brainard Milling Machine Company.

The best Pattern Letters now before the public are manufactured by S. E. Adamson, No. 8 Dey St., N.Y. City. Send Stamp for Catalogue and Price List.

Chucks—Our Chucks are of the very best material & workmanship. Fairman & Co., Baltimore, Md.

Screw and Drop Presses, Fruit Can Dies and Dies of every description. Thomas & Robinson, Cinn., O.

We have a Packing Box Factory in Michigan, and want some party in New York to sell and deliver to city trade, we furnishing shooks. Address, with reference, A. G. Bissell & Co., E. Saginaw, Mich.

For Sale—The Patent of the Sliding Support for Clothes Lines, pat. Jan. 14, 1873. M. Bubser 114 Newark Avenue, Jersey City.

Patent No. 126,693, for Steel Spring Lamp Chimney Cleaner. Price only $1,000. L. Granger, Patentee, Armada, Mich.

Wanted a good machinist, with small capital, to engage in manufacturing and repairs. Nearest shop 18 miles; only shop in county. Or will sell—all new. Ladd & Parker, Elmore, Ohio.

Buy Improved Car Machinery of Gear, Boston, Mass.

For Sale—An established manufacturing (wood working) business, in one of the best sections of country in Illinois. Capital required, $8,000; more can be used. Or will take in partner. Address H. Bevis, Virginia, Ill.

Wanted—The address of every intelligent reader of the SCIENTIFIC AMERICAN, to whom will be sent free a specimen number of the *Illustrated Phrenological Journal*. Address S. R. Wells, Publisher, 389 Broadway, New York.

The Safety Valve—Buy B. M. Johnson's Safety Valve Guide. Any person can learn all they wish of the Safety Valve. Price $1.50, post paid. Address Box 128, Post Office, Greenpoint, L. I.

Indispensable to every Manufacturer and Machinists—Boston Journal of Commerce; send for a specimen copy. $3 per year.

Machinists' grindstones, Mitchell, Phila.

Pulleys ground cheaper and better than by turning. Suitable grits by Mitchell, Philadelphia.

Wanted—A partner to help introduce the best Hay Stacker and Carrier ever invented; saves backing the horse. Patented through the SCIENTIFIC AMERICAN. Address C. H. Kirkpatrick, Sugar Grove, Indiana.

Operates like a sewing machine engine—Agents wanted for steam engine models. E. P. Ryder, 19 Ann St., New York.

Wanted—Agents to travel and sell "Stilwell's Pat. Lime Extracting Heater," and "Eclipse Turbine Water Wheel," on commission. Liberal inducements to good parties. Stilwell & Bierce Manufacturing Company, Dayton, Ohio.

Small Printing Press Wanted—C. S. Bennett, Crawfordsville, Iowa.

Buy Gear's Improved Car Boring Machine, Boston, Mass.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Wanted—Superintendent, capable of managing a manufacturing establishment embracing a general Foundry business, Architectural Iron Work and Machinery. Must be a first class man of practical experience. Address A. H. Massey, Cleveland, Ohio.

For the best Endless Bed or (Farrar) Surfacer, address Davis, Hatch & Co., 436 North 12th Street, Philadelphia, Pa.

Wanted—An experienced manufacturer of Door Locks and light hardware, with $10,000 Capital, to take charge of Shops. Edward Rowe, Jr., Mansfield, Ohio.

Tin Ware Manufacturers should see the patent Weighing Scoop. For Sale, or Worked on Royalty. D. H. Priest & Co., 3 Tremont Row, Boston, Mass.

J.R. Abbe, Manchester, N.H., sells Bolt Vises.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above, see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau St., New York.

Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

We wish to correspond with some party who understands bleaching and refining oils. Any one who can bleach a dark, mixed oil, so as to make it a clear merchantable article, will be well paid for doing it, or for the process. Samples sent on application to Lock Box 199, Pawtucket, R. I.

To Purchase—A large amount of Second Hand Machinery. Any parties having Engine Lathes, Iron Planers, Drills, &c., in large numbers, who wish to dispose of them cheap for cash, will find a purchaser on application to W. A. James, Roche & Spencer, 273 South Canal Street, Chicago, Ill.

Peck's Patent Drop Press. For circulars, address the sole manufacturers, Milo, Peck & Co., New Haven, Conn.

For 8, 10, 12 & 15 horse Steam Engines, with Link, cut-off, and reversing motion, address, for circular, E. West, Lockport, N. Y.

Tree Pruners and Saw Mill Tools, improvements. Send for circulars. G. A. Prescott, Sandy Hill, N.Y.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

Fire Clay and Limestone Mills, which wear longer than any others made, cast to order by Pittsburgh Casting Co., Pittsburgh, Pa. All work warranted.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Carpenters—For Sale, a Sash Factory, run by water power, at a lumber landing, with a profitable run of trade. For particulars, address P. O. Box No. 2, Charlestown, Jefferson County, West Virginia.

For 2, 4, 6 & 8 H. P. Engines, address Twiss Bro., New Haven, Conn.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Needle and Clock Machinery of every description of the most improved styles. Hendey Bro's, Wolcottville, Ct.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisbie & Co., New Haven, Conn.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

English Patent—The Proprietors of the "Heald & Cisco Centrifugal Pump" (triumphant at the recent Fairs), having their hands full at home, will sell their Patent for Great Britain, just obtained. A great chance for business in England. Address Heald, Sisco & Co., Baldwinsville, N. Y.

Read the article on "The Machinists," now being published in the Boston Journal of Commerce. Send for Specimen Copy.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson, 22 Broadway, N. Y., or Box 1899.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable, W. D. Andrews & Bro. 414 Water st. N. Y.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Steel Castings "To Pattern," from ten lbs. upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

Covering for Boilers and Pipes. The most economical and durable article in use. Took first prize at American Institute Fair. Van Tuyl Manufacturing Company, 328 Water Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

Notes & Queries

1.—G. T. P. says: How can I make good red sealing wax?

2.—T. E. B. asks: How can I remove clinkers from the inside of a stove?

3.—E. R. asks what is the best way of resuscitating a person apparently drowned?

4.—W. T. H. says: Please let me know what is put on the tin oval butter kettles to make them look like silver, and how it is made and applied.

5.—T. G. asks: Will some one give full directions for making a solid emery wheel ¼ inch thick and 6 or 8 inches in diameter for cutting slots in rough castings?

6.—P. asks for the *modus operandi* of producing "Grecian painting," also for the transparent varnish for the same.

7.—J. M. asks for a method of treating old oil paintings, which have been almost obliterated by frequent and bad varnishing; also for the best way of treating a painting on panel of which the wood is cracked.

8.—G. E. H. claims to have a process for tinning cast iron, which he has tried with success both on finished and rough castings. He asks: Has nothing of the kind been done before, and if not, to whom is it of the most value?

9.—E. H. asks: What is proper speed per minute for a common wood turning lathe, and also for a circular saw from 8 to 12 inches in diameter? What is the best method of tempering cast steel for common wood cutting tools?

10.—P. P. has often observed such birds as eagles, hawks, and turkey buzzards, and wishes to know how they can gyrate and ascend by a spiral course without any motion of their wings and tails. As a phenomenon utterly at variance with the laws of gravitation, P. P. thinks it deserves investigation.

11.—H. says: I have a great many horses with tender feet, having what I call corn on the inside of the heel of the fore feet. I have been trying many ways to cure it, and I wish to know if there is any certain remedy, and what is the cause.

12.—L. says: I have a house organ which troubles me by giving every pulsation of the bellows feeders when less than half the instrument is in use. The reservoir for wind is three feet six inches by three feet, rising twenty-two inches, with two feeders of the usual construction. Can any correspondent tell the cause or its remedy?

13.—W. H. says: Is there such a society as a co-operative grocery store in this country, from which we can get a copy of the constitution and bye laws? If so, where is it, and what is its name?

14.—S. W. P. asks: What system of phonography is most used by the reporters of the press at the present time? Which is the easiest to learn, and can phonography be well learned without a living teacher?

15.—A. S. G. says: I recently saw a receipt for liquid glue in the SCIENTIFIC AMERICAN, stating that nitric ether would dissolve glue. I have had some white glue soaking in this ether for nearly three weeks, and find no solution; the glue has become leathery, with no further change. Can you tell me anything practical about this

14.—A. K. asks: Are there any power looms for weaving sacking out of the Mexican "Istle," and machinery for transforming that fiber into the necessary thread, in existence? Istle is a very hard and cross grain fiber, about as stiff and thick as horse hair. The threads used for sacking are two cord and ⅛ inch diameter, making 3 to 4 meshes to the inch. The sacking is now all made by hand, and I would like to know if and where any simple machinery, to make such coarse fabric, is to be had.

Answers to Correspondents

G. S. T. says: My mouth is full of your praise! You are at the pinnacle of wisdom, and are ever ready to impart instruction to your subscribers. Please tell me (1) how I shall prepare a black board upon the wall of a room? I have read and racked my brain without success, and, without your help, I will abandon the task. 2. Which arrangement of a stove pipe is the better, a straight slanting or a perpendicular and then a horizontal one? Which would secure the best draft? Should the chimney be contracted at the top or a little enlarged, and should it be closed just below where the pipe enters it? 3. Am I right in believing that some glass is not a non-conductor of electricity? I find it impossible to construct a Leyden jar of the ordinary fruit jar or bottle green glass. 4. How long before the United States mail will remove my anxiety by bringing on my SCIENTIFIC AMERICAN of February 15? Answers: The editorial countenance is suffused with blushes as the compliments of our gushing correspondent become fully comprehended. 1. Send for the preparations of the dealers in silicate slate; or mix shellac varnish with any slightly gritty material and lay on rapidly with a brush. 2. The fewer the bends the better. Make the chimney straight. It does not pay to attempt a deviation from the uniform sectional area. 3. Some glass, especially that containing iron oxide or the oxide of lead in considerable quantities, it is stated by President Morton and other authorities, is sometimes quite a good conductor. A hard glass, without iron or lead in excess, is the best non-conducting glass. Good non-conductors, such as are used in insulating the best submarine wires and in insulators, are better than any glass. 4. "For ways that are dark and tricks that are vain" commend us to some of the agents of the Post Office department. Do not despair, however.

J. M. W. says: 1. Can you tell me the composition of printers' ink, both black and in colors; also the composition of inking rollers? 2. Can you tell me whether, in stuffing animals, the natural eyes are ever left in? Answers: 1. Printing ink is essentially a combination of lamp black and oil; the best is obtained from the smoke of naphtha and boiled linseed oil. The rollers are made of glue and molasses. 2. Apply to some reputable taxidermist. We have many enquiries of this nature, and our readers can probably find replies to them by watching our advertising columns.

G. W. K. asks for some idea of the first cost, and cost per day of the calcium light. Answer: About $50 first cost for apparatus, and 50 cents to $1 an hour to run it.

A. B. S. says: I have a dispute with a friend o mine with regard to a piece of rubber. My friend maintains that it is devulcanized, "that the mere trace of sulphur that it contains is not in chemical union with the rubber, that the quality of the rubber is not injured and that it is in a suitable condition for manufacturing purposes." I maintain that the rubber is not devulcanized or only slightly so, that its quality is injured, and that it is not in a condition to be worked into rubber fabrics. We refer the matter to you, and upon your decision rest three year's subscription to the SCIENTIFIC AMERICAN. Answer: To decide this question, an analysis would be necessary, and our time is too much occupied to allow us to do it.

E. R. S. asks: 1. By what means can ordinary writing ink be given that intense, shining gloss which some kinds have? I have a small ink well in one of the desks at school, made in the ordinary way of glass within zinc, in which after the ink has stood several days, it is found to have this gloss, I suppose the zinc must produce some chemical action in union with the acid in the ink. 2. Can you inform me in what way a letter should be addressed to the Emperor of Russia, and how it should be sent? Answers: A fine gloss is imparted to ink by the use of gum arabic solution. For copying, the following is a good recipe: Mix thirty grains of extract of logwood, seven grains of crystal soda, and half an ounce of water. Boil till dissolved; then, while stirring well, add thirty grains of glycerin, one grain bichromate of potash previously dissolved, and four grains of powdered gum arabic. 2. A letter sent by mail addressed to the Emperor of Russia, St. Petersburg, would reach its destination if prepaid.

J. M. asks how to treat oiled walnut wood to polish it without varnishing. Answer: The directions given on page 72 of our volume XXVI. will no doubt serve your purpose.

L. F. A. L., of Cal. The only metallic substances in the minerals you send are pyrites and oxide of iron. It is an old idea to propel vessels by means of endless belts of paddles. Placing floats around the edges of boats, filled with cork or inflated by air as you propose, is also very old.

W. H. W. asks: Will shrinking a cast steel tire of ordinary thickness on the circumference of a cast iron locomotive driver affect the central hole of the latter? Answer: We presume not. Ask the skillful railroad superintendent at the Marquette railroad repair shops to try it and send us results.

B. N. C. would like to know if there is a rule for cutting patterns, such as tin and sheet iron workers use. Answer: Study the "Sheet Metal Worker's Instructor," by Warn.

P. J. C. sends a mineral specimen found imbedded in limestone, and asks what it is. Answer: The mineral you send is iron pyrites.

J. J. C. comments on our reply to J. H., who asked how the outside wheel of a locomotive or car on a curve keeps pace with the inside wheel, on account of the distance to travel being greater, both wheels being fast on the axle. Our answer was: "With wheels of equal size, having cylindrical bearing surfaces, one or both must slip on the rail. The wheels of the cars on railroads are coned to avoid the difficulty, their diameter on the outer edge of their bearing or tread being less than that of the portion of the tread next the flange. In turning a curve the wheels ride toward the outer rail, and thus, to some extent, if not wholly, this tendency to slip is prevented." J. J. C. says: I claim that coning of the wheel is more of a damage than a benefit in rounding a curve, for this reason: The wheels, being in pairs of equal diameter, will roll the flange of the outer wheel hard against the outer rail and set so tight to the head of the rail that the wheel on the inner side, merely touching the top portion of the rail, will slip, being the easier of the two. Any one can demonstrate the fact by the experiment of taking one wheel of 30 inches and another of 29 inches diameter, and keying them on to an axle. Then move them forward on a level floor, and they will describe a circle; but take two pairs of such wheels and construct a car truck, the wheels being fastened as truck wheels are. Now push this truck forward over a smooth surface, and it will be found upon examination that the small wheels have slipped and the large ones have traveled in a straight line. This proposition will convince any mechanic that the coning of car wheels is a damage rather than a benefit to the safety of traveling on the rail. Answer: Our correspondent's experiments confirm fully our former statements.

C. C. says to J. D. W., who asked of what material a mold for casting a small engine cylinder should be made: I have a good cylinder that I cast in a mold made of pine wood. Take a block of the length you wish your cylinder to be, bore a hole through it, and put in a core. Cut through one side for your valve seat, make some small pieces of wood to the shape and size you want your ports to be and fasten them into each end of the core, and fix your exhaust to the bottom of the mold. Cover the ends and side and pour in your metal. I used block tin with a little zinc, mixed.

C. T. says, in answer to T. C. M. who asked for directions for gilding on marble, porcelain, etc.: I use, for sizing, equal parts of elastic copal varnish and fatty linseed oil slightly diluted with turpentine. The time required to produce the requisite "tack" is about 24 hours. Barbers' shaving mugs have been treated in this way with success; but, if the articles are such as require repeated washing and rough usage, it may be well to cover the gilded portions with a coat of good varnish.

S. L. D. replies to S. T. W., who asked how to transfer engravings on glass: First coat the glass with a varnish composed of balsam of fir diluted with turpentine, then press the engraving on smoothly and evenly, being careful to remove all air bubbles; let it stand for about 24 hours, then dampen the back sufficiently to allow the paper to be rubbed off by the forefinger, rubbing it till a mere film is left on the glass; then varnish again. When dry, it is preferable to put a yellow paper on the back of it, next the varnish, which adds greatly to the beauty of the picture.

H. A. B. says: I am taking the position of engineer in a steam saw mill, and there is a dispute, between myself and the man who is building the furnace, as to the proper place for the wall to strike the boiler (a tubular one); he contends that the wall should strike the boiler above the upper water gage; while I contend that it should strike the boiler a little below the lower water gage, as I think that it is dangerous to have the fire strike the boiler at any point above the water line. Answer: Our correspondent is right. No part of the steam space should be left exposed to the action of the hot gases and flame from the furnace until, at least, they are reduced in temperature, nearly to that of the steam itself and far below the temperature at which iron is perceptibly weaker than when cold.

C. M. S. asks: How can I calculate the effective heating surface of an upright cylindrical boiler, with horizontal water tubes arranged across the fire chamber? Answer: Determine it by measuring the total area of all surfaces exposed to the directly or indirectly communicated heat of the furnace gases, and proceed as directed in replies to earlier correspondents.

B. M. P., who asks for the best thing to remove scale from steam boilers, should read our advertising columns and especially the answers to correspondents. In the latter, directions for treating particular cases are constantly being published.

R. O. B. asks: How can I collect small particles of lead from dross and ashes cheaply? Oil answers very well, but it is too costly. Answer: Fuse the lead with some cyanide of potassium in a crucible.

F. H. asks: Can a valve which has sufficient lap to cut off at one half of the stroke be set so as to admit steam correctly when the crank is upon either center, and shut off the steam when the piston has traveled an equal distance from either end of the stroke? Answer: No. The obliquity of the connecting rod will prevent perfect equality of cut off.

J. F. B. says: Knowing that strange and singular freaks of steam engines are interesting to you, I will tell you of one in our place, that puzzled us for some time. The cylinder is 14 inches bore by 36 inches stroke, with a common slide valve, using steam the whole length of stroke, making 41 revolutions per minute. About two weeks ago, she commenced by making a strange crackling noise in the cylinder, increasing until it seemed as if she would break everything to pieces. Steam poured from every joint that, at other times, was tight, and she slowed down in speed until she scarcely moved. The fly wheel trembled as though about to fall in pieces. But the moment steam was shut off, if only for an instant, she would start up again all right, and the trouble would probably not occur again for one or two hours. At some times it would be more severe than others. Everything seemed to get loose during the difficulty, and all the keys would have to be set up after each occurrence. I took off the cylinder head, found the rings a little slack, and set them out; but the next day, she was as bad as ever. The two boilers are 42 inches in diameter and 26 feet long, having two 13 inch flues in in each. Can you tell me what the difficulty is? Answer: The difficulty arises from excessive priming, we presume and will probably knock out a cylinder head or do worse damage if the trouble is not remedied.

J. P. S. says: How many inches does the lawful bushel used in Pennsylvania in measuring coal contain? Answer: The standard United States bushel is that which contains 2150·4 cubic inches, when level full; when heaped up to standard hight, 6 inches, it contains about 2,700 cubic inches. Usually 28 bushels are reckoned to the tun.

N. L. T. asks: Why is it that the shadows cast by an object from two different lights, as those of the moon and of a candle, on a white surface are of different colors? The difference is most distinct when the object is placed on a line between the two lights. Answer: The colors of the lights being different, they together illuminate all of the white surface, not the shadow, with a tint which is compounded of both. The shadows are each illuminated by the light from only one of the two sources, and each therefore differs in tint from the general field, as well as from the other.

C. D. R. & Co., say: We have a 12x20 inch plain slide valve engine, cutting off at about ⅜ stroke and running at 80 revolutions. Would it be economy to speed up to 125 revolutions with the same valve? Answer: If more power is required than the engine can now develope, it would be proper to speed up as proposed. If the boilers are reliable at higher pressure, carry five pounds more steam to make up for friction of pipes and passages at the greater speed. Watch the crank pin and other journals. They may heat at a higher speed.

T. M. S. says: I would like to know how many pounds pressure it takes to burst the head of a barrel off. The head was of white oak, 1½ inches thick, and 1 foot 3 inches across. Answer: We have no means of determining the figures desired. We presume it would vary immensely with different kinds of barrels, and with different examples of similar make. Cannot some of our readers enlighten our correspondent?

J. F. W. asks if there is any way of distinguishing anthracite pig iron from charcoal pig iron? Answer: We do not know of any way to distinguish anthracite from charcoal pig iron, nor do we think it can be done by judging from the appearance of the pig metal. Mechanical tests of the product of the metal say that wrought iron will show greater softness for charcoal iron. Swedish bar iron is much softer than Low Moor and other high class irons made with mineral coal.

S. A. T. says: The manner in which a pantagraph is to be constructed is very plain (see page 99 of your current volume), but I do not know whether one (for ordinary use) should be 6 inches or 36 inches in length of longest stick. Can the stationary or pivoted end be fastened to the table with an awl or screw? Can the casters be dispenced with? What is the piece projecting to the left between C and F, from D, for? Why is it jointed differently at F than at E, D and B, and how is it jointed? Answer: Our own instruments are from 18 inches to 30 inches in total length. In a rough apparatus, an awl will answer to pivot the fixed joint. The casters are used to reduce friction, but may be dispensed with. The arrangement of joints is a matter of indifference. In making the copy, say, three quarters the size of the original, the stick B D is hinged near the end which, in the sketch, projects.

G. N. A. says: I wish to know how the red and blue lights such as are seen at theaters are produced. I want to light a large room without incurring any danger. Answer: It is always better to apply to a pyrotechnist for colored lights, as there is danger in preparing and keeping them, and it would cost less to buy than to attempt to make them.

W. K. asks: Which is the best acid or combination of acids that will entirely destroy the fiber of paper? Answer: The best solvent for paper fiber is cupro-ammonium, known as Schweitzer's reagent.

W. R. J. says: The powder I enclose is the remains of an evaporated gallon of well water. Supposing it to be lime I applied the test for that substance, with no indications. The same kind of water is used in a boiler here and causes some trouble by the deposit. 2. Can a bubble or ball similar to a soap bubble be made of any substance (except glass) that will allow handling? It must be transparent. Could a solution of gelatin be made to serve the purpose by the addition of any material? Answers: The enclosed powder was chiefly composed of carbonate of lime and a little organic matter. The water is evidently impregnated with lime. 2. Soap bubbles of considerable size and strength can be made by mixing glycerin in soap and testing from time to time until the proper proportions are obtained.

J. J. R. asks: Do pure wood ashes contain mineral matter? Answer: It was the opinion of the ancients that the potash of plants was produced from the air during combustion, but as soon as this alkali was discovered in rocks, it was readily traced to plants and shown to be a necessary constituent of all vegetables. It makes no difference how pure wood ashes may be; they necessarily contain mineral matter, chiefly composed of carbonate of potash.

W. H. F. says: 1. I would like to know if there is any way that I can use to get the grime and dirt off of my hands. I am a machinist and I find it very difficult to get my hands clean. 2. I am very desirous of learning to draw, and I would like to know if I can learn without a teacher, and what books you would advise me to get. Answers: 1. Use plenty of soap and elbow grease to clean yourself. 2. With dividers, rule and pencil, practice copying the best engravings in the SCIENTIFIC AMERICAN. You will learn to draw in this way, if you persevere.

S. R. asks: What proportion should there be between the steam port area of a steam engine, and the area of the piston? Also, what should be the relation between the steam pipe and the cylinder? Can poppet valve engines be run at as high a speed as slide valve engines? Answer: Steam ports are made, in good practice, of from one sixteenth to one tenth the area of piston, according to speed. At very high speeds, poppet valves may not seat themselves promptly, and hence a limit of speed is sooner reached than with slide valve engines.

A. B. says: A mercurial siphon gage has one leg twenty times the area of the other; what will be the rise of mercury in the smaller leg per pound pressure? Please give rule. Also a rule to work out the power required to raise a given weight by differential blocks. Answer: The difference of level must be, approximately, two inches per pound. The mercury rising in the smaller leg must be supplied from the larger. This quantity will occupy one twentieth the hight, in the larger leg, that it fills in the smaller. Hence the sum obtained by adding the rise in the smaller leg above the original level to one twentieth the same distance is equal to two inches, and the actual rise in smaller leg will therefore be $\frac{2}{21}$ of two inches = $1\frac{1}{21}$ inches. The exact figure will be $\frac{2}{21} \times 2.035 = 1.938$. The handiest way to determine the relation of the force exerted to the resistance overcome, in any combination of mechanical powers, is to measure the distances moved by each. For example: If the weight is raised 3 inches, while the fall of the tackle is overhauled a distance of 4 feet, the ratio is as 1 to 16, friction not being considered.

H. P. says: Take a fly wheel ten feet in diameter, with a hollow rim 12 inches depth and 2 feet face (the shell being ½ inch thick), and fill the hollow in the rim half full of water. Will the wheel and water weigh more, or less, when it is in motion and the speed great enough to keep the water next to the face, or when it is standing still? Answer: It will make no difference.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Metal Palladium. By G. J. R.

On the Influence of the Moon on the Tides. By W. S.

On the Formation of the Tides. By S. S. G.

On Steam Engine Economy. By C. H. C.

On the Dredging Machines Used at the Bar of the Mississippi River. By E. B. B.

On Certain Mechanical Enterprises in Newark, N. J. By C. B.

On the Passage of the Sun from one Date to Another. By H. B.

On Lost Arts. By O.

On Perpetual Motion. By W. D. A.

On a Substitute for the Crank and on a Self Operating Water Wheel. By J. B. S.

On Positive and Negative Forces. By E.

On the High Prices of Certain Productions. By J. C. C.

On the Sidereal Day. By J. H.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 4, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,928.—WERRING.—J. C. Cooke. April 9, 1873.

23,866.—CULTIVATOR.—M. Alden. April 30, 1873.

23,893.—KATE FASTENING.—E. Behr. April 23, 1873.

23,921.—HARVESTING MACHINE.—M. G. Hubbard. April 23, 1873.

23,924.—MAIL BAG.—T. J. Lamdin. April 23, 1873.

23,950.—CLOCK DIAL.—S. E. Root. April 23, 1873.

23,960.—LATHE.—C. & A. Spring. April 23, 1873.

23,963.—COOK STOVE.—H. G. Leonard. April 23, 1873.

24,051.—PIN STICKING.—J. W. Naramore. June 18, 1873.

EXTENSIONS GRANTED.

22,901.—ELASTIC TOY.—L. P. Porter.

22,906.—MOP HEAD.—L. Taylor.

22,947.—WRENCH.—D. P. Foster.

DESIGNS PATENTED.

6,378.—CARD RECEIVER.—G. Gill, Taunton, Mass.

6,379 & 6,380.—CAKE BASKETS.—G. Gill, Taunton, Mass.

6,381.—CENTER PIECE.—S. Kellett, San Francisco, Cal

6,382.—URN.—P. P. Meyer, New York city.

6,383.—BEER MUG.—J. Oesterling, Wheeling, W. Va.

6,384.—VASE.—W. H. Wilkinson, New York city.

TRADE MARKS REGISTERED.

1,115.—HAMS, ETC.—Evans Brothers, Cincinnati, Ohio.

1,116.—BEARING METAL.—I X L Metal Co., St. Louis, Mo.

1,117 & 1,118.—GALVANIZED IRON.—McCullough Iron Co., Philadelphia, Pa.

1,119.—BOOTS, ETC.—C. Merritt, South Weymouth, Mass

1,150 to 1,152.—GINS.—F. E. Suire & Co., Cincinnati, Ohio

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CANADIAN PATENTS.

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Patents taken by citizens of the United States are marked U. S.

[NOTE.—Under the new patent law, now in vogue, American citizens may patent their inventions in Canada on favorable terms. For full particulars, address Munn & Co., Office SCIENTIFIC AMERICAN, 37 Park Row, N. Y.]

Shoe pegging machine, H. Kuhlman, Ger., Dec. 13	1,900
Steam engine, C. Levey, U. S., Dec. 19	1,901
Wood for paper, L. Smith, Dec. 18	1,902
Hose valve, E. A. Day, U. S., Dec. 18	1,903
Nail machine, N. W. Goderich, U. S., Dec. 18	1,904
Needle machine, F. W. Mallett, U. S., Dec. 18	1,905
Stool, A. A. Murphy, Dec. 18	1,906
Hot air drum, G. Bolton, Dec. 18	1,907
Washing machine, G. R. Willett, N. S. Dec. 18	1,908
Wood pulp, R. Harrison, U. S., Dec. 18	1,909
Slip keel, etc., J. Dean, U. S., Dec. 18	1,910
Track cleaner, A. Day, U. S., Dec. 18	1,911
Washing machine, G. Moorehouse, Dec. 19	1,912
Water meter, D. B. Spooner, U. S., Dec. 18	1,913
Washing machine, G. Schatz et al., U. S., Dec. 18	1,914
Propelling sleighs, W. Nevers, U. S., Dec. 23	1,915
Bench, R. Blain, Dec. 23	1,916
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Boot, etc., G. Goodyear, U. S., Dec. 23	1,918
Steam packing, G. Gwynn, U. S., Dec. 23	1,919
Cigar machine, J. W. Innis, U. S., Dec. 23	1,920
Cutting soles, S. J. Shaw, U. S., Dec. 23	1,922
Shuttle spool, T. H. Dodge, U. S., Dec. 23	1,925
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Churn, M. Fiske, U. S., Dec. 30	1,927
Coffin, S. Stein, U. S., Dec. 30	1,928
Fitting gores, J. Walden, U. S., Dec. 30	1,929
Biscuit machine, J. Turner & S. Turner, Dec. 30	1,930
Desk, J. K. Otis, U. S., Dec. 30	1,931
Kettle, F. P. L. Jones, N. S., Dec. 30	1,932
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Sewing machine, etc., G. Young, Dec. 30	1,935
Riveting soles, H. H. Bigelow, U. S., Dec. 30	1,936
Wheel, S. Vreeland, U. S., Dec. 30	1,937
Spool, etc., J. F. C. Rider, U. S., Dec. 30	1,938
Furnace, W. J. Keep, U. S., Dec. 30	1,939
Cook stove, etc., W. J. Keep, U. S., Dec. 30	1,940
Cleaning grain, A. Hunter, E. H. Osborne, U. S., Jan. 3	1,941
Baling press, W. R. King, U. S. Jan. 3	1,942
Preserving meat, J. K. Collett, Eng., Jan. 3	1,943
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Turning, J. Fensom, Jan. 3	1,945
Nail machine, D. Turbayne, G. M. Wyman, U. S., Jan. 3	1,946
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Boot stretcher, J. Lyons, Jan. 9	1,954
Heater and filter, J. Armstrong, U. S., Jan. 9	1,955
Removing hay, J. C. Cramer, Jan. 9	1,956
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Braider, etc., P. L. Sheepler, F. M. Heath, U. S., Jan. 9	1,958
Shuttle, J. H. Osborne, Jan. 9	1,959
Soap, J. Burke, U. S., Jan. 8	1,960
Slide valve, H. Fairgrieve, Jan. 10	1,961
Steam engine, L. Perkins, Eng., Jan. 10	1,962
Pipe elbow, C. Bolton, Jan. 10	1,963
Car coupler, etc., W. P. Scott, Jan. 10	1,964
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Car coupling, H. Ellender, Jan. 10	1,966
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Stand, R. M. Wanser, Jan. 20	1,968
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Lubricator, E. McCoy, U. S., Jan. 10	1,971
Iron and steel, C. M. Nes, U. S., Jan. 14	1,972
Line fastener, O. Benoit, Jan. 14	1,973
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Saw, M. Jincks, U. S., Jan. 14	1,975
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Washing machine, S. Deveau, S. E. Perkins, Jan. 14	1,979
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Tar burner, J. Burns, Jan. 16	1,986
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Lubricator, J. S. Eggleston, U. S., Jan. 16	1,988
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Animal poke, E. F. Benedict, U. S.	1,990
Boot, W. W. Whitcomb, U. S., Jan. 16	1,991
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More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office; men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office; enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*.

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should besecurely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row New York.

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A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

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Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

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On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with MUNN & Co., 37 Park Row, New York, who will give prompt attention to the business and furnish full instruction.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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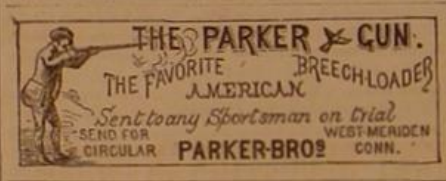

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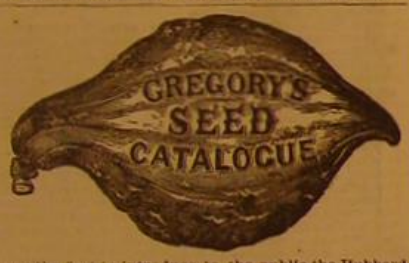

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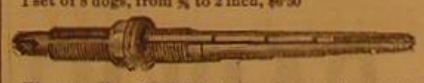

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVIII.—No. 11. [NEW SERIES.] NEW YORK, MARCH 15, 1873. [$3 per Annum, IN ADVANCE.

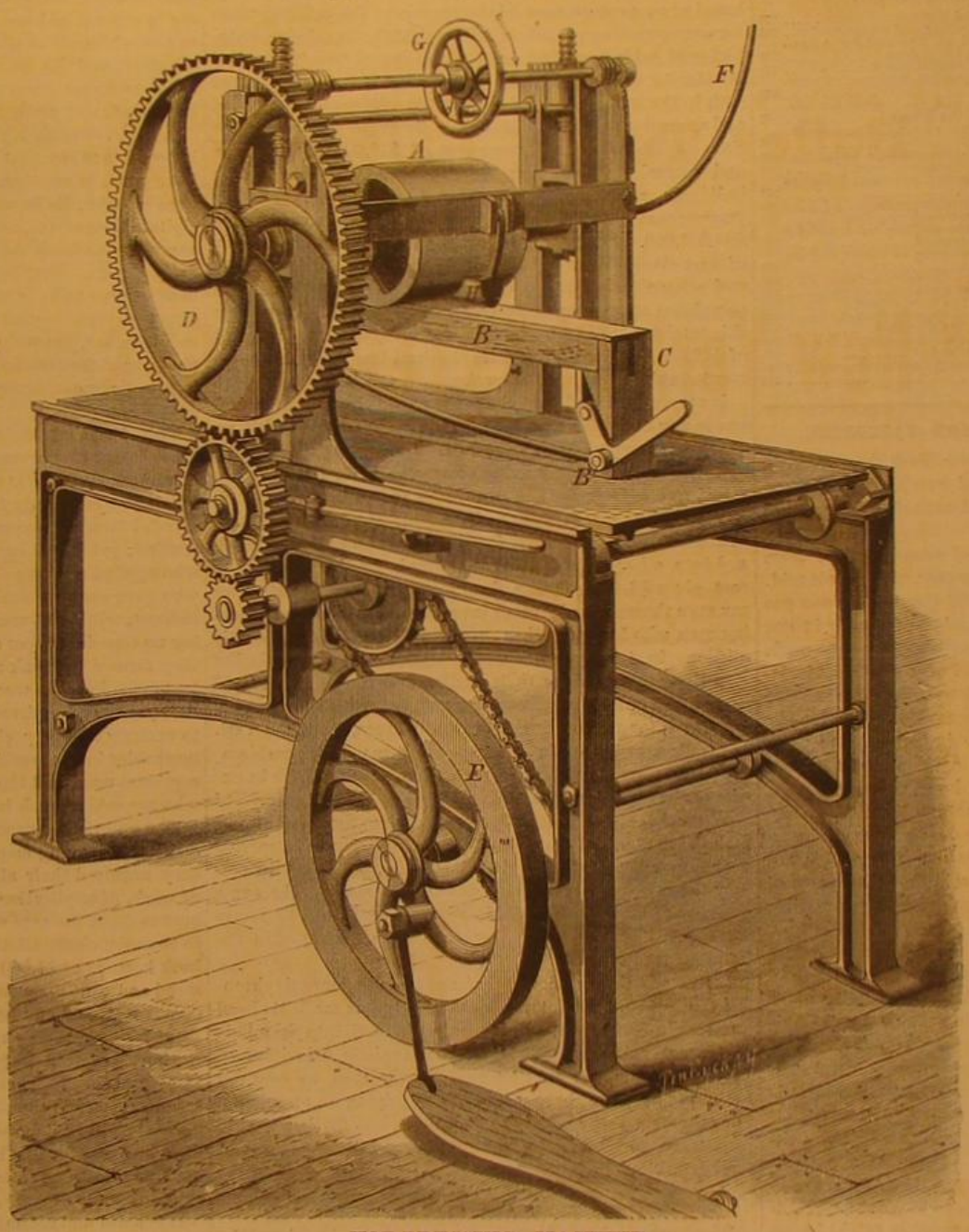
IMPROVED HOT-PRESSING MACHINE.

We illustrate herewith a new device designed for the quicker and better pressing of seams of cloth garments, and also for use in laundries for ironing purposes. It affords a means of working with a regular and continuous heat which cannot be obtained by ordinary hand pressing.

In our engraving, A is a metal cylinder which is heated by means of a perforated gas tube inside, the gas being supplied through the pipe, F. B is the sleeve board, which fits on a rest, C, which is fitted on the rolling table. The sleeve board may be raised or lowered by actuating the lever and connecting rod, B'. By rotating the hand wheel, G, in the direction of the arrow, the cylinder, A, is lowered and the pressure applied. The garment is placed in suitable position on the sleeve board; motion is then imparted to the wheel, E, by the treadle, and is communicated to the gearing, D. By this means the cylinder, A, is revolved, and simultaneously the table and sleeve board are carried along by the same gearing at the same speed. As the seam comes under the cylinder it is opened by the seam opener, H. The seam only is thus pressed, and it is simply necessary to raise the lever, B', to release both garment and sleeve board without interfering with or altering the position of the cylinder.

For pressing the seams of cuffs or other circular work, a small roller is used which takes the place of the sleeve board, and is quickly attached under the ironing roller. For kinds of work broader than sleeves or trowser legs, a lapelle board replaces the sleeve board; and as these boards merely drop into slots in the brackets on the rolling table, they are easily and quickly removed and exchanged.

The advantages claimed for the machine are that it will do the work of six competent pressers, or even of double that number if a man be stationed at its either end, passing garments through both ways. It is also stated to effect a great saving of time, to render the seams better pressed, and to obviate all danger of the accidental burning of clothes by too hot irons. The heat is uniform and safe. It is believed that the economy of fuel and time, caused by using this invention, will save its cost in a short time.



HOT-PRESSING MACHINE

The Vienna Exposition.

As at the Paris Exhibition of 1867, so at that of Vienna, the Sultan of Turkey and the Khedive of Egypt are likely to shine above all others. The former will present a complete Turkish dwelling house, with harem and selamlik. It is finished outside, and is a close imitation of one of those thousands of gaily painted wooden structures which you see along the Bosphorus. Close by you see some dozen Greeks and Bulgarians at work running up the lath and plaster structure, which will be a bazaar and coffee house. This speedy and original mode of building created quite a sensation at first among the workpeople, especially the Italians, who, quick at learning, soon appropriated some of the tricks of the Turkish Exhibition builders. The real show buildings of the Turkish Exhibition will, however, be a close copy of the famous fountain of the Sultan Ahmed, standing between St. Sophia and the entrance gate of the old Seraglio, and the building in which the so much talked of Turkish Imperial treasure of jewels will be exhibited.

As for the Khedive, his buildings will cover a space of not less than 5,500 square meters, nearly half an acre, and present illustrations of all Egyptian styles of building from the Pharaohs downward. There will be an imitation of the tombs of Beni Hassan. Then there is to be a dwelling house in the best Arabian style of the caliphs, the shell of which is already finished, and which even in its unfinished state presents by far the best proportioned building in the whole place, only it is in proximity with a mosque on one side and a gallery leading to a tall minaret of 250 feet on the other, which rather spoils the effect of the central building. The minaret imitations, which are of the best models, are, indeed, graceful additions; but the mosque is a decided failure. Behind this group is to be a complete Egyptian farm, with the classic water wheel, the pigeon cot, and the ovens for hatching eggs.

If anything, private energy and industry outside the Exhibition almost surpasses that displayed inside. To the north of the ground extends the People's Park, while to the west of it, along the main avenue of the Prater, extends that of the "Upper." All those hundreds of booths, gardens, inns and show places of the former have been transformed as if by magic. Most of them have been entirely rebuilt on a more pretentious scale, while the rest have been so renovated that you can scarcely recognize the old, homely, but rather dingy places. The grandest effect is, however, that of the fashionable *café*, No. 3, the last alongside the main avenue. A hall is in process of construction to contain 5,000 people. There are to be two rows of boxes, a theater, orchestra, etc.,—in one word, a place fit for any universal or theatrical exhibition. It will require all those millions of visitors on the presence of whom the Chief Commissioner reckons to pay for all these outlays; but, if they do come, they will have no reason to say that great preparations have not been made to receive them.

At a meeting of the stock-holders of the Williamstown cheese factory, a dividend of 10 per cent was declared. The report showed a net production of 78,000 pounds for the year. The cheese manufactured at this establishment commands as high a price as any made in the country. Nearly half the amount produced was exported.

Practical experience shows that paper mills may be run by steam power with more certainty and economy than by water power. The exhaust steam from the engines may be used to heat dryers and calendering rolls

A New and Useful Photo Improvement.

A new method of enlarging photo negatives, by which any photographer, without the use of solar camera or other apparatus, may successfully produce large prints from small original negatives, is thus described in the *British Journal of Photography*. Collodio-bromide collodion, that is, a collodion emulsion containing nitrate of silver, is employed, formulas for which have been several times given in the Scientific American. The method is as follows:

Let an enlarged transparency be taken on a collodio-bromide plate by means of any of the copying cameras, magic lanterns, or other methods of producing enlarged images, now so well known to photographers. Then develope the image by alkaline pyro., taking care, of course, not to use any silver. Continue the development until every detail is well out, then wash the surface and pour over it some slightly diluted nitric acid. Presto! the transparency instantly becomes a negative, which, after being slightly intensified and varnished, may be used for the production of pictures on either carbon paper or albumenized silver paper. This is the whole process, and we shall now make one or two comments upon it.

First of all, no large silver bath is required. This is a somewhat serious matter when only one or two pictures are required of the dimensions of perhaps 25 by 20 inches. All that is necessary is to coat the plate with emulsified collodion, which can now be so made that it will keep, and be always ready for use, for a lengthened period of time. This done, the plate is then immersed in a dish of water, the dish being composed of wood, gutta percha, porcelain, varnished pasteboard, or even japanned iron. When the water flows evenly over the surface, the plate is then to be lifted up and placed upon its support in the darkened room, or in its frame if a large camera be used. The image, having been previously focussed upon another plate, is now allowed to fall upon the sensitive film for a few seconds, or even minutes if the light be bad; at any rate, for such an exposure as would be given to an ordinary bromo-iodized collodion film sensitized in a silver bath and exposed while wet. The light is then stopped, the plate levelled, and pyrogallic acid, without any silver but rendered slightly alkaline by a drop or two of solution of ammonia, is applied. The image now appears, and in the very nature of things there can be no stains in the shadow. If preferred, a flat bath can be used for developing in, for the same developing solution can be used over and over again.

The nitric acid, too, can be applied by means of a bath if it be desirable, and its function shall have been adequately performed when the high lights, previously a dense deposit, are seen to consist of clear glass, which will most assuredly be the result of the treatment with acid. Observe that the acid must not be thrown away, for the longer it is used for this purpose the more valuable it becomes, because every tyro in chemistry knows it becomes richer in silver with every plate immersed, until at length it becomes quite saturated with nitrate of silver, which may be utilized for other purposes, or may be reduced into metallic silver.

The enlarged negative, still too feeble for printing from, is next washed and held in the light for a few seconds. It is then returned to the developing tray and is immersed in the same alkaline pyrogallic solution by which it was first developed, when the whole of the bromide left in the film will be reduced, forming a negative as dense as may be desired; or, should sufficient density not be obtained, the application of acid pyro. and silver will give absolute opacity. No fixing beyond a wash in water will be required.

The negative can be made direct or reversed at the will of the operator, this being determined by the side of the original negative that was placed next to the enlarging lens.

Scientific American.

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NEW YORK, SATURDAY, MARCH 15, 1873.

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POISONOUS AIR IN SCHOOLS AND FACTORIES.

The City Sanitary Inspector of New York has recently published a report relative to the bad ventilating arrangements of numerous public schools and manufactories within the corporate limits.

We find it stated that the analysis of samples of air from two factories gave 0·14 to 0·16 of 1 per cent of carbonic acid. In the public schools, the quantity of the deleterious gas varied from 0·09 to 0·35. An examination of the air in one of the class rooms provided with a ventilating flue was made while a window was open, yielding 0·17 of 1 per cent of carbonic acid. The window was then closed, and after a lapse of ten minutes the proportion had increased to 0·32. The trial then became so oppressive to the inmates of the room that it was discontinued, though the opinion is given that, had the experiment continued for an hour, no less than 1·1 per cent of carbonic acid would have accumulated. The magnitude of the above percentage of the deadly gas may be estimated from the fact that Dr. Parkes and other high authorities consider 6 parts of carbonic acid in 10,000 parts of air, or 0·06 of 1 per cent, should be the greatest permissible impurity.

Although the above details indicate the deleterious nature of the atmosphere of a crowded and ill ventilated school room to no small extent, they exhibit but a portion of its noxious properties. Not only is the air vitiated by carbonic acid, but by effete organic matter, to which is due the close smell of such apartments. The Inspector, it seems to us, omits an important portion of his investigation when he fails to state the percentage of oxygen, as shown in the samples of impure air which were subjected to his analyses. Graham and Liebig show that the mean amount of oxygen in the atmosphere is 20·9 volumes per cent. Dr. Angus Smith considers that air containing a less percentage than 20·7 is very unwholesome, but adds that the average might be reduced far below that found in circumstances of daily life without occasioning great discomfort, thus proving the seductive and insidious nature of exhaled air. The same authority in the course of experiment noticed nothing more than a slight feeling of closeness when the percentage of oxygen was diminished to 17·45. The small proportionate quantities of carbonic acid are less easily determined than the larger variations in the amount of oxygen, while the absence of the latter is fully as deleterious to health as the presence of the former. Experiment has further shown that an atmosphere containing 18·8 per cent of oxygen and 2·28 per cent of carbonic acid will fail to support the combustion of a candle flame, and yet may be breathed without great discomfort. According to the instance cited above, a room full of people found air, that contained not one half the proportionate amount of carbonic acid just given, very oppressive. It is evident that the closeness of the atmosphere was not due to the excess of carbonic acid to nearly so great an extent as to the deficiency in oxygen; and to the accurate determination of this deficiency, attention should have been especially directed.

The subject of proper ventilation has been so thoroughly discussed of late that it would be useless repetition to again urge its importance. Workmen in badly ventilated factories should take the matter in their own hands and decline to labor in buildings where no means are provided for changing the foul and noxious air, while parents would act wisely in removing their children from the schools specified in the Inspector's report, until they are satisfied that proper sanitary precautions are taken.

PRACTICAL RESULTS OF THE EIGHT HOUR PLAN IN NEW YORK.

The evil results of the eight hour movement of last summer, which for nearly eleven weeks paralyzed the industries of this city, have during the present winter been severely felt. The exhibit of our Commissioners of Charities and Corrections shows that the number of industrious and unemployed poor craving the benefit of public charities has been unusually large, while such statistics as have been gathered indicate serious losses both to employers and workmen in many branches of trade.

It will be remembered that among the builders the strike first began, and that although a certain proportion of the employers having unfulfilled contracts on hand were coerced into acquiescence with the demands of their operatives, many preferred to incur the penalties of their agreements rather than yield; while others succeeded in temporizing with their hands until after the failure of the movement was assured. It is probable therefore that this trade, being the first affected, suffered with even greater severity, and indeed bore a larger share of the loss, than any other industry involved in the unfortunate struggle. This view we think may be safely based upon a comparison of the records of the building trade for corresponding periods in 1871 and 1872, the tabulated statistics of which we find in a pamphlet signed "Practical Builder" recently received. From May 27th to November 30th in the first mentioned year, 1,333 edifices were erected and alterations made in 310 more. Of these 528 were first class structures of an average cost of $18,000: 53, factories and workshops averaging $8,000, and 33, hotels, public buildings, and churches averaging $200,000 each. The aggregate sum invested in all for the twenty-seven weeks was $25,672,000. Comparing this with the same months in 1872: of first class edifices but 107, of factories 29, hotels etc., 16 and altogether but 707 buildings and 287 alterations were completed at an aggregate cost of $12,821,000. Deducting this total for 1872 from the total for 1871, we have a result of $12,851,000, which indicates the dead loss to city improvements in the twenty-seven weeks.

It cannot be urged that the year would have been a dull one in any event for the trade, as the spring opened with an excellent prospect for a busy fall. During September (the principal month for making contracts), 1871, 108 first class structures were begun: in the same period in 1872, but 9, one twelfth as many, were undertaken. Here then is nearly thirteen millions of dollars forced out of the building trade and into other channels. Estimating labor at one half the cost gives $6,425,000, as a dead loss, not to capitalists who can save themselves by other investments, but to the working men who have no other support. Almost six and a half millions in twenty-seven weeks—$39,663 per day—is the sum these men paid for their strike, and if we should add thereto the outside expenses incurred, of which the money borrowed, for support during its continuance, from the various trade associations in other cities, forms no inconsiderable portion, we should doubtless arrive at a total far in excess of the largest estimates.

We find it stated that at the present time there is but one fifth the amount, of first class work in this city to be carried over into spring, of that done last year, and that to employ the same number of men and they to average the same quantity of labor as they did in 1872, there is not 4½ hours work per day this season, for each man employed in the building trade.

Let us add that we notice that recent daily journals chronicle the fact that the International Society has made its head quarters in New York, and is seeking to instil into the minds of our workmen the baleful and communistic principles of its organization. It may be well for the men to consider such facts as those above stated before joining an association the only object of which is to lead them into further strife, productive of no results, save misery to themselves and their families.

FOUL AIR SIGNAL.

We abound in inventions to warn us of fire and to alarm the household of the approach of a burgler; but there is an insidious foe who enters everywhere, in every apartment of private houses, and riots unmolested in all public places, of whose presence we are not warned in time to make good our escape. We refer to bad air. It is perfectly notorious that no public or private buildings are adequately supplied with ventilation, and the consequences are more injurious than we are apt to believe. In default of suitable ventilation, it would be well to have some kind of a signal to warn us of the danger, or a contrivance to automatically open a door or window. The presence of fire damp in mines is made known by the explosion of the small volume of air in the Davy safety lamp. When this explosion takes place in the narrow compass of the wire gauze, the miner knows that it is better to retreat until the dangerous gas can be blown out. Unfortunately the gases of close rooms are not of this explosive character; if they were, we should not suffer so much from bad ventilation as we now do, as no one would run the risk of being blown up for the pleasure of being suffocated. The gas which leaks through stoves and furnaces and arises from imperfect combustion, known as carbonic oxide, can be absorbed in a way to betray its presence by the following ingenious invention: The apparatus consists of a small galvanic battery with a bell attached, and an open test tube containing liquid chloride of palladium. The chloride of palladium is extremely sensitive to the presence of carbonic oxide gas; it absorbs the gas and precipitates metallic palladium; the deposition of the metal in the bottom of the tube makes the connection of the galvanic current and at once rings the bell which will not stop until the current is broken. The invention is found to work admirably for carbonic oxide gas, and the next thing is to devise a plan for disclosing the presence of carbonic acid gas. It is possible that this could be done by putting in a carefully counterpoised balance some caustic baryta or lime which, by the absorption of the carbonic acid of the air, would sink and cause the current to be closed in a battery and the bell to be rung. The same contrivance could be made to open and close a shutter just as the draft of a stove is regulated by the rise of mercury in a thermometer connected with a battery. It would be a novel experience on any public occasion to have the proceedings interrupted by the ringing of bells until equilibrium was restored by proper ventilation. We should all take kindly to the interruption and be thankful for a whiff of pure air. Let us by all means have a palladium ventilating company organized, for the benefit of gasping humanity.

INVERTEBRATE MEN.

When a young man, more than ordinarily useless to himself and friends, had no other occupation, he used to sit down and write a letter to Horace Greeley, pretending that he wanted work, would do anything to get it, and that, if society in general had not turned against him, he would be able to prove himself capable of great things. To beg he was ashamed, and dig he could not, because it made his back ache; so he sat down and emptied all his woes on Mr. Greeley's head, and really felt that he had achieved some distinction if Mr. Greeley replied and told him to go out West. It is needless to say that he never went, although he should have gone, in common with thousands of his congeners who herd in cities, lie in wait for the hapless advertiser, and precipitate themselves, not as individuals but as a horde, upon any one who dares seek assistance in the columns of the daily papers. For, be it known, the young man of the period is as useless as he is ubiquitous. He cannot longer stand on street corners, for that is against the statute, but he can live on his father, his widowed mother, possibly even his school-teaching sisters, pretending the while that he is always seeking employment, always laboring in the vineyard in one form or another.

This jeremiad against a useless class of non-producers is brought out by the result of three or four months advertising at various periods for a young man to fill a certain post requiring an ordinarily facile pen, a knowledge of simple commercial forms of expression, and familiarity with business routine; yet it will hardly be credited that, out of hundreds who applied and were examined, scarcely ten could be found who gave even a promise of succeeding. Vague, uncertain, indirect, willing to work for anything and at anything, having no especial fitness or adaptation for any particular line, they formed the rank and file of the noble army of incompetents who hew the wood and draw the water for their betters. And yet the advertisement in question was specially worded to exclude this very class! Knowing that there were ten incapables in the world for one expert, it called for an exceptional man, and the very class who rushed in were those who are said to rush in where angels fear to tread.

The question presents itself to every thinking man: Where do all these young men come from? In what school have they acquired their aimless, uncertain, vague ideas of duty, of work, of application, of achievement? What do they expect to do in the race of life before them? Do they mean to be entry clerks all their life long? Do they mean to be book keepers at $1,000 or $2,000 a year forever? Will they stand and wait upon the ringing of a bell, and answer some great man's nod and beck? Will they, pending an engagement for even their superfluous ability, continue to wring the hearts of aged parents, hardworking sisters and relatives as poor as they? These are questions hard to answer, but safe to answer in the affirmative. The riddle, never solved, "What shall be done with them" is a serious one. If Satan finds business for idle hands in this city, he must do a thriving trade, judging from the applications received for a clerkship.

It is a sad and solemn question, not to be lightly dismissed on a moment's reflection, a question reaching further than mere technical or professional education. Schools may abound in the land and colleges shoulder each other in a line across the continent; but the aimless, uncertain, purposeless man will still exist unless, from his youth up, his parents exhort him to stand on his own feet, to rely on his own arm, to think for himself, to follow some one line and make himself perfect therein. Then shall a sturdier manhood be apparent, a nobler race spring up; and if one seeks assistance and casts forth his drag net, he shall find it filled with applications that give some evidence on the face of them of the writer's ability to perform his undertakings. It matters little whether a man be a hewer of wood or a drawer of water; there must be such; but it matters greatly whether a man be competent or not for the line he assumes.

THE KNOWLEDGE OF THE TRUTH.

The ancients had no knowledge of the sciences which at present form the domain of the most important and influential of all human pursuits, namely, the investigation of Nature, the explanation of its phenomena, and the application of the wisdom thus obtained for educational training and practical useful purposes. Their philosophical systems were only imaginary cosmologies, basedon a few hypothetical principles. The great philosophers, often so boastfully referred to by those whose knowledge is exclusively confined to the philological branches: Thales, Pythagoras, Democritus, etc.: produced only speculations concerning Nature; and, notwithstanding that they sometimes hit the truth, their ideas were largely mixed up with metaphysical notions, and they only occasionally brought forward conclusions, and these were based

on ill observed natural phenomena. Even Aristotle, without doubt the first physicist and philosopher of antiquity, is himself the best proof that the ancients did not know anything worth mentioning about the physical sciences. As a specimen of the ideas of the most advanced minds of Roman antiquity, we will give here a literal translation of a passage from T. Lucretius Carus, a very esteemed Latin author who flourished about the year 50 B. C. The writer, in his celebrated work, *De Rerum Natura* (on the Nature of Things), thus speaks:

"The elements, out of which our earth is composed, have, after the first chaotic confusion, flown together, and, by reason of their own weight, occupied the lowest space; the more those heavier matters were condensed, the more they squeezed out the thinner lighter ones, which then composed the sea, the stars, the sun and moon, and the limits of the universe. Because all these objects are composed out of much smoother, rounder, and smaller seeds than the earth: for this reason the heavenly vault has first gone up, carrying with it many luminous little flames burst through crevices out of the component elements of the earth, nearly in the same manner as happens when, in the early morning, we see the golden sunbeams radiating on the leaves covered with fresh dew which has been evaporated from rivers and swamps as fog and vapor; we see then sometimes even smoke ascending from the earth," etc. A little further on we read as follows: "After the heaven had obtained its shape, the elements of sun and moon succeeded, which neither heaven nor earth could appropriate, as they were not heavy enough to take the lowest place, nor light enough to occupy the highest, and to assist in the formation of the highest regions. The sun and moon are thus placed between heaven and earth, moving themselves as if they were living bodies, constituting the principal parts of the whole world, in the same way as some parts of our bodies may remain motionless, while other members can move themselves," etc.

These are only samples of the rest, which is not in the least better; and incredible as it seems, it is a fact that the literary savants of civilized Europe, of only one century ago, called this very book of Lucretius Carus "an elegant explanation of natural philosophy, based on intelligent and easily understood principles." Out of respect for the ancients, we would rather be inclined to accept the theory of Hardouin, who attempts to prove, by critical considerations, that this and other works attributed to old Roman authors are the product of some monks of the 13th century. He only makes an exception in regard to Cicero and a few others, concerning the authenticity of which nobody can have any doubt.

Notwithstanding that there has been a great deal of ingenuity wasted in trying to prove that the world is retrograding, and that there are such things as "the lost arts" of the ancients, and notwithstanding that we justly confess our admiration for many products of antiquity, as well of the mental as of the material kind, it cannot be denied, if we are not wilfully blind to the progress of our times, that the ancients knew scarcely anything practically useful at all. To what did their knowledge of acoustics and music amount? What did they know of electricity and magnetism? They even ignored the existence and weight of the atmosphere; and of the nature of light and heat, they could not form the remotest conception. Even the Greeks, who left us such precious models of eloquence, poetry, sculpture, and architecture, were, in regard to the clear conception of natural phenomena, not further advanced than our American Indian savages. As soon as observation was substituted for mere speculation, progress began; in other words, as soon as man commenced to abandon his bad habit of indulging in the full scope of his own imagination, and in place thereof acknowledged Nature as a teacher, he commenced to learn something.

The whole human race of the period of antiquity had the defect which may still daily be noticed in certain individuals, old as well as young, who have not yet attained the docility of mind necessary to absorb knowledge from without. Such persons, instead of listening to what others may communicate to them, have the bad habit of hindering their instructors with accounts of their own suppositions and theories, which are often utterly absurd. Who has not met persons who love to hear themselves talk? These people have the very worst prospect in regard to their further mental progress, and are the very opposite of the far superior class who are able to listen patiently to what others have to say, and to gather knowledge from exterior sources, in place of from within, from their own conceited imaginations, which as experience should have taught them, over and over again, are utterly worthless.

It is especially the investigator of Nature's secrets who must train himself to mind with docility her teachings, who must patiently and carefully watch all the phenomena, during an observation or an experiment, and especially foster no previously conceived theories; but, above all things, he must value the greatest boon which man can ever possibly attain: The Knowledge of the Truth.

COLBURN'S THEORY AND THE BOILER EXPLOSION AT PITTSBURGH.

One of our Pittsburgh subscribers sends us two extracts from the *Evening Chronicle* of that city, in which are considered the causes of explosions, with particular reference to the terrible disaster at the American Iron Works, of which we published a description in the SCIENTIFIC AMERICAN of February 22, on page 112. He asks us what we think of the views of the writer of the article on the subject of the intensity of explosive force by the sudden evaporation of large masses of water relieved from pressure.

The writer says:—"Now suppose a rupture to have taken place in any one of these four boilers, above the water line; before the steam, rushing out at initial velocity of two thousand feet per second, was exhausted from the steam space, it would, being liberated from the water contained in the water space, rush from the water along with a portion of the water itself and strike with immense velocity upon the upper part of the boiler, rending it in a manner to produce the most startling results. Supposing 1,066 cubic feet of water in each boiler was converted into steam; upon the liberation of steam contained therein, this would make 30,000 cubic feet of steam (at the pressure of the atmosphere); and this, acting expansively upon fragments of the boiler already hurled into the air with great velocity, would be sufficient power to account for large portions being carried one hundred rods or more from the scene of the explosion. Here were 120,000 cubic feet, or more than two tuns, of vapor in the atmosphere surrounding the boilers; sufficient force and sufficient gas in all conscience to account for the destructiveness and the 'blue gas' without resort to the superheated steam, or the burning of an explosive gas within the boilers." The views here expressed are, by leading authorities, generally believed to be well founded. We believe that this theory, which is known to engineers as "Colburn's Theory," was first given its present form by our late talented fellow countryman, Zerah Colburn. The extraordinary violence with which explosions frequently occur are good evidence of its probable correctness in many instances.

It is by no means certain, however, that the effect of this sudden liberation of immense volumes of steam is, in all cases, to appreciably intensify the disastrous effects succeeding the explosion. The only experiments which have ever been made on a scale sufficiently large to permit us to make reliable and unexceptional deductions are those of the United Railroad Companies of New Jersey, which were conducted by Mr. F. B. Stevens. One of these allowed of quite reliable estimates of the intensity of this effect. It was shown by Professor Thurston (*Journal of Franklin Institute*, March, 1872), in an examination of this experiment, that "the energy of this explosion and all of its tremendous effects were principally due to the simple expansion of a mass of steam suddenly liberated at a moderate pressure, by the general disruption of a steam boiler of very uniform but feeble strength," and that "in this case, the liberation of steam throughout the mass of water contained in the boiler, and which resulted in setting free nearly 70,000 cubic feet of steam, would not seem to have taken place promptly enough to greatly intensify the effects of this explosion."

We have no evidence which enables us to form a decided opinion in regard to the cause of the boiler explosion to which our correspondent refers. We can only say that the almost invariable, and possibly absolutely invariable, inference, which we draw when we read of an explosion, is that there has been either ignorance, carelessness, or recklessness somewhere, for which some one is responsible, and of which some one should be made to suffer the just consequences.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE EFFECTS OF SUPER-OXYGENATED AIR.

A correspondent, L. G. F., of Las Vegas, New Mexico, speaks of the extremely exhilarating air of his locality, and states that it is very invigorating, and any stimulant is doubly injurious in such a climate. Sometimes a visitor will come in, with glasslike eyes starting from his head and incoherent speech. Persons so affected invariably attempt to get near a fire; but L. G. F. finds the best treatment to be to keep them far from the stoves, and to administer food and hot coffee to stimulate the stomach into action to replace the carbon lost by super-oxygenation of the blood. Riders on horseback are not thus affected; probably the vapor from the horse's body uses up a large proportion of the oxygen near him. L. G. F. recommends phosphorus in small doses, as, in addition to its well known stimulant effect on the brain, it will appropriate the superfluous oxygen of the air, and stop the exhaustion of the carbon in the system, which would otherwise become too rapid for the patient's health.

THE FUENTA DE SANGRE IN HONDURAS.

Our correspondent, O. L., of N. Y., has in his possession a quantity of a red fluid, taken from a cave in Honduras. The liquid runs down the walls and collects on the earth. The place is called by the natives the *fuente de sangre* or spring of blood, and was, for centuries, considered to be caused by a Divine miracle. Dr. A. Habel, who traveled Central America during many years, preserved the specimen in question, and added a little alcohol to prevent decomposition. The fluid, when observed by the help of a microscope, exhibits some colorless rhombic crystals and also some reddish brown amorphous particles, as well as organic fibers and cells. To the smell, ammonia is distinctly present in it, and the odor becomes intensified by the addition of caustic soda. The ammonia was volatilized by heat, and the red brown residue was imperfectly soluble in water. The salts of lead, of silver, and of copper were precipitated from the fluid, and the deposit was found to be completely soluble in alkalies."

This precipitate evolved, on heating, the odor of burnt horn, and a considerable quantity of carbon was found in the residue; after perfect incineration, only a small amount of ashes remained, principally consisting of oxide of iron and lime. Concentrated sulphuric acid dissolved it, with a red color; nitric acid oxidized it, at moderate heat, to a yellow mass, in which picric acid was recognized.

"It has occurred to me," says our correspondent, "that this red color may be due to the coloring principle of the *krameria triandra*, the plant yielding the rhatany extract, which occurs in tropical climates in great abundance. In comparing the rhatany extract with the *fuente de sangre*, I was struck with the identity of all the reactions, so that I became convinced that this spring is a more or less decomposed aqueous extract of the roots of the above named tree. These roots contain a nitrogenous body: and Wittstein, of Munich, succeeded first in separating it in fine colorless needles, showing almost all reactions for tyrosine. Ruge, in 1862, determined its formula to be $C_{10}H_{13}NO_3$; he calls it rhatanine. It is analogous to tyrosene and yields, by oxidation, dark red products. This theory accounts for the presence of ammonia as well as for the red color of the *fuente de sangre*."

DISTINGUISHING FIBERS IN MIXED GOODS.

A correspondent writes to know if there is any way in which to distinguish vegetable fibers such as cotton, flax, tow or jute, in woolen and silk goods. In addition to the information on this subject published on pages 131 and 150 of our current volume, we give a method somewhat different to any we have yet published, proposed by Professor Emil Kopp: If the goods be boiled in a ten per cent caustic soda lye, wool and silk are dissolved, but the vegetable fiber will not be acted upon. The addition of sugar of lead to the alkaline solution will occasion a black precipitate if wool be present. The undissolved fiber ought to be bleached in chlorine water if it is colored, and it can then be decomposed by cupro-ammonia, which dissolves cellulose. Where the goods are highly colored, it is well to treat them with a mixture of 2 volumes concentrated oil of vitriol and 1 volume nitric acid. Wool, silk, and coloring matter will be destroyed, while the cellulose will be converted into gun cotton and can be recognized by its explosive properties. When the goods are white, a solution of fuchsin can be used as a test, which dyes silk and wool, but not vegetable fiber. The sizing must be removed before applying this test, which is best accomplished by washing in a weak solution of carbonate of soda and in soap, and applying the fuchsin mixed hot with some carbonate of soda. To detect wool in silk, a solution of oxide of lead in caustic soda can be employed, which turns woolen goods black owing to the sulphur of the wool combining with the lead. Silk in wool is shown by its solubility in a cold solution of cupro-ammonia—from this solution acids precipitate the silk in *flocculi*. Wool is only soluble in cupro-ammonia by aid of heat. Concentrated acids, such as sulphuric, nitric, or preferably hydrochloric, act in the cold upon silk but not on wool. The solvent properties of cupro-ammonia, Schweitzer's test, make it one of the most useful reagents we have in the laboratory. It is prepared by suspending strips of copper in concentrated ammonia in a large flask, lightly corked, and occasionally shaking so as to bring the metal in contact with the oxygen of the air. A good plan is to transfer the contents from one flask to another. By degrees a tolerably concentrated solution of oxide of copper in ammonia is obtained, which is one of the best solvents of cellulose known.

SPRING WATER IN THE VICINITY OF CEMETERIES.

The *Annales de la Société de Gand* contain a very interesting analysis by Lefort of the water of St. Didier, which illustrates the influence of cemeteries on the spring water around them. The water had a sweetish taste and produced no desire for vomiting, but left a disagreeable fetid taste on the tongue. A gray, thick sediment remained after evaporation, which turned, by continued heating, to a dark brown, emitting an empyreumatic smell. One part of this residue was treated with diluted muriatic acid, producing carbonic acid and a strong smell of glue; another part was treated with hydrate of lime and showed a considerable amount of ammoniacal salt. The presence of organic substances in this water shows that, even at a distance of 300 feet, water may tainted by a cemetery. No cemetery should be laid out unless it is clearly shown that no filtration of water from the burial ground can take place into that used for human consumption. It is also a necessary sanitary measure to draw off all the water in the vicinity of established cemeteries or other places used for the interment of animal bodies, and it is matter of hygienic importance to analyze from time to time the water used in the neighborhood for drinking, so that any substances dissolved therein, which may be deleterious to health, may be clearly discovered. This is especially necessary in localities with but a limited supply of water.

FILTERING STRONG ACIDS.

James St. Clair Gray recommends the use of a bundle of spun glass threads in a funnel, with glass powder spread over it. Before use, this filter can be washed with hot water, dried, and then washed with pure acid.

PARCHMENT SOLUTION.

A Berlin chemist (De Souwageon) has introduced a solution of gutta percha in ether for the purpose of giving maps, pictures, globes, etc., a clear, thin coating for protecting them against dust and dirt. Objects so covered can easily be cleaned by the application of a moistened rag. Drawings executed with charcoal, pencil, or crayon may be permanently fixed by the application of the dilute solution to their surfaces. The ether evaporates, leaving the gutta percha in a thin but sufficiently protecting covering on the drawings.

Burnt Boiler Plates.

A correspondent, J. H. T., of Ky., states that, in his opinion, a frequent cause of burnt boiler plates is the too close proximity of flues to the shell of the boiler, owing generally to the flues being too large. Thus there is but little water between the flues and the shell, and evaporation cannot take place, in so narrow limits, rapidly enough to prevent burning the plates. Owners of boilers thus troubled should reduce the diameters of their flues.

THE KING PENGUIN AND THE AUSTRALIAN BUSTARD.

The birds invariably form the most interesting class of specimens in any zoölogical collection. As they are, almost without exception, perfectly harmless, and possess the friendly disposition which generally belongs to the weaker creatures, they are universal favorites with the juveniles: and their plumage is as strangely varied as their voices, ranging from the plain russet brown and liquid melody of the nightingale to the brilliant colors and shrill scream of the macaw. We give herewith representations of two recent additions to the collection of the Zoölogical Society of London, kept in the well known gardens at the north end of Regent's Park.

The King Penguins were brought from the Falkland islands, and are shown in the engraving in company with two penguins from the Cape of Good Hope. The former are young birds, only 30 inches in hight, and are as yet covered with a downy fur which will, in time, give place to feathers. The two species are friendly to each other, the nimble little Cape birds, being fond of running about, an exercise in which the big infants are not capable of joining to any great extent.

The Australian bustards are of the order *grallæ*, or waders, of the genus *gallinaceæ*. They have long necks and legs, but their wings are short, and they use them, as ostriches use theirs, more as assistants in running than for purposes of flight. They are singularly timid birds; they live on grain, herbs, or worms, and never perch. The male bird has, as is the case with most other birds, the more luxuriant plumage, and possesses the additional distinction of a pouch in the upper part of the neck, which it inflates when it desires to attract attention, as the peacock spreads his tail. The

THE KING PENGUIN

THE AUSTRALIAN BUSTARD

neck swells and the feathers droop, the tail is shot upwards and bent over the back; the pouch swings as the bird waddles rather than walks about. The bird has a habit of making this display chiefly in the mornings and evenings during May and June of each year.

[Engineering.]

PHOSPHOR-BRONZE TWEERS.

Every practical blast furnace engineer knows the inconvenience, labor, and often seriously disadvantageous consequences which are connected with the removing of a damaged water tweer. For the purpose of obtaining a satisfactory form of tweer, I have, since 1859, carried out at the Neusser Iron Works a series of experiments with variously constructed water tweers. The tweers mostly used in England, and made of helical iron tubes, either placed simply in loam or, as is more usual, surrounded by cast iron, I found to give the least satisfactory results. These heavy and unmanageable lumps cannot resist the contact with the fluid iron and iron-containing slag; they are soon worn off by any contact with the fluid mass of metal, become leaky, and occasion accumulations which become so intimately connected with the mouths of the tweers that often great portions of the wall of the hearth have to be broken away in order to get them out.

I next tried wrought iron tweers with welded seams. These gave better results, but they also could not withstand the contact with the molten metal, and became united to the latter, though the tweers were not so easily damaged as those of the first mentioned construction.

When these tweers had to be removed, the same difficulties were met with as with those previously described. It is also difficult to ascertain beforehand the perfect soundness of the weld. Some of these tweers were often not many days in the furnace when leaky seams were discovered at the mouth, thus necessitating their being taken out, and this would happen notwithstanding the perfectly satisfactory testing of the tweers with a water pressure of from 10 to 12 atmospheres. The best mode of testing such tweers consists in filling them with water and, after driving wooden plugs into the inlet and exhaust openings, placing the tweers perpendicularly with the mouth upon the fire, until the wooden plugs are thrown out by the pressure of steam. If the tweer withstand this test without leaking, the welded seams are then generally trustworthy.

I obtained better and, in fact, thoroughly good results with bronze tweers, and have used them for ten years. The bronze tweers form less easily a connection with the fluid metal than the iron ones, and withstand the contact with the molten iron very well. Of course they sometimes get cracked; but in that case they are easily taken out, because the bronze, even if connected with the products of the furnace, may always be removed from them with a small amount of force. We may presume that such a tweers, will sustain perhaps ten times the exposure to contact with metal and fluid slag that would be endured by an iron tweer. I use tweers of the pattern shown in the annexed sketch, and have found it the best after many experiments. If made too long and the fire is allowed without consideration to extend, the walls of the hearth suffer; if kept short, say, twenty inches, it becomes necessary, with the increasing action of the fire, to renew the ramming in, and the walls of the furnace are preserved. These tweers are not easily damaged if well made, and if the precaution is taken to conduct the current of water (supplied through a ¾ inch pipe with at least a pressure of from 30 feet to 40 feet, and more if possible) directly to the front of the tweer, in order to prevent incrustation, though that end is not entirely obtained by this arrangement. Such a tweer has to be removed every six months, in order to get the incrustation out either by means of hammering, or by drying the tweer and making it slightly red hot at the mouth, in which state cold water is poured into it, when the incrustation becomes converted to dust, and is washed away by the water; the tweer may also be boiled with half diluted hydrochloric acid.

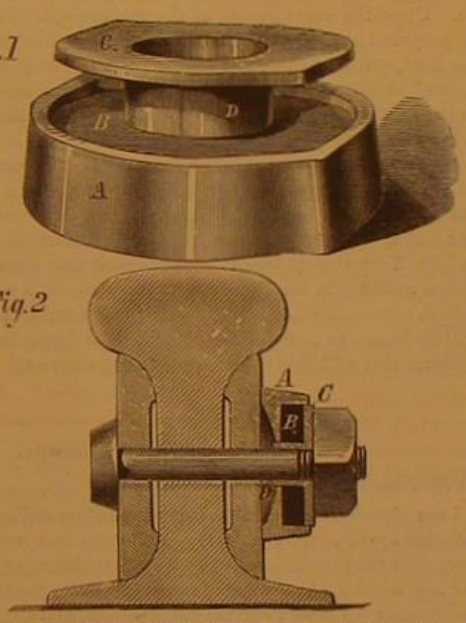
The water is introduced through ¾ inch wrought iron tubes (gas pipes) screwed into the bottom of the tweer, as shown in the annexed sketch, which represents a fastening that I consider to be the best.

Besides the advantages mentioned above, the bronze tweers are more durable, are more easily manageable, and are more uniformly circular than the iron tweers, which latter property is always an advantage for the furnace. Moreover, if more expensive in their application, they are, nevertheless, much cheaper in their use than the other tweers, as the founder will always accept the old metal in lieu of part payment.

The bronze tweers are therefore certainly the cheapest in their application, but it appears to be no easy matter to have them cast, as it is not every brassfounder who can do it satisfactorily, success depending much upon the selection of the metal and the skill of the founder; in fact the casting of tweers is an art, like that of casting bells. I have found that intelligent brassfounders could not succeed, and even large establishments, with all their resources, have tried in vain to obtain satisfactory results. But even the bronze tweers were not perfect; they often became cracked in a manner quite inexplicable, and, if they came into contact with the bed of metal from below, would tear or melt. A few years ago my attention was called to the so-called phosphor-bronze of Montefiore Levy, and everything said about it in private and public reports, and the results obtained from the trials with this metal for artillery purposes, about which a great deal has also been published in England, convinced me that the properties of this metal must offer the same advantages for tweers as for guns. It appeared, in fact, to offer greatly increased toughness and density, and, therefore, great resistance against change of temperature and the influence of molten masses. I ordered, consequently, several tweers of this metal, according to exactly the same pattern as that for the ordinary bronze tweers. These tweers have given me the fullest satisfaction; they have the advantage of being more tough than the tweers of ordinary bronze, and in cases where other tweers would certainly have burst, they sustained the shock without any damage being done to them. I ascertained further that this metal does not take up so readily or so firmly the incrustations produced by the contact with the water, and, what is of great importance, the oxidation of phosphor-bronze is much more slow than that of the ordinary bronze. I have found after a year's use that a tweer of phosphor-bronze, when wiped with a piece of rag, appears quite smooth, and has a bright metallic surface, and that it had remained entirely without incrustation. The extra preliminary expense for phosphor bronze appears almost insignificant in view of the advantages mentioned above, and, the expense of re-casting this metal being the same as for ordinary bronze, the higher value is in the metal itself.

ELASTIC WASHER.

We present herewith perspective and sectional views of a new elastic washer in which the packing is so inclosed as to be protected from injury by reason of the torsional action of the nut.



A is the flanged disk or socket, B the packing of rubber or other suitable material, and C the metallic follower or face plate. In each of these is formed a central aperture of suitable size to receive the bolt. In one piece with the face plate, C, is made a tube, D, so as to form a prolongation of the orifice. This tube passes through the packing and the base of the flanged disk, A, which is arched to leave sufficient space for the tube to work freely without coming in contact with the fish plate of the rail, as shown, or other bearing surface of the washer. The packing and follower move freely within the socket. The latter with the follower is made in oval form so as to prevent the movement of the socket upon the packing.

It is clear from the above that, when the nut is screwed home, it will follow the face plate, C, into the socket, and thus project a correspondingly less distance beyond the latter than it otherwise would. It is consequently less exposed to injury. The socket has incidentally also a broader bearing surface, and hence will not turn with the nut when made smooth or when oil or other lubricant has been accidentally applied to it.

The inventor claims that a shorter screw bolt may be used with safety in connection with this washer than with others of like thickness. The device appears strongly constructed and of simple though efficient form. It is doubtless durable, and, we should judge, not costly to manufacture.

Patented through the Scientific American Patent Agency, July 2, 1872. For further particulars address the patentee, Mr. Caspar Dittman, Leacock P. O., Lancaster Co., Pa.

Hot Air Furnaces.

It has been proved by careful experiments, in this country and in England and France, that carbonic oxide and carbonic acid gases will freely pass through cast iron when under the influence of heat. This metal should therefore be discarded in the construction of hot air furnaces, and wrought iron substituted. The latter does not permit these deadly gases to pass through.

FRICTION IN ROLLING MILLS.—In a large rolling mill, calculation shows that about 40 per cent of the power is absorbed in friction. It is evident that great economies may be effected in this direction.

Xylol.

We read the following in a contemporary:

"BALTIMORE, MD., January 15, 1872.

"*The Superintendent of Police, St. Louis, Mo.:*

"SIR: I would most respectfully call your attention to the new medical compound known as 'xylol,' which is now being used in this city for purposes of robbing and murder.

"The mode of application is by mixing it with the feathers in a pillow; and when the warmth of the head is applied to it, it gives off vapor similar in effect to the fumes of charcoal, and the person using it is found dead in the morning, which gives the monsters who apply the drug ample opportunity to possess themselves of the property of their victims and otherwise dispose of their remains.

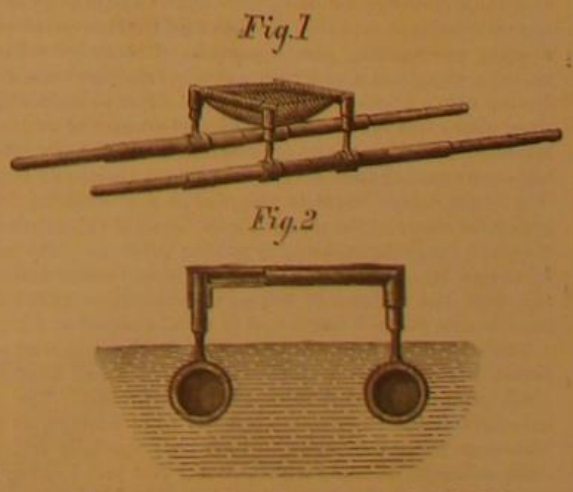
"The drug was tried upon myself here some time ago by a German Jew, who invited me to stop in his house. I escaped his foul designs, and obtained a knowledge of his intentions and manner of proceeding by trifling circumstances, the details of which I will not weary you with.

"But as I had lately read accounts of several persons being missing in this and other cities, I felt in duty bound to investigate the matter for the benefit of society at large. Consequently I have devoted my leisure hours to it for the last two years, and have now acquired a perfect knowledge of the drug used; and I lose no time in communicating its name to you, that you may cause the officers under your control to put themselves in communication with the druggists, and keep a system of surveillance over those who purchase it. Hoping that you will also cause a notice of the hidden qualities of the drug to be sent to the police authorities in all the principal cities in the State of Missouri, I remain, Sir, yours very respectfully, M. WALSHE, M. D."

REMARKS BY THE EDITOR.—Xylol, called also xylene and di-methyl benzole, is one of the coal tar products, and is analogous to benzole and toluol. It was first found in wood spirit by Cahours, who gave it its name from the Greek word *xulon*, wood. The series is: Benzole, $C_6 H_6$; toluol, $C_7 H_8$; xylol, $C_8 H_{10}$. Xylol can be prepared from coal naphtha by fractional distillation. As soon as a product is obtained having a specific gravity of 0·866 and a boiling point of 140°C., it is mixed with sulphuric acid, which dissolves the xylol and yields xylol-sulphuric acid. The acid product is decomposed by dry distillation and further purified. It is colorless, has a faint odor resembling benzole, but differs from the latter in boiling point and specific gravity. A good deal was said about it at one time as a remedy for small pox. Ten or fifteen drops a day were prescribed as a precaution in addition to vaccination. The theory was that it destroyed the poison in the blood. Raspberry sirup was given to mask the disagreeable taste, particularly when prescribed for children. The dose is three to five drops for children and ten to fifteen drops for adults, but it should not be taken without the advice of a physician. The paragraph copied above from the St. Louis *Democrat* is decidedly of a sensational character. Any one with the smell of benzole, ether or chloroform in his pillow would not be likely to lay down to pleasant dreams, but would open wide the casement, and if he were staying at a hotel would loudly call for another room. A somewhat similar story went the rounds of the papers in reference to the hydrate of chloral, which it was said was administered for the commission of crime. It is not probable that any of these re-agents are employed for such purposes, but no harm can result from the publication of them in order to put all persons on their guard.

SECTIONAL LIFE BOAT.

Mr. Christopher Pond, of Philadelphia, Pa., is the inventor of the novel form of life boat represented in our illustrations. The device consists in two metal tubes made in sections and screwed together to form two continuous floats, each section constituting a water-tight compartment. At proper distances, at each side of the center of the floats, rise standards which are coupled by stretchers or bars. The latter are hollow, fit over the standards, as shown in the sectional view, Fig. 2, and serve to retain the floats in position, preventing them from rolling independent of each other. To the stretchers are attached straps, to which is secured a seat made of netting or other suitable material. When it is desired to remove the boat from the water for storage or transportation, it may be readily taken apart and packed in compact form.



If the occupant of the boat is thrown out by any accident, he may grasp the floats and buoy himself thereon, as the latter will not sink, even if the boat is on its side or completely overturned.

Correspondence.

The Ignition of Wood by Superheated Steam.

To the Editor of the Scientific American:

In your issue under date of February 8, I notice an article on the ignition of wood by the heat of steam; and if I understand your remarks correctly, you take the ground that the heat from steam at any ordinary pressure will not ignite wood. The inference would be that wooden supports for steam pipes, used in heating buildings, would be safe. Perhaps you are right; but if such is your opinion, I must differ from you. I formerly held the same opinion, and I will state what it was that led me to change it.

A few years since I worked in a factory which was heated by steam pipes, running round the rooms, and passing through the partition walls from one room to another. The pipes had been laid several years, when a fire occurred near by, which brought the insurance officers to the neighborhood and caused them to make an examination of the condition of other buildings and of the factory in which I worked. The result was all the wooden supports were ordered to be removed, and the passages through the partition walls to be made larger, and the pipes kept from contact with wood. In making the changes, I found that, in some places where the pipes came in contact with wood, especially in positions where no air could circulate, the wood was in some instances burnt to charcoal, particularly the soft pine, and in one instance a chestnut stick was similarly affected. We removed the pipes from contact with wood, in all places as we supposed, but there was one place, through a partition wall, that was overlooked. Sometime after, I think it was the next winter, we were alarmed at the smell of scorching wood; and, upon making search, we found the place which I have said was overlooked, and the wood was smoking. Enough smoke had been made to give a blue look to the air in the passage adjoining. I found the wood next the pipe for one eighth or one quarter of an inch turned to charcoal; and it was turned brown for a considerably greater depth. The charcoal made by such low temperature long continued is very loose and becomes dust by slight rubbing with the finger. I have no doubt that, if the place had not been attended to, it would at some time, and perhaps that very morning, have originated a fire. The place was about thirty feet from the boiler, an upright tubular that carried eighty pounds of steam at the highest, but not usually over sixty pounds.

Is there anything unreasonable in the supposition that charcoal, made at a very low temperature and finely divided, will ignite by the heat imparted by a steam pipe carrying eighty pounds of steam, if in long continued contact? In your issue of January 25, I find a table which shows that charcoal made at a low temperature will ignite more easily than that made at a high temperature. Observation of the facts which I have stated above led me to the conclusion that wood may be ignited by the heat of steam pipes carrying a pressure of not more than eighty pounds to the square inch. Certain I am that charcoal may be produced by such a heat, and by still less, even that from sixty pounds of steam; but it takes several years to do it, for wood, in another instance, that had been in contact only one year was scarcely brown, while that which had been exposed five or six years was in some cases turned to charcoal. I will say that, in the cases I have mentioned, I think there could have been no oil to play a part. M. M.

Franklin, Mass.

The Ignition of Wood by Superheated Steam.

To the Editor of the Scientific American:

As there appears to exist considerable doubt as to the possibility of superheated steam igniting wood, I give two facts which will speak for themselves:

During the early part of the spring of 1872, I had occasion to take indicator diagrams from a 20 by 48 Corliss engine, of which I have charge. From the ceiling I suspended a lever of white pine 1¼ inches by 3 inches, and about 8 feet long, with an open slot in the lower end to receive a pin screwed in the crosshead; after use, I raised the lever up over and let it rest on the bare steam pipe. Finding from the diagrams that the engine was not doing work equivalent to the amount of fuel consumed, and that the boiler (of the Howard sectional style) was working great quantities of water over, I connected a superheater of 3 inch wrought iron pipe therewith, having also a 3 inch pipe from top of drum to main steam pipe, with valve to regulate any desired amount of saturated steam. One day, some two or three months after, I saw sparks and smoke coming from between the pipe and lever; on lifting it, I found a hole burnt in the edge of the wood conforming to the shape of the pipe, an inch deep and full of sparks. Steam in the boiler was at 100 pounds pressure. The same lever now lays in the same position as when I found it smoking, with the addition of felting underneath, saturated and superheated steam being mixed in equal quantities.

The second instance was brought on by the contact of a 1¼ inches live steam pipe (superheated) with small blocks of black walnut, mingled with fine dry sawdust. The fire brought out the fire engines but did little damage, as the watchman put it out with a 1¼ inch hose specially laid for such accidents, he being within twenty feet and looking toward the fire when it broke out. I would add that the stop valve, although closed, leaked badly all night at the time of the fire, and now every morning, when it is opened, we get a number of electric sparks from the neck of the valve.

I hope you will give this space in your valuable journal, that it may be the means of inducing others having charge of steam and steam boilers to keep all easily inflammable matter from live steam pipes. E. R. DINGLEY.

New York city.

The Million Dollar Telescope.

To the Editor of the Scientific American:

In regard to the big telescope, you truly say that "some of our correspondents are determined to push this matter." Let me propose one or two ideas to serve as a basis for a company.

Let the company be known as the American Telescope Company, the capital stock to consist of 100,000 shares of $10 each. A board of 25 directors should be appointed to manage the affairs of the company, and should consist of five eminent astronomers, five eminent mathematicians, five eminent mechanics, selecting those especially interested in this class of work, and five eminent public benefactors, such as Messrs. Peter Cooper, Cornell, and others, and five eminent business men, a portion being manufacturers who, being familiar with the details of great enterprises shall, with the preceding five, constitute a business committee to push the thing along. These may elect a President and other officers.

Immediately establish a bureau of information, and set about collecting all that is known of telescopes or similar instruments. Let notice be given that any communications relative to the subject as well as models and specimens will be received and placed on file. Also let a suitable compensation be offered for a design for mechanism for mounting and operating the instrument. These will naturally call in numbers of communications from which, at intervals, a digest may be prepared and published (in the SCIENTIFIC AMERICAN, of course, Mr. Editor.)

Should any novel plans be presented, the directors may cause experiments to be instituted to test them; but no compensation shall be given to the designer unless his plan is adopted, and then only his actual expenses; but he shall, if his plan is adopted, have precedence over others in looking through the instrument, at times when it is open to the public. Upon the organization of the company, let a prospectus be prepared and sent to all colleges and libraries throughout the land, setting forth the purposes and plans of the company and soliciting subscriptions and donations, and also sent to the local press of the country with a request that they will give extended notice of it.

And now, that the enterprise may be speedily inaugurated, let us, with your permission, nominate you a committee to receive and place on file the names of all who will send to you and agree to attend a meeting, for organization, to be held in New York city at some time during the present year. When a sufficient number have responded, let a call be published, time and place being named, and a meeting held that will do honor to a subject of such great importance. The achievement will make America famous above all the earth.

F. H. R.

The Million Dollar Telescope.

To the Editor of the Scientific American:

I am glad to see the subject of the million dollar telescope agitated by you and your correspondents; and whilst I believe that the government has appropriated many millions for far less worthy purposes, I am opposed to its paying for this instrument. I prefer private subscription, and although I am hardly able to make a living, I am willing to pay something for this purpose.

Could not the governor of each State call for voluntary subscriptions, to be collected through some collecting officer already on duty, without commission for collecting? The money should be paid into the State treasury, to await the completion of the instrument, or be disbursed to the contracting party upon such terms as all the governors might settle during the building of the instrument, or after its completion. The amount of such subscriptions, or the receipt for the same, should stand good for so much State taxes or be refunded should the instrument not be completed.

Should a subscription be started and the public be satisfied that it would be honestly appropriated towards the building of the telescope, I think the amount would be quickly raised. When the instrument should be furnished, Congress would cheerfully build a house and have it mounted. All who subscribe should have the privilege of using it, if indeed it should not be open to the public.

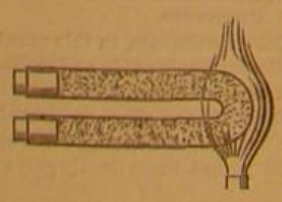
Let this subject be discussed; I think the "times are ripe" for such an undertaking. Let the whole world be called on for the largest glass that art can make. Dispose of this letter as you like, but agitate the subject. J. A. C.

Nashville, Tenn.

An Improvement in Bending Glass Tubes.

To the Editor of the Scientific American:

If the glass tube be filled with sand and each end stopped to prevent its escape, on heating over a Bunsen burner it will be found that the tube may be quite doubled if desired, a perfect curve being produced. In this way bends of any desired size may be accurately produced in tubes of any bore, without any previous skill in working glass. Obviously the principle depends on a uniform distribution, by the sand, of the pressure exerted. A similar plan is resorted to by metal workers in bending tubes of lead, etc. A. H. GALLATIN.



Retrograde or Direct Motion of the Sun.

To the Editor of the Scientific American:

As I have no instruments whereby to test and find out the fact, and as I have no better way of ascertaining the truth than through your scientific journal, will you publish the following?

In each of the astronomic books I have read, in speaking of precession, the author says, substantially, that a "vernal equinox day is shorter than a sidereal day by an amount equal to one day in about 25,868 years." If that is true, my theory of solar retrograde motion is knocked on the head: for if the sun really moves retrogressively, as I believe and claim, then a vernal equinox day must be shorter than a sidereal day by an amount equal to one day in 25,868 days, and to one year in 25,868 years.

This last I believe to be the truth; for the equinox, and of course the whole seasons of the year, fall back on the ecliptic 50·25″ annually: a space which the earth takes 20 minutes and about 23 seconds of time to pass by. This 20 minutes and 23 seconds amounts to a whole year in less time than 25,868 years. So I conclude that a solar day is longer than a sidereal day by an amount equal to 20 minutes and 23 seconds less than one day every year; and that an equinoctial day is shorter than a sidereal day by one day in 25,868 days, or by one year in the same number of years. If I am correct, then the sun moves retrogressively as sure as light flows from him. If I am not correct, that is to say, if the time is one day instead of one year (as I say), then my theory is at an end. If I am correct, as doubtless I am, the sun annually carries the earth as it were back in her orbit 50·25″ or about 28,500 miles; and it requires the earth 20 minutes and about 23 seconds to pass through that space in her orbit.

This retrograde motion of the sun does not in the least interfere with the so called 18,200,000 years orbit of the sun and the 117,000,000 of other suns and solar systems, recognized by popular astronomy. To suppose that the movement of such a host of celestials represents the orbit of our sun is a poor astronomical idea. As well might we suppose the Gulf Stream to represent the orbit of all the fishes in it. The movement of such a host of celestials around *Alcyone* in direct movement towards *Hercules*, may be a "drift motion" in celestial space; and there may be many thousands of other suns besides our sun moving retrogressively, while the vast multitude is moving directly.

Gloucester, N. J. JOHN HEPBURN.

Water Supply for Fire Purposes.

To the Editor of the Scientific American:

New York city seems anxious to obtain a water supply for fire purposes that shall be both economical and practical. Binghamton was so once, and has been very successful in attaining the end desired. We have a constant supply of water for fire and domestic purposes, with a head changeable at will from 1 to 120 feet pressure, under the control of an automatic governor located at the pump house, regulated by the opening and closing of a hydrant; and all this without either a reservoir or stand pipe, both of which are needless as well as expensive, as has been demonstrated over and over again in our city.

Our works have cost us about $150,000; we have over twenty miles of service pipes, and have nearly done away with the old fire department, depending upon the hose companies for the suppression of fires. All that is needed is to attach the hose to a hydrant, turn on the water, and, in three minutes time, there is a full head at every hydrant in the city, which, if needed, can be confined to the immediate precincts of the fire.

The system is scientific and intensely practical. The power consists of suitable boilers and engines, located near the Susquehanna river. The water is forced directly into the main pipe, and distributed thence through the service pipes.

The pumps used are rotary, the inflow being without the thud that follows the stroke of a direct acting piston pump, thus relieving the pipes from the intermitting blows so destructive to pipes and joints. Our pipes are stovepipes (rolled iron with riveted joints) lined with the best water cement, and are very durable. The pressure is regulated at will, as stated before, by the demand made for water, and is under absolute control from this source. ALFRED C. POPE.

Binghamton, N. Y.

Why Boilers Explode.

To the Editor of the Scientific American:

From the number of explosions throughout the country during the past year, one would suppose the epizoötic had attacked the boilers. But I think that a majority of these explosions have been caused by negligence and incompetency. A short time since I stepped into a flouring mill here; and the first thing I heard was the lower gage cock open and no water. The proprietor informed me that the water had been down below the lower gage cock about one hour and a half. They had stopped the supply pump for repairs, and kept the mill running. When I went in the engine room, the pressure gage showed eighty pounds and the furnace was full of wood and coal. The plates of every ring of the boiler were sprung out of shape; the fire line of this boiler was at the second gage cock. I remarked to the proprietor that I would not like to have such a hot fire and then to pump cold water into the boiler. His answer was: "It doesn't hurt it." This man has a negro to attend the engine; and as he can stop and start, he is considered entirely competent to take charge. Last summer I saw two engines ready to go out on a threshing tour; both had their crown sheets badly burnt, and on one the crown sheet had gone down six inches; and some of the stays were broken in both. Yet both were pronounced

perfectly safe. And now I contend that these boilers are not safe, because they have been so weakened that they are liable to explode under a moderate head of steam and "plenty of water," which latter is generally the verdict in most of these accidents. Perhaps it is true at the time, but nothing is said about the previous treatment which weakens the boiler; and then the maker is blamed. ENGINEER.

Extinguishing Fires by Steam.

To the Editor of the Scientific American:

The extinguishing of fires by steam has been mentioned in your paper as a new German discovery. I do not believe it to be new, as I have before seen propositions to admit steam into the rooms of burning buildings to extinguish flame; and if it could be confined, it would be very effectual. As an evidence of its effectiveness under very trying circumstances, I will give a case which occurred in my own experience:

While engaged, during the year 1859, in making oil from cannel coal in the Kanawha Valley, at Charleston, W. V., a cast iron still cracked, while nearly filled with oil, and a small stream of the heated oil fell on the fire below it. This was probably caused by the watchman and fireman getting asleep, letting the fire go down, and then, on awaking, endeavoring to make up the amount of oil that should have come over by heavier firing; and as the bottom of the still was very thick, it was cracked by the unequal expansion. Sleeping in my office, not far distant, I heard the alarm and hurried to the factory, accompanied by several of the workmen. An iron chimney, about 18 inches in diameter, was attached to this still, reaching about 12 to 15 feet above the roof. This chimney was white hot, and was pouring out an apparently solid flame, ten feet high, and large quantities of unconsumed soot were falling on the roof. On going in the building, I found the men throwing water under the still and on the blazing coke under it, but with no effect, as the oil kept the fire on the grate up; the burning oil was floating on the water which fell through. The fire was getting hotter, and there was great danger of the crack enlarging. I directed the men to close the doors of the furnaces as tight as possible to exclude the air, and then to attach a steam hose to the boiler and to fire it up higher at the same time. Luckily it was in the winter time, so we had to keep up some steam in the boiler to keep the pipes from freezing. We soon got up our steam, put the nozzle of the hose under the still door, and let on all the steam we could. In less than five minutes the fire was out, and the chimney cooled off; and, strange to say, the still did not leak any more. The bottom, however, was taken out, as we did not dare to trust it any longer over the fire. This was a very narrow escape. The fire had got considerable head before the steam was applied, and one who has not seen such a fire can hardly imagine its fierceness. Afterwards a crack occurred in another still, but the men, knowing how to manage it, applied steam at once and put it out without much trouble.

We also had a fire occur under a 2,000 gallon boiler-iron still, caused by the springing of a rivet. This occurred in the day time and was soon extinguished in the same manner.

Either of these fires would certainly have burnt up the factory if it had not been for the steam. So much for what I know about steam as a fire extinguisher. Let others give their experience under other circumstances and something of value may be elicited. C.

Dayton, O.

Bursting Strains of Boilers.

To the Editor of the Scientific American:

I would suggest the following plan for ascertaining the pressure necessary to burst a cylinder; it will put the matter at rest by a practical test.

Take a number of cylinders of uniform size, face the ends true and grind them to a fit, in the same way as we fit a set of rings to a piston. Have the heads separated, so as to admit water all around, and apply pressure by a force pump with a pressure gage attached, and register the result for several trials. Then try with a testing machine the same material, uniform in size with the first, but straight. This would give a fair comparative test with cast iron, for instance; it could be cheaply done by any one having the machinery, and to me would be more satisfactory than the theoretical demonstrations that have appeared from time to time.

I have believed in the "semi-circumference" theory from the first, but there may be some things brought to light which would give us a new idea.

The same result could be obtained with a system of levers bearing on each inch of the inner circumference of the ring, each lever weighted equally until the breaking strain was reached. E. BURROUGHS.

Auburn, N. Y.

T. Windle obtained a patent for a glass monument April 24, 1866, and the drawing furnished to the Patent Office with the application has the following inscription:

"Here lies Windle,
As inventor by trade,
This monument, you see,
Is an invention he made.

A curious fact:
It has sometimes been said
That he made it while living,
But enjoys it while dead."

THE Mechanics' and Agricultural Association of Louisiana announces its seventh Grand State fair, to take place during seven days commencing April 23, 1873. Diplomas, medals and other prizes are offered for excellence in all branches of agriculture and handicrafts, domestic economy, and the fine arts.

ODD MATERIALS FOR PAPER MAKING.

It is said that far more money and time is annually wasted in prosecuting novel investigations, which in the end prove fruitless, than is expended in perfecting ideas which eventually become remunerative to the inventor and of benefit to the world. Probably, in no case is this *assertion* more true than in that of paper. Numerous patents have been procured for its manufacture from articles which have been experimented upon and thrown aside as useless years and sometimes centuries ago; and not only this, but expensive machinery has been devised and works established to carry out plans to which their originators would not have given a moment's consideration had they previously acquired a knowledge of what had already been done in the same line. Of late years, the utilization of waste or hitherto valueless products has attracted no small share of public attention, and the making of paper from such substances is becoming a favorite object for the researches of inventors. The brief *resumé* which we give below, of the efforts which have been made to put in use new material for paper stock, will therefore, we think, prove timely, both as pointing out how frequently the same invention is made by different parties, and also as suggesting, to those who may be interested in the subject, an idea of what has been heretofore accomplished.

The records of the United States Patent Office show that thirty-four patents have been granted during the present century for the use of special components in the manufacture of paper. In making the historical researches requisite to obtain the facts below given, we ourselves have found records of no less than forty-two different applications of wood, twenty-five of straw, and about a dozen each of leather and corn stalks, being introduced in the world since the invention of paper, and there is little doubt but that more extended investigation would materially increase these numbers.

The first vegetable material used was, probably, in prehistoric ages, the Egyptian papyrus. In the year 95 A. D., a Chinese mandarin is said to have discovered that paper could be made from the bark of trees and rags of silk and hemp. The first records of cotton paper show that it was used, in A. D. 900, for the papal bulls; and history tells us that, at intervals of a couple of hundred years apart thereafter, satin and linen papers were invented. In 1727, one Dr. Brueckmann published, in Germany, a work on stones, four copies of which were printed on leaves made from the fibers of asbestos. The use of this material has since been discovered (if we may use the term) twice. E. Maniere obtained, in 1854, a patent in England for asbestos paper, made by mixing the finely ground stone with rag pulp; and in 1871, a United States patent was granted covering the use of pulverized and ground asbestos. In 1765, a book appeared in Bavaria interleaved with specimens of paper made from hornets' nests, sawdust, moss, beech, willow, aspen, mulberry, clematis and pine, hop vines, peelings of grape vines, hemp, leaves of aloes and lilies of the valley, *arroche*, mothwort, *masse d'eau*, barley straw, cabbage stumps, thistle stalks, burdock, *conferva*, wheat straw, broom corn and Bavarian peat. The volume is entitled *Sammtliche Papierversuche*, and a copy, we believe, is to be found in the library of the Smithsonian Institute at Washington.

Paper was first made from "maize or Turkish wheat" in Italy, in 1772. Four years later, a book was published in France on paper obtained from bass wood, and it contained, like the work above mentioned, a large number of specimens. Such literary ventures must have met with popular favor, for, in 1786, still another volume appeared, this time printed on marshmallow paper, and containing samples made from nettles, hops, moss, reeds, 3 species of *confervæ*, couch grass, spindle tree, wayfaring tree, elm, lime, yellow willow, sallow willow, poplar, oak, burdock and coltsfoot. During the succeeding decade, patents were granted in England for paper made from leather cuttings, and also from sawdust, substances which have since been applied to the purpose, it would seem, in almost every conceivable manner. About as queer a material as could be well devised was that experimented upon by Labigarre, a Frenchman, during the first year of the present century. How he came to pitch upon such stuff as frog-spittle, it is difficult to imagine, unless, following the proverbial taste of his nationality, the idea flashed across his mind while hunting the batrachian delicacy. At all events, an old volume of the *Historical Magazine* says that he brought a bag of the substance to the paper mill at Catskill, N. Y., and had it made into a poor kind of paper; and that several persons became very much interested in it, and thought it a great discovery. Frog-spittle, by the way, is not the saliva of the frog, but the larvæ of an insect called the frog hopper, which are found on leaves enclosed in a kind of frothy liquid.

During the year 1800, paper was first successfully made from straw by Burton of London; in 1802, corn husks were again experimented upon, and a patent was granted in this country for their use. In Italy, paper was exhibited made of the *papus* of *seratula arvensis*, the *carduus nutans*, and the bark of the *erigerone* of Canada. In 1809, S. Green, of New London, Conn, obtained a patent for paper from sea weed. Eleven years after, the Danish government granted similar protection, for a term of five years, for a re-discovery of the same idea; and in 1828, another United States patent was taken out for the use of *ulva marina*, also a sea weed. In 1821, Janbeaurt of Marseilles devised a process of paper manufacture from licorice wood and hemp. In 1827, a Parisian inventor employed the same wood, mixed with pasteboard scraps. Within this decade, 1820–1830, we find processes for the employment of hop vines, moss, Mexican maguey, pine shavings, and the bullen of certain plants, decayed wood, an animal substance called "aporentype," hay, straw, and blue grass, besides several new methods of use of leather cuttings and corn stalks. In 1830, a coarse paper was made from the pine tree; and a journal called the *Crawford Messenger*, in this country, was published on pages made of lime tree and aspen wood. Binders' boards were obtained from three kinds of salt grass. A French inventor—we suppose he was a *cook*—produced paper from asparagus, and a Swedish *confrère* followed his example by publishing a book the leaves of which were of paper obtained from the beet root. The latter invention has been repeated in this country, for we find a patent, dated 1857, in which the claim covers the employment of the refuse of all species of the beet genus, left after the sugar-making processes. Banana fiber was introduced in France first in 1845, and again in 1851, in connection with aloe and alfa fiber. In the former year, paper made from gutta percha attracted considerable attention in London. From 1850 to 1860, paper was produced from the dwarf pear tree of Algiers, a plant called the water broom, white pine shavings, southern cane, tow, horseradish leaves and fiber, vegetable remains of manure, the common hollyhock, undressed flax, wood shavings with bran, the "everlasting" plant or *gnaphale*, and plants of the *sparganium* family, marble dust (invented by a Glasgow stonecutter), Scotch ferns, bark of cotton stalks boiled with coal tar (an odd mixture), moss from the Lake Superior region (said to make excellent paper), and ivory, mixed with pulp.

Among the new materials introduced and in use during the next decade, we find "trash" or refuse of the sugar cane, swamp flag or cat tails, and sedge. Munsell's work on paper making says that, in 1867, the following substances were in actual employment: Manilla hemp, agave of Cuba, cultivated hemp, white hemp of Hayti, India hemp, acacia, cotton, fibers of aloes, jute, Spanish broom, hops, silk weed, down of date tree, flax, Chinese hemp, mallows, mulberry, Chinese nettle, New Zealand flax, esparto grass, linden, yucca, bamboo and cane.

It is related that, during the war, a New York merchant loaded a ship at Alexandria, Egypt, with mummies from the catacombs. On the arrival of the vessel in this country, the cargo was sold to a New England paper manufacturer, who reduced it to pulp, bones, bitumen and all. The fact was well announced by a clergyman in Boston, who, during the course of a sermon, astonished his congregation by remarking that the paper on which his discourse was written might once have been a portion of the Egyptian masters of the Israelites whose sojourn in that land he had just described. Unfortunately for the freshness of our story, this case is also a repetition. At the time, 1866, mummy paper was not new; for, ten years previously, a journal published in Syracuse, N. Y., greatly plumed itself on the circumstance that its issue of a certain date was made from the "ancient habitants of the land of the Pharaohs."

In 1869, *tule*, a product of the swamp lands of California, was tested and found to make a fair quality of paper. The *Annals of Scientific Discovery* for 1870 state that, during the preceding year, the following Asiatic plants were used for paper manufacture: the *tchuma* of Assam; the *rumee* of Malay—identical with the ramie plant now largely cultivated in the South—and the *jeetee*, *moorva* and pineapple of India.

During 1870–1871, patents were granted in this country for the use of wild and cultivated rice, potato pomace mixed with pulp, the vine and tuber of the potato, the bark of coniferous trees from which the resin has been extracted, stalks and fibers of cord grass, the plant *abutilon Avicennæ*, Indian rice or water oats and *agrostis litoralis*. In 1871, the *Mobile Register* was printed on paper made from okra. During the year lately closed, but two patents were obtained, one for the use of *tule*, and the other for that of plants of the *typha* family.

India Rubber Varnish.

There are many substances, among them nitrate of silver, upon which pure india rubber has no deleterious effect. Now, as india rubber dissolves with readiness in chloroform, sulphuric ether, bisulphide of carbon, and caoutchoucine, and as these solvents, when evaporated, leave the rubber firm and unaltered, it is evident that we have in a varnish so composed a means of applying a coating of pure rubber of any degree of thickness to the inside of any vessel, such as a photo bath composed of either ebonite, gutta percha, wood, or any other material of a similar description. From experiments made in this direction, using bisulphide of carbon as the solvent, a coating of rubber of a good quality has been obtained, which will answer most effectively for preventing all contact between the silver solution and the material of which the bath itself is formed.

THE DETROIT RIVER TUNNEL.—The small test or drainage tunnel, preliminary to the construction of the large railway tunnel between Canada and the United States, under the Detroit river at Detroit, Mich., is progressing. The drift has been carried out 1,200 feet from the American shore; the remaining portion from Canada has been carried only 400. It will, however, be completed and the junction made during the present year.

LENS TROUBLES.—If any photo reader be in trouble with a lens—whether a single one or a combination—that gives concentrated flare, let him extemporize a stop of blackened cardboard and try the effect of changing its position with respect to the back lens; for a position will probably be found at last in which the evil will be greatly diminished. As regards diffused flare, due precaution must be taken to have both the edges of the lenses, as well as every internal portion, properly coated with dead black varnish, black velvet being a most excellent material with which to line the inside of the tube.

IMPROVED GRAIN CLEANER.

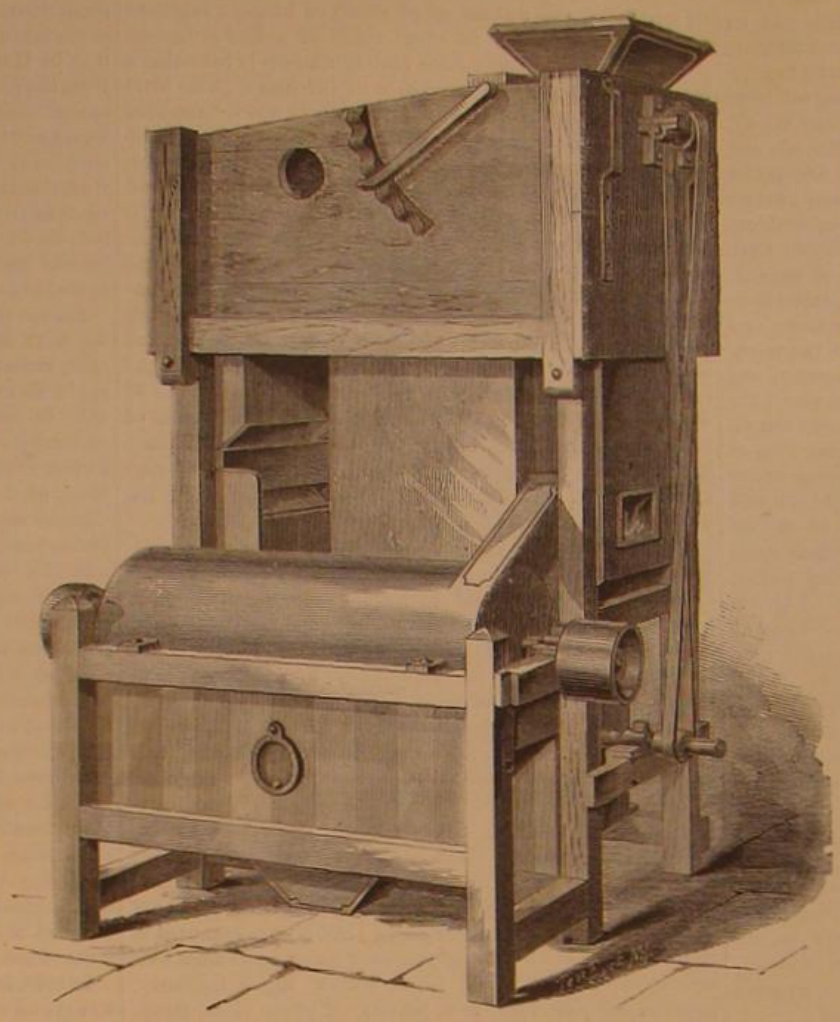
The invention herewith illustrated is known as the California Smutter and Separator, and serves to thoroughly cleanse grain, delivering it in proper condition to feed or grind.

A riddle made of perforated zinc, of dimensions proportionate to the size of the machine, is vibrated by a belt connected with the fan shaft, and serves to remove sticks, stones, long straws, etc., causing them to pass off at the end of the apparatus. The grain, after leaving this appliance, is conducted into an air chamber up which a current of air is drawn by the fan, blowing away smut balls, loose dirt, and similar refuse. The scouring cylinder into which the grain next passes is open at one end, and has a perforated case along the whole length of its under side. The fan draws in a current at the end of this receptacle and through the slots in the case, which carries off all adhesive dirt or smut as soon as loosened from the kernel, besides preventing any further contact of the wheat with the offal. After passing to the other extremity of the scouring cylinder the grain is thrown out of the top side into another air chamber, and again blown, this process completing the operation. The balance of the refuse passes down a lattice work in the receptacle, and escapes clean and free from dust from the hopper under the scourer, the dust being drawn through the lattice into the fan and passed out of the mill.

The machine has a valve in its rear side to graduate the current in the air chambers for heavy or light grain. Opening the valve lessens the suction, and closing it increases the same, thus taking out more cheat and small wheat. The fan case, wings, shafts, and pulleys are made of iron and can be removed and replaced without marring the machine. The scouring cylinder and its surrounding cases are made of heavy iron. The bearings to shafts are supplied with composition boxes and will, it is claimed, run constantly without heating. To afford further security against fire, the combustible material produced by the smut machine is entirely removed, so that the latter can be placed in an open room. By attaching a spout to the mouth of the fan case, the dirt can be conveyed to any convenient place of deposit.

It is claimed that this apparatus is much wider than others, and that the riddles or shoes are larger than usual, covering the entire top. The latter being constructed of perforated zinc instead of wire cloth are said to be much more durable and effective. The grain is conducted on a smooth surface, and evenly distributed in a thin sheet on the perforated part of the riddle by means of a feeder. From the time of its entering the machine the grain is spread over a wide surface, so that it is prevented from bunching, and better separation is insured. It varies in capacity according to size, from 15 to 100 bushels per hour, and requires but little attention when in operation.

For further information address the manufacturers, Messrs. M. Deal & Co., Bucyrus, Ohio.



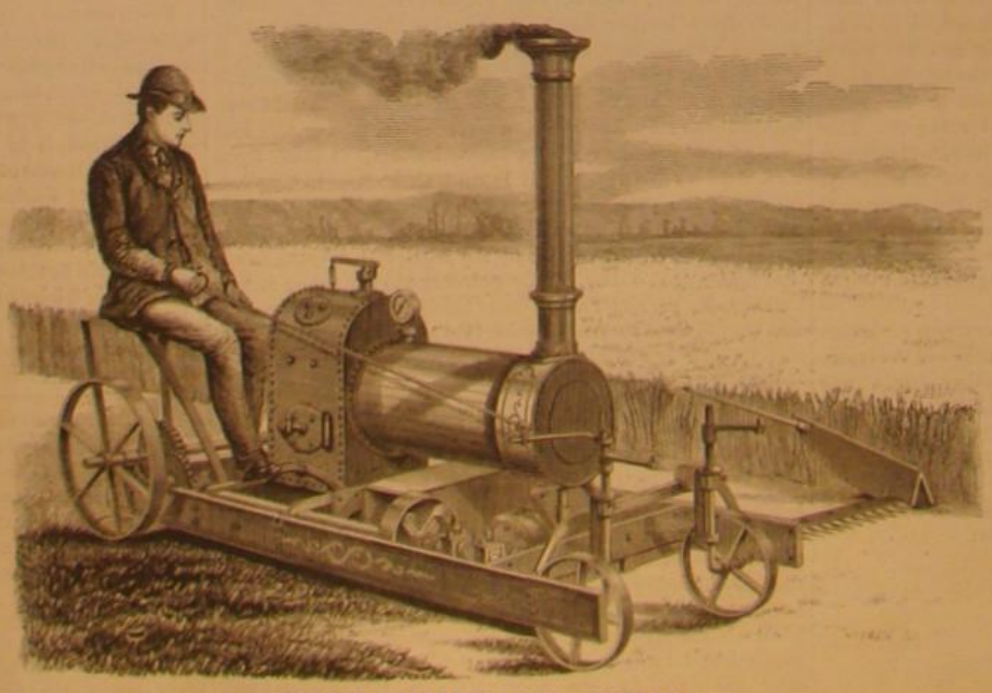
GRAIN CLEANER.

STEAM REAPER AND MOWER.

We are indebted to *Iron* for details relative to the new steam reaper and mower, recently patented by Mr. Edward Hayes, of London, England, which we illustrate herewith.

The implement consists of a boiler and steam engine, erected on a light wrought iron girder frame, the whole being carried on four wheels, of which the two hind wheels are utilized for propulsion and the two fore wheels for steerage and for carrying the cutting apparatus from off the ground. The boiler and engine are specially designed to develope a maximum of power with a minimum of weight; and the steam is used at a pressure of 120 lbs. to the square inch in the boiler. The piston speed is high, and is applied by suitable intervening mechanism to the double motions of actuating the cutter bar and propelling the implements by means of the driving wheels. With the object of not overloading the frame and machine, the storage room for fuel and water is very limited, and arrangements must be made for supplying the tender with these requisites at suitable localities. The machine is worked by two hands, a man to steer and a boy to attend the fire.

This entirely novel invention is self-propelling, and altogether its weight does not exceed that of the combined reaper and mower in every day use. It will be recognized by practical men as a great gain, inasmuch as the horses are exposed to injury and laming in drawing ordinary machines, and this class of work is undoubtedly the most trying to them in the hot weather of harvest time. The farmer will, by the use of this apparatus, not only be enabled to reserve his horses for more advantageous labor, but he will have the means of acting promptly and expeditiously when occasion serves and requires, without reference to the antagonistic influences of weather or man, so far as it is humanly possible.



STEAM REAPER AND MOWER.

Remarkable Photographs from India.

At a recent meeting of the Society of Arts in London, a magic lantern display of transparencies from Captain Lyon's Indian negatives was made The photographic views include every temple of note in the great empire, and may be considered veritable works of art, upon the production of which much scientific labor and patience must have been bestowed. With the intense heat and glaring light, it is not always easy to obtain a satisfactory outdoor photograph in India; and the difficulty of procuring a good perspective in the long corridors of the temples—one of which exceeds seven hundred feet in length—is even greater. One of these temples, near Trichinopoly, is inhabited with 8,000 Brahmins, and is embellished with some of the most wonderful carving in granite that is to be seen. The Mundapum at Madura, which cost five million dollars to build, and of which the galleries are formed of carved pillars, each being solid rock of granite fifteen feet high and of the most exquisite workmanship, is represented with marvelous delicacy of outline, which conveys a very clear idea of the immense time, patience and skilled labor that must have been bestowed upon its erection. The great Juggernaut car, too, constructed out of several smaller ones and carved out of the finest ebony, was presented in several aspects. The Adavea Covill, a temple, the stone of which cannot be chiseled with our present tools: the Tanjore, with its magnificent tower, and the Bull of Shiva, weighing eighty tuns, and brought from a distance of 500 miles, no one knows by what means: tho seven pagodas, with their numerous, unintelligible, and unfinished carvings: and the fakirs, in all their strange and revolting habits: are represented with the clearness of reality and speak of a religious life so intense and universal, with such a wealth of idealism and apparently so little of the sublime, that the mind is lost in wonder. Although India is the most magnificent portion of the British Imperial possessions, comparatively little is known of it.

Dyeing Kid Gloves.

The dye solutions are brushed over a glove drawn smoothly over a wooden hand. In order to dye black, the glove is brushed after washing it with alcohol, dried and brushed with a decoction of logwood, left for ten minutes, and brushed over once more with logwood. After ten minutes the glove is dipped into a *solution of* sulphate of iron, and brushed afterwards with warm water. If the color is not dark enough, add a little fustic or decoction of quercitron in the logwood bath. In place of the sulphate of iron, the nitrate may be better employed. When the glove begins to dry, it is rubbed with a little Provence oil and talcum, laid between flannel and pressed. It is then rubbed again with oil and talcum, and drawn on a wooden hand. The glove must not get black on the inside, consequently none of the dye fluid should reach the inside of the glove. Brown is dyed by brushing on a decoction of fustic, red, and logwood, with a little alum. The quantities of dye stuff to be used are regulated according to the tints. For darkening the color a small quantity of solution of sulphate of iron is used. Morocco red is produced by brushing on a decoction of cochineal, to which a little salt of tin and oxalic acid is added. The tint is easily made darker by adding a little logwood. Gray is produced by brushing on a decoction of sumach, and subsequent treatment with a weak solution of sulphate of iron; greenish gray by the addition of fustic and logwood, also fustic and indigo carmine, to the decoction of sumach. The aniline colors all fix themselves without any further addition by brushing their solutions on the glove. In place of the brush a sponge may be used where it seems suitable. In order to give black a pleasing bluish appearance, after the dyeing it may be washed with a little sal ammoniac. Should the seams in the gloves remain white after dyeing, they are coated with a paste in which a little fat is put.

The Spectrum of the Aurora and of the Zodiacal Light.

J. R. Capron has collected and compared the spectral results given by many of the principal observers, among whom are Schmidt, Barker, Proctor, Smyth, Zöllner, Clar, Lindsay, Herschel and Backhouse, and from these observations he deduces the following remarks, given in *Nature*:

1. That the full spectrum of the aurora consists of seven bright lines or bands and a faint diffused spectrum.

2. That two (perhaps three) of these lines are sharp and well defined, while the others are more or less nebulous.

3. That the red line (which seems to have been accurately positioned by two observers only) is not found to coincide with the spectrum of any known substance or gas.

4. That the yellow green aurora line, and perhaps two other lines, according to one observer, coincide with lines of oxygen; while two lines according to other observers, either all very near to, or actually coincide with, F and G hydrogen, and that to this extent the axiom of Zöllner, that the spectrum of the aurora does not agree with any of the known spectra of the gases of our atmosphere, is challenged.

5. That Zöllner's theory, of the lines or bands in the blue being remains of a continuous spectrum broken up by dark absorption bands, is hardly supported by the other observers.

6. That the aurora spectrum is probably a mixed one, and that the red and yellow green lines are independent spectra; as also may possibly be the corona line and the continuous spectrum crossed with the fainter lines.

7. That the discrepancies in the observations recorded are considerable, and that all the lines (except, perhaps, Angström's), and specially the red one, require further examination to confirm their positions.

THE Westinghouse Pneumatic Car Brake has just been fitted upon a complete train of the London Underground Railway (Metropolitan District Railway) and operates with admirable efficiency. The locomotive superintendent, Mr. Speck, states that it is the best brake ever used on that line and will pay its first cost within a year.

The St. Gothard Tunnel.

The machine piercing of the Swiss tunnel through the Alps commenced last month. The cost of the preliminary arrangements, plant, etc., is estimated at about $400,000. The compression of the air for the rock-boring machines and the machine work of the shops will be effected by hydraulic motors of a combined power of 500 horses. At the northern extremity of the tunnel, there is an available fall of water of about 95 feet, close to the entrance, which will be utilized for turbines. At the southern end the waters of the Tremola, with an available fall of 984 feet, will be turned to account with turbines or by a hydraulic machine with vertical column of water. It is expected that upwards of 100 yards at each end of the tunnel will be driven each month, or considerably over a mile by the end of the year.

The Swiss *Times* says: The first monthly report with reference to the state of the works of the St. Gothard line has just been published. This report, which has already been communicated to the governments interested, shows that on the 31st of December the tunnel at the Göschenen end has been pierced 60 feet, at the Airolo end 336 feet, or nearly 400 feet altogether. At Airolo 43 feet of the masonry of the arch has been completed. The average number of workmen employed during the month of December was 272—171 at Airolo, and 101 at Göschenen. In addition to the work already executed on the tunnel proper, about 60 feet of the cutting at the opening of the tunnel have been completed. At this side the boring has hitherto been entirely through hard granite. At Airolo, although softer descriptions of stone have been met with, operations have been carried on with extreme difficulty, on account of the water filtering very abundantly through the rocks. Strata of dolomite and mica-schist, with veins of quartz, have been met with.

BRIDGE OVER THE MISSOURI RIVER, NEAR LEAVENWORTH, KANSAS.

There is no branch of engineering in which the native genius of America is more effectively displayed than the construction of bridges. The almost illimitable West presents, in its rivers, gorges, and mountain sides, localities difficult enough to trouble the ingenuity and numerous enough to weary the patience of any ordinary mortal. But these things are to our engineers merely opportunities to display their skill and perseverance, and the clever devices and fertile invention of our railroad constructors have always been equal to the occasion, and have elicited the admiration of the civil engineers of the old world. Our present instance is a bridge for both railroad and highway traffic, erected over the river Missouri at a distance of 1¾ miles north of Leavenworth, Kansas. It is entirely of iron, and very substantial; and it presents a fine appearance. The funds required to construct it were principally raised by bonds, which nearly all the prominent citizens personally pledged themselves to redeem, and which were thus negotiated in New York.

Work on the approach was commenced on July 20, 1869, but the piers were not started until October following. On October 20 the first column was placed in position, and on July 1, 1871, the whole substructure was completed. The bridge would have been completed fully twelve months earlier, had not many vexatious delays occurred. The total weight of wrought iron in the bridge is 2,093,300 lbs., and of cast iron 700,417 lbs., making a weight of iron per lineal foot of 2,812 lbs., exclusive of the floor. The bridge consists of three spans, the western and middle being each 340 feet, and the eastern, 314. Being intended for both railway and highway traffic, a single railway track is laid in the middle of the roadway, and the top course of floor planks is laid even with the top of the iron rails, so that wagons can pass freely from one side to the other. The western railroad approach may be considered as extending from the end of the bridge to a point where any railroad desiring can connect with it. This point is about 1,500 feet from the bridge, and is reached by a cutting through a hill, with a maximum depth of 50 feet. The eastern railroad approach commences at the bridge, with a substantial wooden trestle 50 feet high, decreasing in hight to 35 feet in a distance of 1,600 feet; it is then continued by an earth embankment 2,400 feet further, to a point where the grade is but 10 feet above the natural surface, and where all desired railroad connections can be easily made.

The most remarkable feature about the bridge, and the one which, by its comparative cheapness and peculiar adaptation to the conditions of the Missouri river, enabled the work to be undertaken and completed, is the use of pneumatic iron columns for piers. In no case had this principle been carried to such a depth or to so great a hight. How successful the experiment has proved is best seen and appreciated by an inspection of these graceful and substantial piers.

The total cost of the bridge was $800,000. The whole work was planned by the engineer in chief, General W. W. Wright, under whose personal supervision it has been executed.

Rather Foggy.

There often appears in Europe and in some parts of America, a peculiar kind of dry fog which is visible during the early morning of summer days, and is regarded as a presage of fine and warm weather. It is of a reddish tinge and is hardly visible except through distances of several miles, when it appears near or above the horizon in proportion as the dryness and heat of the atmosphere are less or more augmented.

In explanation of this phenomenon, M. Collas, in *Les Mondes*, advances the theory that it is due to the combustion of aerolites or shooting stars. These bodies, coming within the sphere of attraction of the earth, are precipitated to its surface at a speed which is considered to exceed twelve miles per second. By this great rapidity, they are heated, inflamed, and finally volatilized. The vapor thus produced is rapidly condensed into particles so extremely small that they may be regarded as the last limit of the divisibility of solid matter. These descend to the earth with great slowness on account of their tenuity, and are scattered, by the winds, to various quarters where they appear as the dry fogs.

Ruins of the Boston Fire.

Although it is some months since the great fire, the rains and snows of winter have not succeeded in entirely quenching it. In many parts of the burnt district, dense columns of smoke are still ascending, and bright flames dart out from beneath piles of brick and granite. The influence of heat upon various kinds of merchandise found among the ruins has afforded, says the *Boston Journal of Chemistry*, examples of metamorphosis interesting and curious in a high degree. Huge piles of leather in some cases were precipitated into cellars, and so covered with *débris* as to undergo a kind of dry distillation or fusing, out of contact with air. The resultant mass resembles a dry gum, with a clean vitreous fracture, upon the surfaces of which are seen the lines between the hides, like thin strata in a mass of silt. We have a lump of coke, produced from clover seed, which closely resembles cannel coal. It came from a mass of two thousand bushels which tumbled into a cellar, and was subjected to dry distillation under the bricks and mortar. Many other substances have undergone curious changes, and we may allude to some of them at a future time.

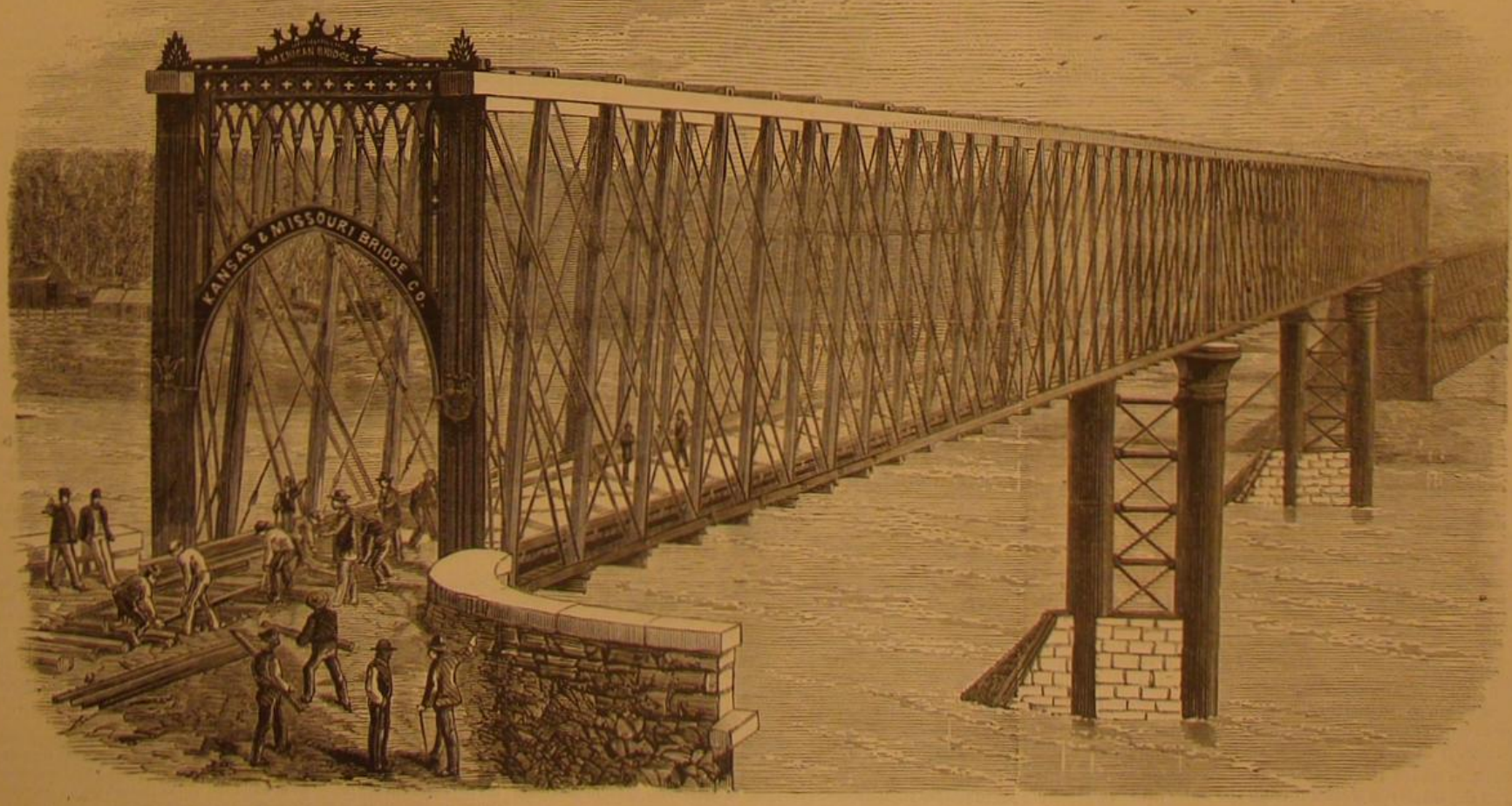
The Bar at the Mouth of the Mississippi.

A correspondent, E. B. B., of Cal., refers to the report of Mr. C. W. Howell, U. S. engineer, on the value of the screw dredging machines employed. He states that between December, 1868 and May, 1869, a channel originally 12 feet in depth was dug down to 17 feet at mean low tide, and nearly to 18 feet at high tide; and to show the efficiency of this apparatus, he mentions that the channel began to fill up when the screw ceased working. In another instance, 22,400 cubic yards of earth was dug out in 28½ hours; a channel was cut to a depth of 19 feet and another to 18 feet 10 inches. The work was done so thoroughly that, during one year, all vessels drawing not more than 19 feet water went over the bar, and one ship of 20 feet draft passed over; and he avers that there has been a depth of from 17 to 19 feet on the bar for three years and more, for proof of which he refers to the official reports of the government engineers.

He quotes these facts to show that Mr. Stewart's statement that costly dredge boats can hardly keep a channel open to a depth of 14 feet is erroneous. The work which he describes was done with Bishop's submarine screw, with spiral boiler-iron scrapers.

Novel Life Preserving Apparatus.

M. Tellier, in *Les Mondes*, proposes a new method for saving shipwrecked persons. His apparatus consists in a life preserving vest, a balloon of a few cubic yards capacity attached to the belt of the swimmer, and a receptacle for holding liquefied ammoniacal gas which is fastened to the life preserver. When the vessel strands, the person to be saved turns a cock which allows the gas to flow through a long rubber tube and distend the balloon. As the latter rises, he jumps overboard. He is then buoyed up by his life-preserving waistcoat and also by the balloon which, being acted upon by the wind, tows him to the shore. By this means, it is suggested that a person might carry a line from the wrecked vessel to the beach, or an apparatus might be devised to contain several individuals who could thus be drawn ashore in safety.



THE GREAT KANSAS AND MISSOURI BRIDGE.

Glycerin in Boilers.

At the last *séance* of the Society of Civil Engineers, Paris, M. E. Asselin recommended the use of glycerin to prevent incrustation in steam boilers.

Glycerin, soluble in water in every proportion, increases the solubility of combinations of lime, and especially of the sulphate; it appears, besides, to form with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor form with the glycerin soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. Moreover, the gelatinous substances thus formed are not carried with the steam into the cylinder of the engine.

M. Asselin advises the employment of one pound of glycerin for every 300 or 400 pounds of coal burnt, fifteen days supply being introduced at once. From trials made with boilers fed with bad water, it was proved that the glycerin combined with all the salts, and left the plates perfectly clean.

Sewing Machine Sales.

The sales of sewing machines in 1872, just reported, show, says the New York *Sun*, the following remarkable results:

	Machines
Singer Manufacturing Company sold	219,758
Wheeler & Wilson Manufacturing Company sold	174,088
Howe Machine Company (estimated) sold	145,000
Grover & Baker Sewing Machine Company sold	52,010
Domestic Sewing Machine Company sold	49,554
Weed Sewing Machine Company sold	42,444
Willcox & Gibbs Sewing Machine Company sold	33,639
Wilson Sewing Machine Company sold	22,666
Amer. B. H. O. & Sewing Machine sold	18,930
Gold Medal Sewing Machine Company sold	18,897
Florence Sewing Machine Company sold	15,793
B. P. Howe Sewing Machine Company sold	14,907
Victor Sewing Machine Company sold	11,901
Davis Sewing Machine Company sold	11,376
Blees Sewing Machine Company sold	6,053
Remington Empire Sewing Machine Company sold	4,982
J. E. Braunsdorff & Co. sold	4,262
Keystone Sewing Machine Company sold	2,665
Bartlett Reversible Sewing Machine Company sold	1,000
Bartram & Fanton Manufacturing Company sold	1,000
Secor Sewing Machine Company sold	811

DURING the recent session of the National Academy of Science, at Cambridge, Mass., Professor Mayer gave some interesting information regarding the effect of magnetism on iron: He states that he has discovered, by means of the Saxton comparator, that rods of iron suffered a permanent elongation by magnetization of one hundred and fifty millionths of an inch. English refined iron gave the maximum of elongation, scrap iron, the minimum. Whether the current was gradually increased in intensity, or whether it was sent full charge at once, it produced the same degree of elongation. With one cell the elongation took place in six tenths of a second; with 25 cells it took place in two tenths of a second. Professor Pierce thought if the elongation of iron under magnetization were true, it might make its effect on the earth in an appreciable difference in the length of the day. This could be detected by astronomy. A change in the day of seven hundredths of a second would be perfectly easy to discover now.

A CORRESPONDENT, C. B. of Newark, N. J., thinks, when he pays a few cents for a copy of our journal (which, he says, is worth ten times its price), that he can lighten our labors by sending us information occasionally. He states that our recent article on the experimental canal boats has caused an excitement in Newark, where it is stated that the Baxter is the only boat that has fulfilled the legal requirement, having made three full trips each way, with a cargo in excess of the stipulated tunnage, at a rate of over three miles an hour through the canal. The Newarkers claim the prize for her. He also states that Mr. H. M. Paine has returned to Newark, and is engaged on an electro-motor for sewing machines. Another item of interest is an account of the reinvention of the engine with its cylinders curved longitudinally, a form applied on the U. S. frigate Princeton, thirty years ago. A Newark firm has constructed such an engine to order, and is patiently waiting for the "inventor" to fetch it away.

ROSE CUTTINGS.—The most certain way of rooting rose cuttings is by bending the shoots and inserting both ends into the ground, leaving a single bud uncovered at the middle and on the surface of the ground. The cuttings are about ten inches long, and are bent over a stick laid flat on the ground, holes being dug on each side of the stick for the reception of the ends of the shoot. The roots form only at the lower end of the shoot, but the other end, being buried, prevents evaporation and drying up.

THE *London Times* says that the recent transmission of the Queen's speech throughout England evidenced some very rapid telegraphing. The document contained 858 words, and reached York, a distance of about 200 miles, in six minutes and a half. Wheatstone's automatic instruments were used. The above is at the speed of 132 words per minute.

THE Atlantic cable companies and also the Western Union Telegraph company have, we learn, consented to the free transmission of dispatches relative to astronomical discoveries to and from the Smithsonian Institute in Washington. The object of telegraphic communication is to avoid the difficulties which might supervene from the change of position of the observed bodies during the interval required for postal correspondence.

A number of very severe tests were recently applied in England, to dynamite with a view of showing that it could be safely transported on one of the principal railroad lines. It is stated that no explosion occurred when a box containing five hundred weight of sand was dropped from a hight of forty feet upon a mass of cartridges, although the latter were badly crushed and broken. It was also proved that a fire in a railway train containing dynamite need not cause any more anxiety than would be experienced from a conflagration of ordinary timber or similar material. A fifty pound box of the substance thrown into a bonfire burned with a powerful flame for two or three minutes, but no explosion took place. Loose cartridges laid upon rails exploded when run over by cars, but loose dynamite sprinkled near them was unaffected.

The John Leland cheese factory, at Cheshire, used up 1,046,210 pounds of milk, last year, producing 104,976 pounds of cheese, or a pound of cheese for each 9 $\frac{9}{10}$ pounds of milk. The receipts were $12,786, and the stock pays 9 per cent in dividends.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From February 4 to February 10, 1873, inclusive.

ENGINE VALVES, ETC.—G. F. Blake, Boston, Mass. (Two patents.)
FIRE ARM.—H. Berdan, New York city.
HAT.—R. Eickemeyer, Yonkers, N. Y.
HEAT DISTRIBUTOR.—D. Shedd, New York city.
HOE.—M. Csokerly, Baxter Springs, Kan.
KILN.—A. Morand, Brooklyn, N. Y.
LINING BOARD, ETC.—G. S. Levy, New York city.
MAKING SCREWS.—J. A. Ayres, Hartford, Conn.
PENCIL AND ERASER.—J. Reckendorfer, New York city.
PRESS, ETC.—B. G. Martin, New York city.
SEEDING RAISINS.—C. Dixon, New York city.
SCREW PROPELLER.—J. L. Cathcart, Washington, D. C., J. S. Negley, Pittsburgh, Pa.
TREADLE MOTION.—G. B. Kirkham, New York city.
UNIVERSAL TOOL.—W. L. Grout, Boston, Mass.

NEW BOOKS AND PUBLICATIONS.

THE ILLUSTRATED ANNUAL OF PHRENOLOGY AND PHYSIOLOGY FOR 1873. By S. R. Wells, Publisher of the "Phrenological Journal" and the "Science of Health." 25 cents. New York: Samuel R. Wells, 389 Broadway.

A neat little book, the character of which is indicated by its title and place of publication.

BREAD-AND-CHEESE AND KISSES. By B. L. Fargeon. Illustrated. Harper & Brothers, Franklin Square, New York.

A pleasant story, beautifully told. The publishers have hardly done justice to its merits, as the illustrations are simply execrable.

Recent American and Foreign Patents.

Improved Snow Ram for Railroads.

William C. A. Frerichs, Tottenville, N. Y.—The invention consists in a tunneling snow ram for railroads. The forward end of the ram is made wedge-shaped, and the top is curved and extends up to or a little above the top of the body of the ram. The sides of the hood project so that the said hood may form a tunnel larger than the body of the ram. In the rear part of the body is placed a suitable engine to drive fan blowers. In the forward part of the body are placed two furnaces into the upper parts of which the blast from the fan blower is introduced, to be heated and driven out through pipes which pass into the space beneath the hood. The furnaces are surrounded by an air-tight space into which the blast from the other fan blower is introduced. This air circulates around the furnaces, becomes heated and is designed to keep the outer surface of the hood sufficiently heated to prevent the snow from sticking to it, and to cause the snow to pack. The smoke stacks are hinged so that when the ram is at work they may be turned down out of the way. The bodies of the cars readily pass through the tunnel formed by said ram. To the sides of the car bodies are attached plates which project down nearly to the track to guard against any snow slide passing in beneath the cars and clogging them. The spaces between the platforms of the adjacent cars, at the sides and top, are shut in by plates overlapping each other, and connected with each other and with the cars by springs, to give them the necessary elasticity for passing around curves, etc.

Improved Car Starter.

James J. Wheeler, Grinnell, Iowa.—This invention consists of a small frame of two legs, connected together by suitable cross bars. Each leg has a clamping foot adapted for clamping the head of a rail—one acting when forced downward, and the other when raised upward. On said frame is a drum and crank, with a rope or chain for hitching to the car, which is thus moved by winding the chain or rope on the drum. The frame is confined on the rail by the clamps, which are caused to hold fast to the rail by the one next to the car being forced down on the rail by the strain upon the rope or chain, and the other by being forced upward by the said strain.

Improved Truck Barrow.

James J. Richardson, Marion, S. C.—This invention relates to an improvement in barrows or trucks of the class in which the wheels are arranged under the body of the truck; and it consists in the arrangement of a cross bar to scrape the wheels of the barrow and connect its sides. The wheels are arranged to revolve on a stationary shaft secured on the under side of handle rails. The front posts mortised into the upturned ends of the handle rails support the removable front boards and the forward ends of the side boards. A cross piece standing edgewise is provided by which the bottom ends of the posts are connected, and the wheels scraped. This arrangement raises the bottom and allows the weight or load on the barrow or truck to rest directly over the wheels. This allows the barrow to be used as a truck, the load in either case being discharged over the front end when desired. In handling cotton bales and other heavy articles the side boards are removed, and such articles are loaded and discharged as when a truck is used. Braces and straps of iron are applied wherever necessary to strengthen the connections, and add to the durability of the combined articles. Thin pieces of sheet metal are attached to the forward cross piece opposite the wheels, the design of which is to scrape the tires or peripheries of the wheels, and thus keep them clear of mud, mortar, or other adhering matter.

Improved Bottle Stopper.

Herman F. Reiner, Blairsville, Pa.—This invention has for its object to furnish a stopper for bottles which shall be so constructed that the influx or efflux of liquids is rendered possible without the removal of the stopper from the bottle. The invention consists in the employment of a stopper composed of a metallic tapering tube which is provided with a horizontal central flange and with a bayonet slot for receiving and securing the vertical stem of a conical disk valve, by the movement of which stem the valve is opened or closed to admit of the induction and discharge of liquids.

Spring Attachment to Car Windows.

George Cornwall, Brooklyn, N. Y.—This invention relates to a spring attachment to the sashes of car windows, and more particularly to such sashes as are let down into boxes of the car frame when opened. The invention consists in the application to each upper end of the sash of one or more U-shaped inverted springs, whose ends are fastened to the faces of the sash, while their upper rounded parts project above the sash and come in contact with the frame of the window to prevent rattling either in closed or open positions of the sash, and to adapt them to serve as handles for raising and lowering the sashes.

Improved Cultivator.

Amos B. Colver and John Priest, Albany, Oregon.—This invention consists of a triangular cultivator with an adjustable device for varying the depth of the furrows by shifting and maintaining it at different hights on a truck of two wheels at the rear, and a caster wheel at the front; for raising it above the ground, and supporting it for moving it on the road.

Improved Sewing Machine Cover Hook.

John C. Egly, Philadelphia, Pa.—This invention relates to a new means of applying a hook fastening to the cover of a sewing machine table, so that if the wood of the cover or table should shrink or warp the fastening may be readily adjusted to the change. It consists in making the hook adjustable in a recess of the table, and in combining it with a slotted plate, whereby it is held in place. The shank of this hook is made in the form of a flat rectangular plate, to fit a mortise in the table, wherein it has backward and forward play. A plate is fitted to the table as a cover to this mortise, and is fastened by screws so that it bears upon the shank. The hook proper projects through a slot of this plate. When the desired position has been assigned to the hook, the plate is firmly screwed down, and bears upon the shank so as to hold the hook in place. If the table or cover should shrink so as to require the readjustment of the hook, it is only necessary to slightly loosen the plate, reset the hook, and then refasten it. This invention also makes it convenient to fit covers to tables when either is not of the exact size required.

Improved Dish Washing Machine.

Joseph Usher, West Albany, N. Y.—This invention has for its object to furnish an improved machine for washing dishes, which shall be so constructed as to wash the dishes quickly and thoroughly. In using the machine, the dishes to be washed are arranged and secured in a frame, and placed in a metal case which rests on gudgeons which pass through holes and revolve in bearings in an outer box. A quantity of water, or soap and water, is then placed in the case and the door is closed and secured. The case and its contents are then revolved a few times—first in one direction and then in the other—which quickly cleans the dishes. The door is then unfastened, and the case is turned, allowing the water to run off. A quantity of clean water is then poured into the case and the dishes are rinsed in the same manner as they were washed, after which the rinsing water is emptied out in the same manner as washing water, and the frame and the dishes are removed and placed in a drawer beneath. When the dishes are to be used they are removed from the frame and wiped with a clean cloth.

Improved Wood Pavement.

Mary H. Alexander, Newark, N. J.—This invention consists in making a pavement of a series of wedge shaped blocks, flat on top, notched across one of the upper ends, and driven into the soil at right angles to each other, so that each one may be supported by another, braced lengthwise against each of its opposite ends. The object of the corner notch is to bring the filling spaces in small zigzags or right angled triangles, and thus afford good foot hold without the necessity of cutting away the block too much or wasting the filling. This would seem to be an important improvement and advance in wood pavements.

Improved Paper Box.

Moses W. Dillingham, Amsterdam, N. Y.—The object of this invention is to provide convenient and efficient means for holding the covers to paper boxes without tying them, and it consists in pieces of pasteboard or other suitable material attached to the box and to the cover. On the outside of opposite sides of the box, or on one or two of the corners and one of the ends or sides, are attached strips of pasteboard at or near the upper edge. On the inside of the cover are also attached similar pieces, arranged to correspond in position with the pieces on the box and so that there shall be a recess for each piece on the box, and so that any two of such pieces—one on the box and one on the cover—shall engage with each other, and thereby hold the cover securely to the box.

Improved Horse Power.

Zachariah P. Landrum, Columbus, Miss.—The invention consists in a new mode of applying the levers to horse powers so that the length of power arm to that of weight arm can be increased without requiring any greater space for the sweeps, thereby giving great leverage and enabling one pair of horses to do easily what heretofore two have done with difficulty. This invention affords a very convenient and smoothly working horse power, which has been practically tested and received by the public with great favor.

Improved Corn Coverer.

John Tweedy, Vernon, Ind.—The invention consists in combining a clod mover with a leveler and pair of covering plows, and in the means of attaching and holding it in position. The plows are inclined inward so as to throw the soil into the furrow and cover the corn. The end parts of a semicircular or arched mold board are attached to the lower parts of the standards, and are so formed as to round up or ridge the soil over the corn so as to prevent the corn from being carried off by the crows, and to prevent the soil from being washed away by the rain. The sod mover or leveler is formed by attaching two side plates, at their upper edges, to the side edges of a small triangular top plate, which meet in a sharp inclined edge, so that the said device may be V-shaped in its horizontal section. The clod mover may be adjusted forward or back, as may be desired, and moves along the top of the ridge and pushes off the clods, sods, and other obstructions that might impede the corn in coming up, and thus leaves the top of the ridge in proper condition.

Improved Sugar Cane Cultivator.

Alcide Trouard, New Orleans, La.—A wood or metal cylinder is provided or set with teeth having sharp or curved arrow-shaped points. The cylinder revolves around an axle, which is mounted or journaled in levers that are pivoted at their forward ends to the frame bars, and are adjustable vertically at their rear ends. The bars with the cross bars, constitute the frame proper of the machine, which is supported on runners made in the form of ordinary sled runners. Horizontal bars or rods are provided for cleaning the teeth of the cylinder. Before the machine can be used the stubble is barred off by running a plow on each side of the row. A shaver on slides is then run in the furrows to shave or slice off the stubble to an even length. This machine is then run in the same furrows, and the hook teeth of the cylinder enter between the stubble stalks and grub or pick out the earth. The cylinder is adjusted vertically to correspond to the condition of the soil or stubble.

Improved Glove.

Edwin V. Whitaker, Gloversville, N. Y.—The invention relates to gloves made with leather palms and cloth backs, and consists in cutting a glove with the thumb and all the forgets, except for middle finger, in the same piece with the palm. The purpose is to economise the material, give the exact relative quantity of leather to each, and make the forgets seamless at the points between the fingers. A much smoother and more accurate fit may thus be given to gloves, while the irdurability is also greatly increased.

Improved Meat Chopper.

Jesse Battey, Manchester, N. J.—This invention consists of a novel contrivance of pawls and a shifting device with a ratchet bar having two sets of ratchet teeth, reversed as to each other, for moving the chopping box and reversing it from one direction to the other. The invention also consists of an intermittingly reciprocating square chopping box, combined with a vertically moving blade and a carrier for the box, in such manner that the box can be turned a quarter of a revolution, and thereby be presented to the blade so that the meat will be chopped crosswise.

Improved Inkstand.

James B. Thurston and Frank M. West, New York city.—The invention relates to an improvement in the class of inkstands or holders in which two or more receptacles are arranged to be revolved around a central axis to bring them successively or at pleasure under an opening in a cover; and it consists in suspending the ink receptacles by their upper edges from a perforated disk or plate adapted to revolve in contact with the under side of the cover of the inkstand, and in the arrangement of a spring and lug or projection of the cover for locking the revolving disk.

Improved Paper File.

Emanuel Motz, Woodward, Pa.—This invention relates to an improved device for holding newspapers or other papers filed, and consists in the combination of a rod with a binding string and winding pin, the bar furnishing the rigid back for the papers filed, while the string ties the papers together and to the file, the pin holding the string in proper tension.

Improved Binders' Table for Harvesters.

James H. Smith, Orford, Iowa.—This invention consists in converting the tables combined with a binding trough and platform for a harvester attachment for binding grain into a bundle-carrying and dumping attachment, the tables being hinged to the binding attachment and connected with tilting levers peculiarly arranged, whereby the bundles may be dumped upon the ground by the driver when a quantity sufficient for a shock has accumulated. The tables for receiving and carrying the bundles are made much larger than heretofore, and hinged so that they can be used to hold and carry the bundles and tilted to dump them. They are connected to tilting levers, pivoted to an extension of the frame above the carrier by rods. This extension of the frame is arranged by the side of the seat where the lever, which is provided with a handle, can be conveniently reached by the driver to tilt the tables. Said levers are connected together by a pin in one and a slot in the other, so that both are actuated by one and the same operation of the handle The spring is arranged with one lever to throw the tables back after being tilted. The tables have numerous stud pins projecting upward to hold the bundles, so that they will not be shaken off while being carried to accumulate a sufficient quantity for a shock. By this contrivance the labor of gathering single bundles together in shocks by hand is saved.

Improved Chromatic Printing Press Attachment.

Edward A. Howitt, Whitewater, Wis.—This invention relates to printing presses with movable inking disks; and consists in the application to the face of the disk of metal straps, readily removable and quickly applied.

Device for Producing Pearl Finish on Metallic Surfaces.

Bernhard D. Belderbase and Charles Witteck, New York city.—The object of this invention is to provide means for producing what is known as "pearl finish" on metallic surfaces; and it consists in a head with one or more projecting clusters of wire therein, the device being more especially designed for the inside of silver or other metallic vessels, but applicable to the outside also.

Device for Producing Satin Finish on Metallic Surfaces.

Bernhard D. Belderbase and Charles Witteck, New York city.—This invention relates to the finishing of metallic surfaces, whether the outside or inside surfaces of vessels or flat or irregularly formed plates; and it consists in one or more clusters of wire connected with screw eyes or loops attached to a head which is screwed to the end of a revolving mandrel, the said cluster of wire being connected with the said screw eyes by means of loose plates in such a manner that when the head is rapidly revolved the clusters of wire will fly out radially by centrifugal force, and present a series of metallic points, which, when in contact with a metallic surface, will make slight indentations therein and produce what is known as the "satin or pearl finish."

Improved Blackboard Eraser.

Winfield S. Read, Oakland, Cal.—The object of this invention is to furnish convenient and efficient means for erasing the chalk marks from blackboards in school rooms and similar places; and it consists in a pad formed with a wooden back and a corduroy or ribbed face. The advantage of this corduroy or ribbed covering is that the chalk dust will be detached from the blackboard by the ribs and will find a lodgment in the grooves between, whence it readily drops into the chalk box below.

Improved Combined Tobacco Box and Match Box.

Charles Remhof, Brooklyn, E. D., N. Y.—The invention consists of a combined tobacco box and match safe. It is a sheet metal box, partitioned for the reception of a match drawer, said drawer having a retaining check, and the the ribs, hinged sides of the box being braced by said partition.

Improved Plow.

Joseph W. Reed, Careyville, Mo.—This invention has for its object to furnish an improved plow for breaking up prairie sod, which shall be so constructed as to be of easier draft than plows as heretofore constructed, while doing the work equally well, so that two horses may do with ease the work which requires three or four horses when the ordinary plows are used. The land side handle is bolted to the rear end of the plow beam and its lower end is bolted to the rear part of the landside. The mold board handle is connected with the handle by rounds, and the lower end of it is bolted to the rear part of the mold board. The upper end of the standard is bolted to the beam and its lower end is bolted to the land side. The bed plate is made wide, so that it may receive and support the rear part of the share and the forward part of the mold board. It is also made thin and is welded to the land side, so that it may be close down to the bottom of the furrow, and its outer end projects to the outer part of the share so as to fully support it. The land side is made long, so that the share may project forward about six inches further than an ordinary plow. This enables the share and mold board to be made with such a gradual rise that they may pass the standard about three inches lower than in an ordinary plow.

Improved Rotary Churn.

Wilson McClure, Sinking Spring, O.—This invention has for its object to furnish an improved churn, simple in construction, convenient in use, effective in operation, and not liable to get out of order; and it consists in a box which rests upon legs which are so formed that their upper parts, when left free, may stand out from the sides of the box. Rods are placed so as to press the sides against the end edges of the ends from the bottom to the top of the box, by which construction the shrinking and swelling of the wood will not tend to open the seams of the box, but will only vary its hight. The upper rod moves up and down with the swelling and shrinking of the wood without affecting the tension of the rods or allowing the joints to open. To the dasher shaft are attached four pairs of radial arms. To the alternate pairs of radial arms are attached two round bars, at a little distance apart; and to the other pairs of arms is attached a round bar, in such a position as to be opposite the space between the round bars of the other pairs of arms. The part of the round bars between the arms is made hollow and is filled with heavy material, to cause the dasher to strike the milk harder and heavier and to give it a steadier motion, adapting it to serve as a fly wheel. In one end of the dasher shaft is inserted a pivot, which is held out by a coiled spring inserted in a recess in the end of said shaft. In the other end of the shaft is formed a square socket to receive the squared inner end of the pivot which rests against the inner surface of the side of the box against which it is gently pressed by the action of the spring pivot to assist in preventing the escape of milk through the hole in which said pivot works. By suitable construction, as the box swells and shrinks, by loosening a screw the drive wheel may be adjusted to always gear properly into the gear wheel.

Improved Hose Bridge.

Gilbert J. Orr and Charles E. Gildersleve, of New York city.—This invention has for its object to furnish an improved device for enabling street cars to readily pass over hose stretched across the street, so that the cars and passengers need not be detained. The middle part of the body of the bridge is made parallel or nearly parallel with the rail, and its end parts incline downward to said rail upon which they rest. The upper surface of the bridge may be made simply with an upwardly projecting part for the tread of the car wheels to run upon, and for the flange of said wheels to bear against. The ends of the bridge must be made to correspond with and fit closely upon the rail so that the car wheels may pass readily from and to the said rail bridge. Upon the lower surface of the end parts of the bridge are formed projections to serve as guides in adjusting said bridge upon the said rail. Upon the lower surface of the end parts of the said bridge are formed, or to it are attached, lugs to bear against the flange of the rail and sustain the side pressure. The central part of the bridge is left open to enable one, two, or more hose to be passed through. To the middle part of the bridge is rigidly attached a downward projecting arm of such a length that its lower end may rest upon the flange of the rail, and upon said lower end is formed a jaw to rest against the inner side of the said rail. Directly opposite the arm is formed a lug, to which is hinged another arm which is made of such a length that its lower end may rest upon the outer part of the rail, and which lower end has a jaw formed upon it to rest against the outer side of the rail. The jaws are made of steel, and their faces are roughened to enable them to take a firm hold upon the sides of the rail. By suitable construction, when the bridge has been adjusted upon the rail, by one or two turns of a screw it will be clamped securely to said rail, so that it will not be moved by the car wheels as they run upon and from it. The iron part or rail of the bridge may be made hollow or tubular, if desired, to give it lightness while possessing the necessary strength.

Improved Bottle Stopper.

David M. Cumings, Newburyport, Mass.—This invention relates to an improved device for fastening stoppers in bottles. The stopper is made of suitable material fastened to a metallic center pin, and its shape is cylindrical, with an enlarged upper end. An elastic collar or covering surrounds the entire stopper on all sides except the bottom. The pin has a flange which rests on top of the elastic collar. The lower end of the pin forms a rivet head against the lower end of the stopper. A double wire yoke is hinged to a ring which embraces the neck of the bottle and is connected with the pin and stopper. To another ring that embraces the neck of the bottle, is hinged a lever which has a projecting arm. When the stopper has been inserted within the mouth of the bottle the lever is swung up, and its arm crowded over the horizontal end of the yoke. It thereby tends to force the yoke, with its appendages, down, while the lever itself and ring are drawn up. In this way the stopper is forced into the bottle and held therein. The lever being locked in the yoke, the enlarged outer part of the collar is forced out or up within the mouth of the bottle, and thereby serves to seal and close the same hermetically.

Improved Car Coupling Attachment.

William G. Brown and James W. Jedkins, Monmouth, Maine.—This invention has for its object to furnish an improved device by means of which the operation of coupling the cars may be simple, easy, and perfectly safe. In the outer end of the draw bar is formed the cavity to receive the coupling link, through which the coupling pin passes in the ordinary manner. The ends of a bail are pivoted to the opposite sides of the draw head. This bail is made of such a length that it may move up and down in front of the bumper head, and to its arms are secured downwardly projecting arms, to the lower ends of which are pivoted the forward ends of the connecting bars, the rear ends of which are pivoted to the lower end of the levers which connect with a shaft and operating lever. A spring is coiled around the shaft and one of its ends is secured to said shaft. The other end of the spring is secured to the car frame so as to hold the said shaft securely, except when operated to raise the bail. Upon the outer ends of the shaft are formed levers which are curved downward, rearward, and upward, so that when the bail is lowered they may be entirely out of the way, and may be conveniently grasped to raise the bail, and thus raise the link so that it will surely enter the bumper head of the adjacent car. To the forward part or bow of the bail are attached or upon it are formed two arms, which project forward and downward so that, as the cars are run together, should the attendant neglect to lower the bail, the bumper of the adjacent car may strike the arms and push the bail down so that it may not be struck and injured by the bumper heads as they come together.

Improved Cotton Planter.

William E. Rhodes, Darlington Court House, S. C.—This invention consists in improving cotton planters so that they may be more practical in operation. The dropping wheel is made of such a size that its upper side may project into the hopper to take out the seed. In the face of the dropping wheel are formed notches to receive the seed and carry it out of the hopper. These notches, when the seed is to be dropped in drills, are continued all around the wheel. When the seed is to be dropped in hills one or more notches are made in the wheel, according to the required distance apart of the hills. To the upper side beam is attached a slotted plate, to prevent the beam from being worn by the wheel, and to prevent any seed from escaping at the sides of the said wheel. The size of the opening through which the seed is carried out is regulated by an adjustable slide. The hopper to receive the seed is attached to the rear end of the beam, so that the said beam may serve as a bottom to the hopper. A spout is attached to the lower side of the beam to receive the seed from the wheel and guide it into the channel made by the drill opener, which may be readily adjusted to open the drill to the desired depth. To the opposite sides of the drill opener are attached wings to push back clods, coarse manure, and other substances that might impede the proper operation of the machine. To the middle part of the upper side of the covering block is attached the lower end of a bar, by adjusting which the coverer may be adjusted to bear with any desired force upon the ground, or raised from the ground as may be desired. To the axle at one side of the hopper is attached a gearing which revolves a shaft in bearings in the sides of the hopper, and to which, within said hopper, are attached radial fingers which, as the machine is drawn forward, keep the seed in the lower part of the hopper stirred up so that it may be carried out by the wheel uniformly. In the rear side of the hopper is formed a hole closed by a slide, wholly or partially left open by a pin which passes through holes. The slide is designed for use in regulating the amount of seed sown, so that the machine may be adjusted to sow more or less seed, as may be desired, without stopping the horse.

Improved Sewing Machine Chair.

Franklin Chichester, Milwaukee, Wis.—This invention has for its object to furnish an improved sewing machine chair which shall be provided with a yielding back, and so constructed that it may be adjusted in hight or inclination as the convenience of the operator may require. The pedestal may be of any desired form. To it is secured a nut to receive a screw, by turning which the chair seat may be raised and lowered as desired. The upper end of the screw is formed upon a cross bar, to the ends of which is pivoted the seat frame. By suitable mechanism the chair seat may be tilted or adjusted at any desired inclination or in a horizontal position, as may be desired. To the cross bar or spider is attached a spring connected with the seat frame, so as to tend to tilt the seat frame back. The chair may be used as a spring rocker. The lower part of the back is so arranged as to always adjust itself to and support the back of the operator.

Improved Earth Closet.

John L. Young, New York city.—This invention consists in spouts for distributing earth, in operating the ring soil carriers by means of rack and pawl connected with cover, and in operating said carriers in reverse directions. The distributing spouts are directly above the bucket, and rest on the top of the chest. These spouts are cut from a sheet metal plate which forms the bottom of the reservoir, the center of the plate being cut away. The dry earth is introduced into the hollow back, the base of which is in connection with the space above the chest from the reservoir. To carry the earth contained in the reservoir to the spouts two rings are employed, which are revolved on the bottom of the reservoir by means of pawls which are operated by the cover, ratchet notches being cut in the top edges of each of the rings. The lower edges of these rings are cut and bent to form buckets for carrying the earth toward the center as they are revolved.

Improved Harvester.

Christopher Lidren, La Fayette, Ind., assignor to himself and R. Jackson, of same place.—This invention consists of a pair of grab and carrying rakes suspended from a crane which is mounted on the platform of a two wheeled machine hinged to the truck frame. The crane may be any shaft arranged to swing it forward and back, and so adjusted as to hold the grab rakes during the time they are gathering the grain into a gavel, and also while they are detaining it. The rakes are so arranged, and have rakes to actuate them so contrived, that they are presented in an open condition above the grain on the platform at either end of the latter; they are then dropped down so that the ends of the fingers project below the grain through openings in the platform; then brought together at the middle, moving parallel, or nearly so, to the plane of the platform, raking the grain together in a gavel and securing it. They are next raised and swung around to the rear, and lowered and opened to discharge the gavel, after which they are thrown out of gear and allowed to remain until grain enough for another gavel has fallen on the platform, when they are put in gear again, raised, swung forward over the grain, and presented for taking another gavel, as before. The swinging of the crane is effected and the mechanism for raising, lowering, opening, and closing the rakes is so contrived and actuated by cams of peculiar construction on the axle that the whole is exceedingly simple in construction, and the operation is in no way impaired or hindered by the oscillations of the platform and the truck relatively to each other.

Improved Street Car.

William T. Jenks, Toledo, Ohio.—The object of this invention is to so construct the cars of street railroads that the body of the car may be reversed without the use of a turntable and without detaching the horses. A wheel is rigidly attached to the top of the frame of the truck, in the center of which is the king bolt. This wheel is made in two parts, or with a projecting flange on its rim. On the bottom of the car is a wheel of corresponding diameter. Hooks are attached to the bottom of the car, which hook over the projecting flange and hold the two wheels in contact, the wheel being the foundation upon which the body rests, and the king bolt the center upon which it turns. A spring lever is arranged on the front platform of the car, having a foot piece at its front end and a stop pin at the back end. A spring, which bears upward against the forward end of the lever with a constant pressure, throws the pin down, so that it engages with holes in the wheel when either end of the body is in proper position To reverse the car, all the driver has to do is to bear with his foot upon the foot piece while he turns his horse round half a revolution to the other end of the truck. This action reverses the car, the team or horse being attached to the end of a draft bar, which is fast to the bottom of the car. The brake lever is connected to the king bolt as a fulcrum. The advantages over the ordinary street car are that the driver always occupies the same platform and the same position in regard to the fare box, and the heavy expense of a turntable is avoided.

Improved Extension Table.

Mathias Hofmann, Darlington, Wis.—This invention relates to a new construction of extension table. The table top is connected by toggle joints with the extension frames that constitute the table frame. Legs, in suitable number, support the table frame at proper hight. Each of the two frames supports, near its outer end, a plate, which, when the table is contracted, is directly under the top. When, however, the two frames are drawn apart, the top drops between the two plates and on a level with them so that then these plates form extensions of the table top. In order to contract the extended table, the top must first be raised to enable the plates to pass under it. When the table is contracted, the leaves may be doubled, being jointed for that purpose, so that their outer sections are placed horizontally against the ends of the top to furnish short extensions thereof.

Improved Milk Cooler.

Frank S. Oakes, Cattaraugus, N. Y.—This invention relates to a new apparatus for cooling the milk of which the cream is to be used for churning. It consists in so arranging water conducting pipes that the warmest milk and coolest water, and *vice versa*, will always be in the same or approximately the same plane or locality. The milk chamber or vessel in which the milk is to be cooled is made of sheet metal, of rectangular form. A water chamber surrounds the vessel and holds the same suspended by means of an inner flange. The discharge pipe projects from the bottom of the vessel through a hole in the bottom of the water chamber, and is packed by a rubber plate. A plug closes the discharge pipe. The bottom of the vessel is, a or near the middle, carried up to form a sort of partition. The partition is double, and contains two horizontal water conduits. The cold water is poured into the upper pipe through an inclined spout, and flows along the same, thence down into the water space within the water chamber. The coldest water, being first applied to the upper part of the elevated bottom, affects thus the upper stratum of milk. The warm part of the water ascends and finally flows out of the top of the vessel through a pipe. The partition is perforated, so that the milk can circulate from one side to the other of the vessel. In large dairies several of these devices are placed side by side, one slightly lower than the other, so that the water may from one vessel flow into the other until its temperature is nearly equal to that of the milk, and then be discharged.

Improved Paper Bag Machine.

Truman Hotchkiss, Stratford, Conn.—This invention consists in the improvement of paper bag machines. The paper of which the bags are to be made, being of the right width for the size of the bags when folded lengthwise, is wound in a large roll on a roller which is placed in the machine under a table, immediately behind the feed rollers and the shears, from which said roller the paper is to be fed at intervals through the shears to the folding apparatus by the principal feed roller, which will be moved exactly the same number of turns each time in order to feed off the exact length of paper required for each bag. The paper so fed out between the cutters comes on the plates on either side of a rectangular recess in the table, one edge coming under a spring and the other edge under a bar, which falls upon it to keep it down smooth and hold it so as to be drawn into the recess mostly from the other side. The movable shear blade then comes down and cuts off the length of paper to be folded. After the paper has been so delivered on the plates the margin on the outside of the spring and the margin along part of the end next to the cutters are pasted by bars, which till then rest caused to swing over the paper and deliver the paste along the margins, and then to return back into the trough again. The paper being thus pasted and lying above the recess, is then pressed down into said recess for shaping and folding the body of the bag by the long rectangular former suspended above it, which comes down on the paper, carrying it to the bottom of the recess and folding it between its sides and the walls of the recess. The parts of the paper then rising above the former on each side are then folded over upon the top of the former, and pasted together. This completes the construction of the bag, and it is then raised up out of the folding recess to be discharged off the end of the former by the raising of the former itself, to admit another piece of paper below for the next bag to be made. The discharger carries off the bag, along the table, till the bottom comes in contact with the endless belt carrier, which conveys it to the front of the folding roller above where a folding blade comes down upon the upper side of the bag, just behind the upper edge of the bottom, to break down the upper side of the bag and tilt the bottom backward, so that the lower edge of the bottom will be drawn in between the rollers, in such manner that the cylindrical part of the bag will be folded down flat, and the stiff bottom will be folded over on a portion of the part above in passing between said rollers; at the same time the bag is delivered from the machine on the chute, and the upper portion is then wrapped around the bottom by hand, making a compact flat package that can be packed in boxes or bales without injury to the bottom. The folding cavity, former, pasting apparatus for the first pasting operation, the folding devices used in the construction of the bag, and the discharger, are all arranged in duplicate on two opposite sides of a frame or table, independent of the frame carrying the feeding and cutting apparatus, and the apparatus for folding and discharging the completed bag; and the devices for operating the said parts, so far as they are operative, apply to both in such manner that a double machine can be provided with less cost and complication of machinery than would be required for two single machines.

Improved Movement for Converting Motion.

Jefferson Peabody, Bangor, Me.—The object of this invention is to convert the oscillating motion of a beam, treadle, or lever into the rotary motion of a wheel or pulley, for use on a sewing machine or other instrument to be turned. The invention consists, principally, in connecting both ends of the oscillating lever or beam, by cords, chains, or belts, with the same side of the pulley to be revolved, so that whichever end of the lever may be depressed, it will draw the pulley around in the direction in which the string is being pulled, thus producing constant rotation of the said wheel or pulley during the oscillations of the lever.

Improved Folding Cradle or Crib.

Michael McNamara, Philadelphia, Pa.—This invention has for its object to furnish an improved cradle or crib, which shall be so constructed that it may be very compactly folded for storage and transportation. To the ends of the head and the foot boards are permanently attached the posts to which are fastened the rockers when used. The side boards of the cradle or crib are each made in four sections. The outer ends of the end sections are each hinged to a post, so that all of said end sections may fold inward. The inner ends of the two middle sections are hinged to each other, so that their inner sides may fold together. The outer ends of the said middle sections fold against the outer sides of the end sections. The slat or rack bottom of the cradle or crib, which is made in two parts, rests upon rabbets formed upon cleats. The outer ends of the parts of the bottom are folded against the end boards. The various parts of the cradle or crib, when opened out for use, are secured in place by suitable fastenings connecting the middle sections to the bottom. A piece of cloth or netting is detachably connected with the upper parts of the end boards, to form a summer bed or hammock to allow the air to circulate freely around the child. The cradle or crib is made wider at the top than at the bottom, so that when folded there will be an open space between the folds or sections of the side boards, into which the bedding may be packed. By this construction, by passing a strap around the cradle or crib when folded, it will occupy but little more space than, and may be carried as easily as, a carpet bag.

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Nail Makers' grindstones, Mitchell, York Avenue, Philadelphia, Pa.

File Grinders' grindstones, Mitchell, Phila.

Manufacturers of Agricultural Implements and Farm Machinery, send catalogues to F. B. Thompson, Macon, Miss.

Machine Picked and Country Moss. I. M. Ferguson, 99 Peters Street, New Orleans, La.

An upright 16 h. p. Boiler, small Engine, Shafting, light Power-presses, Drops, etc., for sale low. T. H. Laramee, P. O. Box 798, Bridgeport, Conn.

Wanted—Patent Office Reports, 1864, Vol. 1st, Text. Also any issues from office previous to '49—'70. Condition and price to P. O., 4789, New York.

A Patent for Sale—A Self-Working Revolving Rocking Chair Fan Attachment. Apply to the inventor, W. H. Fletcher, Jr., 78 Ave. D, New York City. No Agents need apply.

Bakers' Ovens—Would like to hear from inventors. Send circular, with price, F. Thorn, Erie, Pa.

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Painters and Grainers by the thousand do their best graining quickly with Pat. Perforated Metallic Graining Tools. J. J. Callow, manuf., Cleveland, Ohio.

Wanted—A first class Machinist, with some capital, to take an interest in an established Foundry and Machine Shop in Minnesota. Address Box 1289, P. O., Rochester, Minn.

For Sale—A No. 4 McKenzie Blower. Has been in use three years. Address D. DeHaven & Sons, Pittsburgh, Pa.

Buy Planing and Moulding Machines of Gear, Boston, Mass.

Patentees realize benefit from their inventions through the N. Y. Exposition & M'f'g Co., 52 to 56 Broadway, N. Y.

Universal Chucks. Fairman & Co., Balt., Md.

For Hand Fire Engines, Price $300 to $2,000. Address Rumsey & Co., Seneca Falls, N. Y.

Over 800 different Style Pumps for Tanners, Paper Mills, and Fire Purposes. Rumsey & Co., Seneca Falls, N. Y.

Screw and Drop Presses, Fruit Can Dies and Dies of every description. Thomas & Robinson, Cinn., O.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable, W. D. Andrews & Bro. 414 Water st. N. Y.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Wanted—Agents to travel and sell "Stillwell's Pat. Lime Extracting Heater," and "Eclipse Turbine Water Wheel," on commission. Liberal inducements to good parties. Stilwell & Bierce Manufacturing Company, Dayton, Ohio.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

J. R. Abbe, Manchester, N. H., sells Bolt Vises.

Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

We wish to correspond with some party who understands bleaching and refining oils. Any one who can bleach a dark, mixed oil, so as to make it a clear merchantable article, will be well paid for doing it, or for the process. Samples sent on application to Lock Box 199, Pawtucket, R. I.

For 8, 10, 12 & 15 horse Steam Engines, with Link, cut-off, and reversing motion, address, for circular, E. West, Lockport, N. Y.

Plow Shares, Mold Boards, Cultivator Teeth, &c., cast to order, by Pittsburgh Steel Casting Co., Pittsburgh, Pa., of steel which can be worked same as wrought steel. All work warranted.

Tree Pruners and Saw Mill Tools, improvements. Send for circulars. G. A. Prescott, Sandy Hill, N. Y.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., New York—126 N. 3d St., St. Louis, Mo.

Needle and Clock Machinery of every description of the most Improved Styles. Hendey Bro's, Wolcottville, Ct.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisble & Co., New Haven, Conn.

All Fruit-can Tools, Ferracute, Bridgeton, N. J.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson, 82 Broadway, N. Y., or Box 1809.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Conn.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

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Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Patent Gearing—Great Strength, Durable, Noiseless, Cheap. J. Comly, 148 Ten Eyck St., Williamsburgh, N. Y.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 479 Grand Street, New York.

C. B. Colton & Co., West Gorham, Cumberland county, Maine, Agents for the Sale of Patents. This Firm is reliable.

For the best Endless Bed or (Farrar) Surfacer, address Davis, Hatch & Co., 436 North 12th Street, Philadelphia, Pa.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Boynton's Lightning Saws. The genuine $200 challenge. Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau St., New York.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Steel Castings "To Pattern," from ten lbs. upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 130 Plymouth St., Brooklyn, N. Y.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

Notes & Queries

F. H. Q. asks: How can I harden steel for turning solid emery wheels?

C. asks: How many 12 inch bastard files can a good workman cut in an hour by the old method?

J. L. S. says: How can I make soft water hard? Has hard water less solvent power than soft?

J. K., Jr., says: I would like to know of a process by which I can soften plaster that has been long set and is very hard. I want to remove globes from lamps, etc.

E. B. asks: Will an achromatic telescope, with 1½ inches object glass, and 23 inches long when extended, answer for the telescopic portion of a spectroscope?

J. M. asks: What method is employed by mechanics to trace a spiral on an octagonal or round stick of timber, 6 or 7 inches diameter, to make what is called a conveyer or creeper, to carry grain or flour?

J. L. S. says: Moths have got into my rep covered furniture and are gradually eating it up. They appear to be in the interior among the hair. Can you tell me how I can destroy them without having the furniture re-upholstered?

W. F. D. would like to know of the whereabouts of the Master Mechanics' Association, when the next meeting takes place, who are the officers and where they reside, and if they offer a premium of $25 for the best plan for removing snow from railroad tracks. If he could invent a plan that would do it successfully, would it be worth while to secure a patent?

S. wants a good white preservative for wood work on buildings which are exposed to sulphuretted hydrogen from sewers. White lead turns yellow in a very short time, and zinc is not much better. No joints can be kept tight on these buildings, which are erected on piles on river sides and are exposed to the shocks of boats.

A. O. asks: Why is it that the water in a kitchen boiler will not become hot when there is a leak in the supply pipe? I had such a case a few days since, where the boiler had not been hot for a number of weeks. I found that the valve of a water closet in the yard was leaking; as soon as I repaired it, the water in the boiler became as hot as was necessary.

J. K. W. asks if some correspondent will inform him as to whether the use of coal or kerosene oil on hones is injurious to the stone or the steel; "I have used it for several years, but some mechanics say that it is injurious to chisels and plane bits, causing the edges to crumble or break off. Its cheapness is in its favor, and it does not gum like other oils."

W. A. S. says: I have a house that was plastered in the coldest weather of this winter, and I put in stoves to dry it. I drove the fires so hard that the walls are colored in some places with the smoke or gas. Can some one inform me of a whitewash that I can apply to cover up the stains, which will not cause paper to peel off if I paper the house in the fall? The paper hanger says that it will not do to paper before the plaster is thoroughly dry. What had I better do?

R. W. says: I am making an article, of many pieces of black walnut, so put together as to fold up. The joints are made by screws. As the joints must be tight, the screws turn outward in operating it. For more than a year I have been trying experiments to remedy this. The best I have done is to use flat head screws with tallow on the shank and head. But even then the screws will turn when driven up quite tight. Rivets are not desirable. If any one knows of a better way, I should be glad to hear from him.

W. C. asks: Is there anything with which I can fasten leather to iron that is constantly immersed in water? Is there any metal of which I can make a ring that will expand while being put on and contract in contact with pressure, so as to form a watertight joint? I have 10 rams packed with leather; they work very well for two or three days, but then commence leaking. The only way in which I can stop them is by caulking with cotton yarn, which only lasts for a short time.

W. V. J. says: I have a sectional boat, composed of zinc with a wooden bottom and end boards. In transporting it to the country it became so strained as to make it leak badly. The zinc is fastened to the wood with galvanized nails and white lead. I used pitch on the seams but it wore off too quickly, and did not stop the leaks. The boat scraped on bottom of river on going over rifts. Would enamelled cloth put on with marine glue stop the leaks? Would it stick to the paint on the boat, or should I use asphaltum, melted and put on like paint? Would it wear off easily and would it stand the heat of the sun? Is there any other cement or preparation I could use? What are the constituents of marine glue?

Answers to Correspondents

M. says: I want to know if a 6 inch double belt will drive as much power as a 12 inch single belt, on a smooth surface. Will not a 12 inch single belt do three times as much work as a 6 inch double belt? Does it not take more power to drive a double heavy 6 inch belt than a 12 inch single belt? What material for a pulley face is the best for getting the most power, mahogany, leather, polished iron, or rough iron? Answer: We should expect rather the best result from the double belt, if stretched to same tension per square inch of section, and properly laced or riveted. Leather covered pulleys are best. Consult the papers of Mr. J. H. Cooper in the *Journal of the Franklin Institute* for the past two years. They form a perfect encyclopedia on the subject.

C. F. S. says: A train of 100 cars must ascend a grade too heavy for one engine, and a second one is called on. Now where should the engines be to accomplish the best results, both in front, or one in front and one in rear, or one in front and one in the middle, or one in rear and one in middle? I claim that if both are ahead, they are not drawing alike, one draws on the following and *vice versa*. I claim that they will work best with one ahead and one behind, each engine pulling and pushing 50 cars. Answer: Merely as a matter of convenience, we should suppose it better, on a straight track, to place both engines together, so that the engineers may communicate with each other and work together. On a curve, it would be better to give each a half of the train, probably.

B. C. B. says that G. S. N. speaks of using petroleum for taking the scale off the flues of boilers. "I would suggest to all who have difficulty in that way to use ½ gallon petroleum and from 6 to 10 lbs. of sal soda to a fifty horse power boiler. I have been using this for six months, putting the quantity named once in every two weeks in the boiler, and I find it both cheap and effective. It should be put in after the boiler has been thoroughly cleaned."

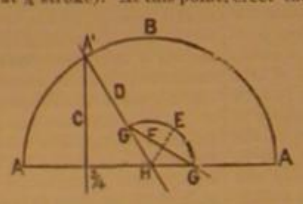
R. M. R. says: I am making a copper boiler. It is 10 inches long and 5 inches diameter, and is to be brazed together. The ends of the boiler are convex outwardly; and having brazed in one head, how can I put the other in? Are there any rules applicable to find the dimensions for small boilers to suit engines? Answer: There are no rules applicable to very small boilers. They vary too greatly to allow of general rules. Drill a hole in the head, put in a steady pin, or screw or solder on a slip of tin for a handle by which to steady the head. Then proceed as with the other one.

A. T. B. says: What size cylinders (for double engine) should I use in a twenty-five foot boat? What is the best style and size of screw to make ten miles per hour? I have got a double engine 3½ inch stroke by 3½ bore; will it do? Answer: See answer to A. & Y., page 75, current volume of the SCIENTIFIC AMERICAN. We should expect a very high pressure and a high speed of engine would be required. Put in as large a "true screw" as the boat will take.

Y. C. E. says: I wish to know a formula by which I can calculate the number of gallons per minute of discharge of a fire engine with an 8 inch cylinder and the nozzle of the discharge pipe ¾ of an inch diameter. Answer: We have not at hand such a formula as is asked. We should be obliged to any manufacturers of steam fire engines who will give us useful statistics and rules for proportioning them.

G. D. asks: 1. How much water does an ordinary canal boat draw, and what is the full depth? 2. There is a cylinder, 30 inches in diameter, with a pump forcing water into it. The pump is 4 inches in diameter; and there is a discharge pipe from the cylinder, 2 inches in diameter. If a force of 40 lbs. is applied to the piston, with what force shall I discharge the water from the pipe, which is only ¼ the diameter of the pump? If possible, I would like to know what pressure in pounds per square inch the water exerts in its exit from the pipe. Answers: 1. Canal boats are of different sizes. A large boat draws 5½ feet loaded, and is 100 feet long, 17 or 18 feet beam, and about 8 feet depth of hold. It weighs 60 or 80 tuns, and carries from 175 to 200 tuns of coal. 2. The pressure will be somewhere about 2 pounds per square inch, as a maximum; experiment only can determine it.

A. H. G. says: To calculate the lap of a slide valve, let A A be stroke of piston, and B, path of crank. Space off on piston line A A the distance which the piston must travel before steam is cut off (in this diagram, at ⅛ stroke). At this point, erect the perpendicular line C, striking B at A'; draw the diagonal D, striking piston line at H and crank path at A. Now ascertain the travel of the valve, take half it, and with the dividers set at half the travel, set one leg at H, for a center, and scribe the arc terminating at G G; draw the diagonal F. The space from H to F is the required lap; from F to E, the opening of port. Answer: The construction is conveniently made and is accurate.



G. W. M. says: I am learning to electroplate with a galvanic battery. My battery and connection wires seem in perfect working condition and the battery begins to act when the positive and negative wires are joined together; but when these are immersed in the gold or silver solution, the battery power seems to subside altogether unless I connect them in the solution, when the negative receives only a slight coating. Can you tell me a remedy for the defect? Answer: All metals are electro-positive, and are attracted from their solutions to the zinc or negative pole of the battery, and whatever substance they may be in combination with passes to the positive pole of the battery; if you are plating a teaspoon or any article about that size, with silver, you must solder or otherwise fasten to the wire leading from the positive pole of the battery a sheet of silver, about three inches square; hang this sheet in the silver solution; then having carefully cleaned and connected the spoon with the negative pole, suspend it in the solution about three quarters of an inch from the sheet or plate. In most electroplating the plate fastened to the positive pole must be of the same metal you wish to coat with. Thus for gilding a gold plate, for copper plating, a copper plate, is used. This plate or sheet is gradually consumed to keep up the strength of the solution, but it has also another important use as an electrode. Although metal solutions are good conductors of electricity, they are poor compared with the metals themselves; and the plate serves as an electrode to conduct the battery current to many parts of the solution at once; thereby enabling more electricity to pass, and consequently to deposit more metal. The telegraph companies connect their earth wire with the water pipes, on the same principle, and it is here where you fail; connect your positive wire with a sheet of metal (the thicker it is, the longer it will last) and you will have no trouble in depositing the metal thickly and heavily, with even a moderate battery power.

W. W. The rules formerly in use were based, as are those given in the letter of our correspondent, upon the diameter of cylinder, and were about right twenty-five years ago, simply because the range in sizes of engine, as well as in pressure of steam, etc., was very limited. In fact, however, the majority of such rules are not based on any true laws of proportion. Accurate rules are given for the principal parts of engines by the authorities noted at page 106 of present volume of the SCIENTIFIC AMERICAN. Our editorial columns will occasionally contain articles which will more fully reply to our correspondent. He and his shopmates should spend some of their leisure hours in the study of algebra, after perfecting themselves in arithmetic, in order to be prepared to study those treatises.

Baltimore. We have received a communication with the above signature, without date, and unaccompanied by the name and address of the writer. We shall be pleased to reply to the question asked when sent us in proper form.

O. A. asks: How many screws of one foot diameter, at a speed of one hundred revolutions per minute, would a keel boat 16 feet long x 4 feet wide x 2½ feet high, use, to run the boat, when empty, at a speed of a mile in 15 minutes? Answer: See page 75, current volume, SCIENTIFIC AMERICAN, answer to A. & Y. Two screws are sometimes used; never more than two.

A. H. S. asks: What is your method of computing the power of stationary engine? Answer: Multiply the area of piston, average pressure upon it per square inch throughout the stroke, the length of stroke, and twice the number of revolutions per minute, together; then divide by 33,000 to obtain the actual horse power.

J. H. B. says: Is steam in a boiler under pressure a conductor of electricity? What is the conducting power of water as compared to iron? Answer: Steam is not a conductor of electricity. Water is usually considered a conductor, but the metals are all infinitely superior to it.

C. I. says: I would like to know what portion of the power of the engine is usually used to carry the piston and connecting rods, or how much power is used to carry a hundred pounds of piston rod with two feet stroke, making two revolutions per second? Answer: As an average, the pressure on the piston required to move the engine itself varies, from 3 or 4 pounds per square inch in small engines down to from 1 to 2 pounds in the largest sizes.

J. H. asks if the "steam man" has ever walked or run by steam with the feet upon the ground? "I refer to the steam man first exhibited in New York city and afterwards through the United States. Is it possible for it to walk or run with the feet upon the ground, as constructed and exhibited?" Answer: Yes; we believe it can and does.

J. B. J. says: The San Francisco Sunday *Chronicle* contains an article purporting to be a report from the United States Consul at Bruges, Belgium, to our Secretary of State, from which it appears that a certain "International Board of Subterranean Exploration" have been boring into the earth for many years, and have at length reached the depth of 27,320 feet, at a place called Dudzeele in Belgium. Among other important discoveries was one which was quite unlooked for, namely, the annihilation of some of the party by the molten earth, which was pouring up through the perforated shell and which, according to one *canard*, would continue to flow forever; according to another, it would only flow sufficiently long to inundate Holland, Belgium, Denmark and a few other unimportant localities, filling up the North Sea with lava and connecting England with the main land, etc. These ideas are slightly novel but I have seen no mention made of them in the SCIENTIFIC AMERICAN, my oracle in such things. I feel a little skeptical at present; but if you are posted and will endorse the above, I suppose I must button my faith to it. Answer: We are flattered by the expressions of confidence from our correspondent, but we decline to endorse the statement of the California journal. It is not probable that the earth's crust could be pierced, not only to a depth of 7 miles but entirely through to the regions of fire, and the matter be kept a profound secret from all the scientific world, except the *Sunday Chronicle* of San Francisco.

J. A. L. sends us a stone, hoping that it is a diamond, and asks what it is. Answer: We are sorry to say the specimens prove to be water-worn fragments of liquid quartz. In hardness and gravity they fall far below the diamond.

W. M. asks for directions for kalsomining. "If the walls absorb moisture too fast, what can be used to prevent it? Will Spanish whiting do as well as Paris white for kalsomining?" Answer: Put on several coats of the kalsomine wash, letting each dry before applying another. Spanish white and Paris white are the same thing. See page 351 of our volume XXIV.

F. D. asks: What kind of engine is used in the Lay torpedo that was tried at Newport a short time since, and how much power did it use? How many cells are there in the battery used as motive power? How much would the engine and battery weigh to make half a horse power? Answer: See page 393 of our volume XXVII.

J. M. asks: Is there any work in English, French or German, that gives practical instructions for laying out the teeth of wheels in actual construction? Answer: Read J. I. Hawkins' translation of M. Camus' treatise on the teeth of wheels. If a copy of the "Engineer's and Machinist's Assistant" is accessible, read the article on gearing, which is about the best treatise, for general purposes, published. An excellent abstract of this article will be found in Appleton's "Dictionary of Mechanics."

J. B. sends us some mineral specimens, and requests an opinion as to their value. Answer: All the specimens are only varieties of chalcedonic quartz. The one (weighing about 10 grains) which is dark red and translucent is the variety called carnelian, and is the only one which a lapidary would want. But small carnelians are of little value. The cutting gives the chief value to nearly all gems.

T. B. wants a recipe for making bronzed lacquer for gas fixtures, and asks if there are any works on lacquers and bronzes? Answer: Read Byrnes'—Practical Metal Worker's Assistant."

S. B. asks: Is it necessary to have a ventilator on the top of an icehouse? The icehouse is entirely out of the ground, and I was told that, unless I put a ventilator in, ice would not keep in it. Answer: For the preservation of ice, ventilation is unnecessary.

T. B. asks how to calculate the capacity of square and round tanks. Answer: The capacity of a square tank is the length, breadth, and depth multiplied into each other. The capacity of a round tank is the depth, the square of the diameter and the constant ·7854 multiplied into each other.

S. A. says: We have two boilers 14 feet long, 5 feet diameter, with 107 three inch tubes in each boiler. The bricklayer built the bridges 5 inches from the bottom of boilers, and gradually sloped the brick to within two inches of the boiler at back end. He likewise built the bricks close to the boilers along the sides, 18 inches from the top tubes. The chimney is 110 feet high, which causes a very strong draft. Question: Are the bricks too close to the boilers at back end, and should we gain more heating surface on the sides, by having the brick work close to the boilers nearer water line? We burn fourteen cords of wood per day; we think it is too much. Answer: The brick work at back end should approach the boiler closely, unless it checks the draft. As we are not told how much work is done by the 14 cords of wood, we cannot form an opinion as to whether the amount is extravagant or not. The heating surfaces of the boiler should be uncovered by brickwork nearly up to the water line.

S. L. C. asks: What is the most economical method of using steam in a rotary engine? Would it be advisable to admit the steam twice during each revolution, and, at each admission, use its expansive power to drive the piston through one quarter of the circle? I would like to purchase the right of a good rotary steam engine. Have any of your patrons such a one to sell? Answer: There are many rotary engines in the market, and the number patented is very great. Some of them are probably efficient, but we know of none which have been tested, by reliable and skillful engineers, with results that have justified publication. There were several exhibited at the Fair of the American Institute last fall, which attracted some attention. The same natural laws govern the action of steam in a rotary as in a reciprocating engine.

J. B. asks our opinion on feeding a flue boiler 18 feet long by bringing the feed pipe through the boiler head near the bottom in the usual way, and running it up inside the boiler between two 16 inch flues, the said flues being 3 inches apart and 3 inches from side of shell. He further says: Why not feed there as well as at bottom of boiler and on first sheet? What would be the difference, and would there be any danger in so doing, the said boiler being over a puddling furnace? Answer: Feeding there will do as well. Keep the discharge opening well under the water line, however, to avoid injecting the feed water into the steam space, if the water should be carried low.

W. R. asks: Will a pendulum vibrating in a vacuum, free from friction at the point of suspension, ever cease to move? If two pendulums of the same length, metal and pattern, one weighing 10 pounds and the other 1 pound, commence vibrating in the air at the same instant, free from all impediment except the friction of the air, which of the two will stop first? Answer: A pendulum vibrating in vacuo, on a frictionless arbor, would never stop. In air, the heavier the pendulum, the longer will motion continue.

C. E. C. says: Will you please inform me what decarbonized steel is, and how it is made? How do it and laminated steel compare for use in gun barrels? Answer: The terms are not recognized by metallurgists, but are trade designations. We are not certain as to the other points of the inquiry. A "low steel" containing about one half of one per cent carbon, and free from impurity, is the best material known to engineers for purposes requiring both strength and toughness.

J. S. B., of Mich. The mineral you send is iron pyrites, of no value. Write directly to the party about the piano invention. His address was published.

H. W. U. asks: Why are there not more low pressure steamboats on the Mississippi river, or are there any at all? Answer: Because the water of the Mississippi is seriously laden with earthy matters; because the shallowness of that river, and of its tributaries, makes it necessary to adopt the lightest possible style of machinery, and because the high pressure noncondensing engine, with plain cylindrical boilers, apparently best fulfils the requisites of successful engineering there. With surface condensation it seems to us not at all improbable that condensing engines would succeed.

C. M. N. says: I would like to know the pressure (on a check valve for ¾ inch pipe, the steam pressing upward on the mound-like face of said valve) required to raise a weight of 60 pounds. The valve has a face like a watch crystal. Some time last summer or fall, said valve, acting as a safety valve, would not work on account of the stem, which had suddenly become too tight, although it had been used for about 18 months and I never had any trouble with it before. I think it is getting as bad as ever. Please explain. Answer: 1. The pressure per square inch is the same as for a valve with a flat face. 2. Examine the valve and stem and you will be able, probably, to determine, for yourself, the cause of trouble. That is what we should find it necessary to do before we could reply to the question asked.

H. P. I. asks: 1. How much water will be discharged per minute by a pipe 4½ inches diameter from a source 1½ miles distant with a fall of 75 feet; and to what hight will water be thrown at the point of delivery through a given sized nozzle? 2. How much water will be discharged by such a pipe under same circumstances into a distributing reservoir sixty feet high, that is, fifteen feet lower than source? Answers: 1. About 80 cubic feet. 2. About 12 or 15 cubic feet.

H. J. D. says: 1. What is the difference between cold water and steam pressure in testing steam boilers? 2. Is there any danger in covering steam pipes with hair felting, the steam not being superheated and oil kept from the felting? 3. Is there any danger of spontaneous combustion to be apprehended from waste filled with the petroleum oils, paraffin, etc.? Answers: 1. There is no difference in the amount of pressure exerted. Hot water expands the metal of the boiler, and closes up slight leaks, and thus places the boiler under conditions more closely approaching those of every day use, under steam. 2. No. 3. We are not certain that there would be absolutely no danger. There would certainly not be nearly as much as if the oils were animal or vegetable.

J. P. asks: With what force will water falling in a vacuum, from a hight of twenty feet, strike upon every square inch of surface at the bottom? Answer: It is generally found to be equal to twice the pressure due to the hight of fall.

J. M. W. asks: What are the component parts of coal ashes? Answer: These vary with the species and quality of the coal. Pennsylvanian anthracite coal gives: Carbon, 90·45, hydrogen, 2·43, oxygen, 2·45, ash 4·67; Newcastle cannel coal gives: Carbon, 78·06, hydrogen, 5·80, oxygen, 3·12, nitrogen, 1·85, silicon, 2·22, ash, 8·94; Pennsylvanian bituminous coal gives: Carbon, 68·82, volatile combustible matter, 17·01, and ash, 13·35.

S. S. says: I am running a 12x20 engine for saw mill. The boiler is a two flue, 22 feet long by 42 inches diameter, with a usual pressure of 60 lbs. When the engine runs at about 200, the boiler shakes to a fearful extent. What makes it shake? Is there more danger of explosion when a boiler shakes than when it stands steady? Answer: If, as we presume, the boiler and engine are mounted on the same frame or the same foundation, the boiler is probably shaken by the engine, the reciprocating parts of which are not balanced for so high a speed. A boiler already too severely strained might be exploded by a severe "shaking," as, possibly, were three of those at Pittsburgh, the other day, by the explosion of the fourth.

J. P. N. says: I would like to have an explanation of the sun dogs. In the summer of 1851, in the afternoon, sun about an hour and a half high, I saw two, one on each side and on a line with the sun; but I do not remember to have seen the upper one, nor anything like a circle, and the two were not very bright. This morning, February 18, at half past 8, I observed, for some ten minutes, two bright ones, one on each side of the sun and one above it, not quite so bright but longer; and between them and below was formed nearly a complete circle of pale white light similar to a circle around the moon. The colors were yellow and orange. Answer: The halo around the sun, called parhelia, and the mock suns are due to the refraction of light occasioned by floating solid particles of ice in the air. Such, at least, is the explanation given by Brewster and others.

M. asks: Is it necessary to keep quicksilver from the air? In confining it in one of the hollow glass tubes used on steam boilers for water gages, what could I seal the ends with? What is the red liquid used in thermometers? Answer: Quicksilver ought to be put up in stoppered bottles to keep out the dirt and prevent the formation of a film of oxide on the surface in warm localities. It is a poisonous substance and must be handled with care. Where mercury is employed about steam boilers, it is well to protect its surface with a little glycerin. The red liquid in thermometers is usually alcohol tinctured with an aniline color.

M. D. asks: What is the best wine made, and its value; and is it made in Germany or France? Please state which is the best produced in the said countries, and its value, and the quantity grown in each country. Answer: The best wines come from Germany and France. Champagne is a true grape wine, and is chiefly made in France. The statistics of production we have not at hand.

W. M. asks: In what volume and number of the SCIENTIFIC AMERICAN was the best way of making collodion published? Answer: It is easier to give the best process for preparing collodion than to hunt up an old reference. Dr. Van Monckhoven recommends the following: Dissolve 10 drams pyroxilin (of no matter what quality) in 1 quart each of alcohol and ether; pour the liquid into a vessel holding 10 quarts of water and shake well. The resulting precipitated pyroxilin is placed upon a filter of muslin, washed and dried, and is found to weigh from 5 to 9 drams. This product is only feebly inflammable, almost totally soluble in alcohol, and, even if obtained from the most inferior gun cotton, it will produce very superior collodion. No matter in what manner the collodion is iodized, its consistency will remain the same. Iodide of cadmium does not thicken it, as is the case with ordinary collodion. Neither do iodides of sodium and ammonium make it thinner.

T. L. sends a sample of boiler deposit and asks how to treat it. Will a large filter remove it, if boiled before filtering? Which shall I filter through, hard or soft wood shavings? How shall I remove the scale from boiler, which is small? What is the deposit? Will it adhere to wood? What shall I apply to a shingle roof to make it less liable to burn in case of fire? Answer: The incrustation is chiefly sulphate of lime with organic matter. Tannate of soda, to be obtained of wholesale chemists, with directions for use, is said to prevent the formation of deposits in boilers.

C. says: Please tell me the best ingredient to make faded hair a nice dark brown, without injury to hair or scalp. Answer: We have seen it stated in a German journal that the following hair dye is entirely harmless, but do not recommend anyone to use this or any other preparation. Mix 10 parts of the subnitrate of bismuth and 150 parts of glycerin, and heat in a water bath; gradually add caustic potash solution under constant stirring until a clear liquid is obtained, and then render the whole neutral by means of a concentrated solution of citric acid. Enough orange flower water is added to make the whole liquid weigh 300 parts. A small quantity of a solution of an aniline color to suit can then be put in to complete the preparation.

A. L. asks whether the mineral enclosed in his letter is of any value, and of what it is composed. Answer: It is specular iron ore, a variety of hematite.

S. B. D. says: Please examine the enclosed four specimens of minerals and tell me what they are, and of what value. Answer: The fragments are too small for satisfactory determination. No. 1 is calcite; No. 2 appears to be zinc blende; No. 3 is ferruginous quartz, and No. 4 resembles red hematite.

G. E. B. asks how to temper steel shanks for shoes, a quantity being done at once. See page 139 of our current volume (A. O.'s answer to L. H. W.)

B. W. C. asks how to find the length of the line B C, in our answer to F. E. D. on page 123 present volume. Answer: B C is the square root of the difference between the squares of A C and A B.

F. S. says, in answer to T. C. C. who asked how to remove scale already formed on the internal surface of a boiler: You may use common sal soda solution in your boiler to remove scale if it be sulphate of lime. I had the same trouble once, and could keep the boiler perfectly clean by the constant use of the sal soda solution, which does not injure the boiler.

R. B. M. says, in answer to D. M.'s question about a leaky roof: Your roof leaks from the action of ice on the solder, which contracts with cold and expands with heat sufficiently to open a crevice for the water from the ice when it melts. Your roof is several degrees warmer at the apex than at the eave, and hence the snow from the apex, warmed by the internal heat, melts; it congeals again at the eave, thus forming an ice dam, which opens the solder and from which the water sets back and leaks through the crevice. Apply artificial heat to the eave, or artificial cold to the apex, so as to have the eave warmer than the apex. See Patent No. 115,940 dated May 30, 1871.

J. B. H. says that H. C. D., who asked if the oil in feed water (introduced in exhaust steam) will injure a boiler, is answered well: "but I would say that crude or common black lubricating oil mixed with feed water and injected will not cause foaming; and if enough is used, all the steam will be greasy, and the engine will work very nicely with it. I have used it, and I know a case of an old boiler, considered dangerous for many years, which is now considered safe. The scale fell off from all smooth places, but all the crevices and leaks are well filled with hard substance. In such places the oil does not soften the scale."

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Boiler Strains. By J. C.

On the Nebular Theory and on Kepler's Harmonic Law. By E. H. P.

On the Causes of Boiler Explosions. By A. W. M.

On the Transplanting of Trees. By M. A. G.

On the Influence of the Earth's Central Fires. By H. P.

On the Chemical Constituents of the Honduras Blood Spring. By O. L.

On the Use of Phosphorus in Medicine. By L. J. F.

On Iron Clad Ships of War. By G. J. R.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 11, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Bale tie, P. K. Dederick	135,700
Bed bottom, E. G. Cameron	135,774
Bed bottom, T. L. Odell & Hudson	135,724
Bed bottom, Ogborn & Kendrick	135,725
Bed bottom, Ogborn & Kendrick	135,835
Bed bottom, R. Rakestraw	135,844
Bedstead, S. Caro (r)	5,275
Bedstead, sofa, J. B. Harlow	135,843
Bell, call, H. Stratton	135,960
Bilge water, discharging, J. A. Miller	135,656
Boiler attachment, wash, R. B. Hart	135,708
Boiler feeder, automatic, S. Cook (r)	5,276
Boiler feed apparatus, R. Berryman	135,707
Boiler fire plate, E. Boileau	135,739
Bonnet frame stiffener, P. C. Ritchie	135,730
Book, blank, J. C. Bonnell	135,709
Boot and shoe pegging machine, E. Woodward	135,681
Boot soles, trimming, L. Cote	135,694
Boring machine, L. Cory	135,692
Box, lunch, C. E. Lockwood	135,651
Box fastening, W. Youngblood	135,973
Bridge, J. Gates	135,705
Bridge, iron, Hammond, Adler & Abbott	135,902
Bridge, pivot, Clarke, Bonzano & Griffen	115,776
Broom head, Owen & Brydges	135,661
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Buckle, harness tug, C. W. Adams	135,744
Bung hole facer, Prosser & Gillette	135,843
Burner, petroleum, J. Law	135,649
Bustle, J. H. Hall	135,801
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Can, cotton, H. W. Shepard	135,854
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Car coupling, W. J. Chaplin	135,775
Car coupling, Kennedy & Diss	135,714
Car coupling, Royal, Lentz and Delbert	135,849
Car coupling, Truxell & Williams	135,905
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Car, hand, H. L. Brown (r)	5,274
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Car, freight, B. P. Lamason	135,717
Car, safety truck, B. P. Lamason	135,716
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Carriage step, G. A. Keene	135,815
Carriage dash rail, Noyes & Stratton	135,834
Carriage painter's stand, J. Burtch	135,771
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Cooler, beer, J. Chandless	135,688
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Cultivator, B. Witter	135,972
Cultivator, rotary, C. N. Poundstone	135,684
Derrick, Donald & Newton	135,705
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Fruit basket, W. D. Trisler	135,975
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Furnace, puddling, E. Lloyd	135,650
Furnace, regenerator, H. Frank	135,640
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Furnace, metallurgic gas, H. Frank	135,639
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Purifier, middlings, Huntley & Holcomb	135,810
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Radiator, steam, L. S. Daniels	135,693
Radiator, steam, E. L. Einckley	135,645
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Railroad track, L. H. Peteler	135,839
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Railway track lifter, A. H. Arnot	135,747
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Razor, E. A. Freeman	135,793
Register, grain, S. Ramer	135,845
Roller, road, A. Lindelof	135,825
Rope, etc., preserving, W. H. Torrey	135,935
Saccharine liquids, treating, C. W. Durant	135,788
Sad iron, J. T. Fewkes	135,791
Saddle tree, P. Becker	135,755
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Saws, gumming, C. N. Brown	135,769
Saws, setting, J. G. Baker	135,752
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Spool case, J. D. Cutter	135,758

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Stove grate, J. R. Stone	135,735
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Swing, E. A. Tuttle	135,798
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Wrench, N. L. Post	135,842
Wrench, J. Smiley	135,856
Wrench, pipe, W. H. Burton	135,773

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

23,996.—SURGICAL SPLINT.—D. Ahl. April 30.
24,081.—RAILROAD FROG.—D. D. Lewis. April 30.
24,428.—TRIP HAMMER.—B. Hotchkiss. May 28.
24,451.—ATTACHING HANDLE TO PAIL.—T. Evans. June 4.
24,688.—BORING MACHINE.—L. Worcester. June 13.

EXTENSIONS GRANTED.

22,812.—ROLLING HORSESHOE IRON.—W. W. Lewis.
22,941.—CAR SPRING.—A. B. Davis.
23,011.—WATER WHEEL.—N. F. Burnham.
23,052.—MOLDING COVER FOR STOVE.—G. W. Gardner.
23,062.—STEAM PRESSURE GAGE.—T. W. Lane.
23,091.—FIRE PLUG.—J. L. Lowry.

DISCLAIMERS.

22,812.—HORSESHOE MACHINE.—W. W. Lewis.
22,941.—CAR SPRING.—A. B. Davis.
23,062.—PRESSURE GAGE.—T. W. Lane.

DESIGNS PATENTED.

6,385.—LAMP.—D. Ashworth, Kenton county, Ky.
6,386.—CARPET.—J. H. Bromley, Philadelphia, Pa.
6,387 to 6,409.—SHAWLS.—F. Wink, Philadelphia, Pa.
6,410.—LANDAU SLEIGH.—J. C. Goold, Albany, N. Y.
6,411.—FENCE.—J. I. Healey, Brooklyn, N. Y.

TRADE MARKS REGISTERED.

1,125.—DRESS PATTERN.—W. Cornwell, Philadelphia, Pa.
1,126.—MEDICAL COMPOUND.—E. Frese, San Francisco, Cal.
1,127.—PACKED SALMON.—L. L. Newton, Brooklyn, N. Y.
1,128.—AXES, ETC.—Collins Co., Collinsville, Conn.
1,127.—HARVESTERS.—Whiteley, Fassler & Kelly, Springfield, Ohio.
1,128.—SELF RAKE.—Whiteley, Fassler & Kelly, Springfield, Ohio.
1,129.—GUARD FINGERS, ETC.—Whiteley, Fassler & Kelly, Springfield, Ohio.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On an application for Design (7 years)	$15
On an application for Design (14 years)	$30

VALUE OF PATENTS

And How to Obtain Them.

Practical Hints to Inventors

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*. This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

To Make an Application for a Patent.

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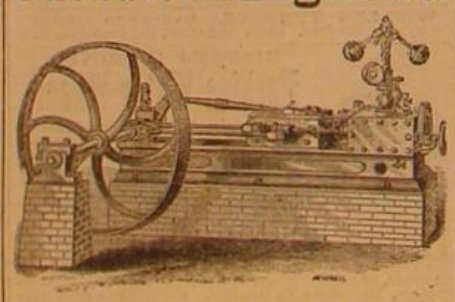

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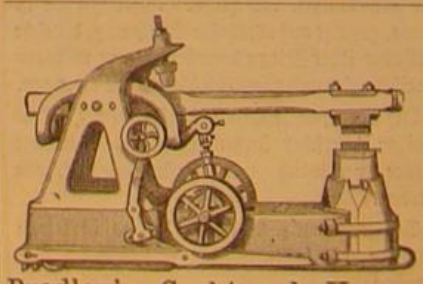

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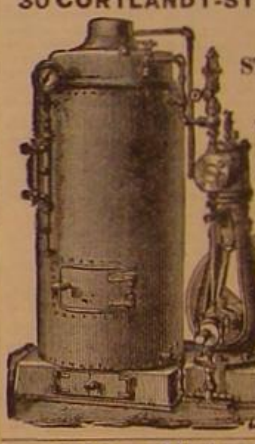

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVIII.—No. 12. [NEW SERIES.] NEW YORK, MARCH 22, 1873. [$3 per Annum, IN ADVANCE.

A MAMMOTH BAND SAW.

A band saw, fifty-five feet long, sawing planks from a pine log three feet thick, at the rate of sixty superficial feet per minute—probably the most extensive experiment in log cutting ever undertaken and successfully carried out—is the subject of the illustration herewith presented. No more forcible instance of the great capability of the continuous saw blade can, we think, be adduced, nor its superior efficiency, as compared with the gate and circular saw, for the purposes indicated be better demonstrated, than by the details below given, obtained directly from Mr. J. J. Van Pelt, in whose mills (at the foot of 10th street, East river, in this city) the immense machine has, for some time past, been employed.

The saw, which is 55 feet long, 4½ to 6 inches wide, and of 16 gage, was made by the celebrated firm of Perin & Co., of Paris, France, at a cost of one hundred dollars. The machinery was constructed from the drawings and specifications of Mr. Van Pelt, by Richards, London & Kelley, of Philadelphia, Pa. The pulleys are of 75 inches in diameter, including hubs of wrought iron, and are mounted centrally on the main column so as to equalize the strain of the saw and prevent its springing, and to economize its weight. They are covered with a lagging of pine, over which is glued an envelope of heavy harness leather. The bearings for the wheel shafts are four inches in diameter and twelve inches long, and are made of an alloy of six parts copper and one of tin. The tension is from one to four tuns, and necessarily calls for the greatest rigidity in the framing to prevent the guides from being thrown out of position by the varying tension of the blades.

The timber lies perfectly still upon the carriage and hardly requires dogging at the ends. The first cut is directed by adjusting the log as the saw progresses, after which the slab face is carried past permanent gages, very much on the principle of common hand slitting. The operation brings into play several ingenious devices for supporting, setting, and guiding the log, inventions of Mr. Van Pelt, to which, however, no especial reference is here necessary.

The kerf of the band saw is one eighth of an inch, or less than one half that of a circular saw. Its speed is 4,500 feet per minute. We are informed that it cuts pine timber at the rate of sixty feet, and oak and yellow pine at thirty feet a minute, the logs being from one inch to five feet in thickness.

By far the most important advantage remains yet to be noticed. It is that the saw will follow the curvature of long timber, such as is used in shipbuilding and is cut with the grain. This not only causes no inconsiderable saving of material, but enhances the value of the work accomplished to such an extent that it is stated that deck planks, thus sawn, are worth fully ten per cent more than when cut by a circular blade. Another and more striking idea of its capability may be gathered from the fact that a board, one eighth of an inch thick, has been taken, without the slightest variation, from the whole length of a log fifty feet long and twenty inches through. In the establishment above referred to, we learn that from eight to ten blades are yearly expended, and that the cost of running is about the same as that of the ordinary forms of saws in common use.

We do not doubt but that this entirely novel application of the band saw will lead to future investigation, tending to develop still further its advantages. There is a great and growing interest manifested in this class of machinery throughout the industrial world, and no subject offers a more promising field for the researches of the inventor and the experiments of the practical man.

Reunion of an Amputated Finger.

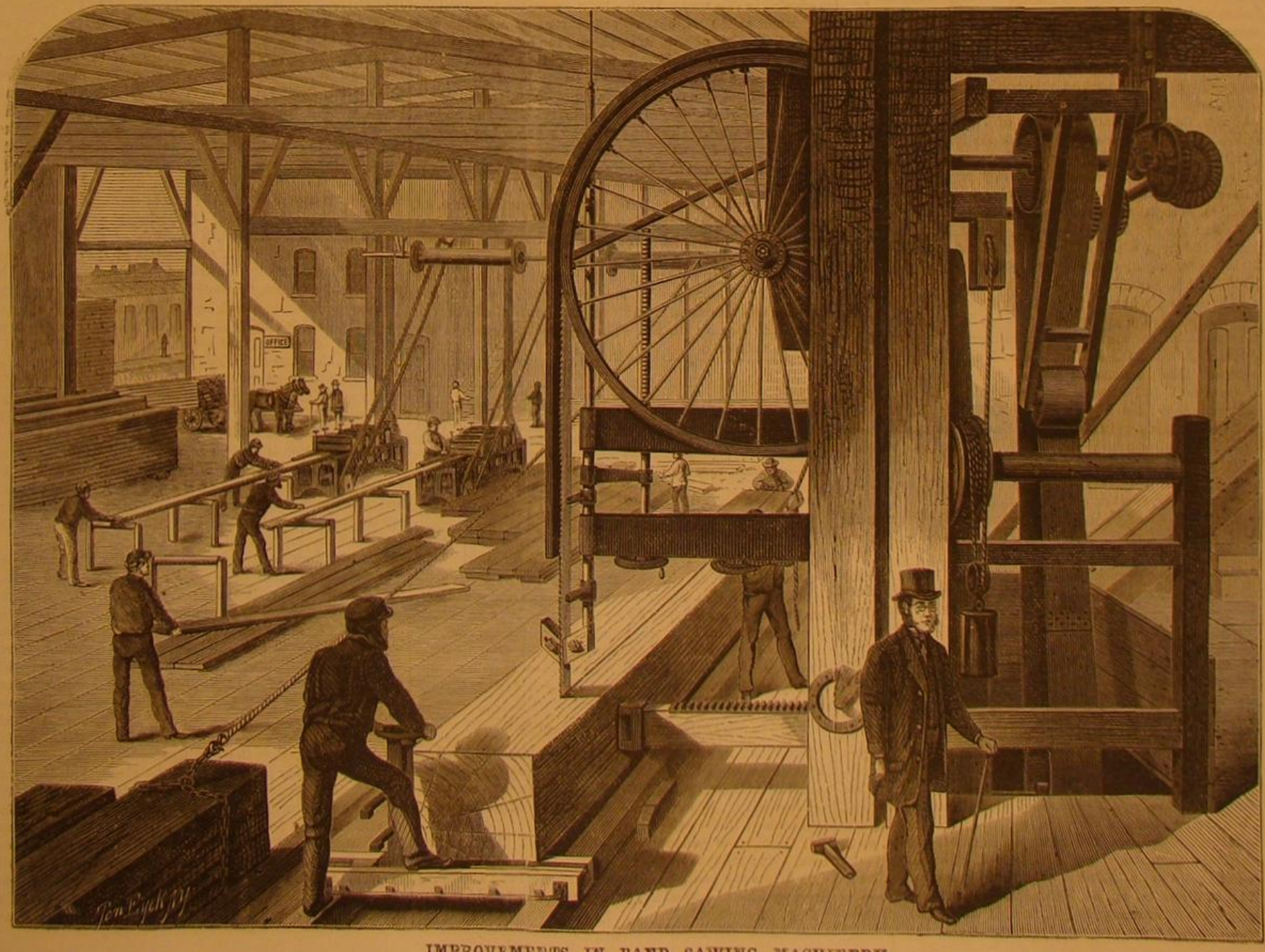
Dr. L. H. Barry, of Jerseyville, Ill., was recently called to see Mr. Solon W. Johnson, a resident of that city and a carpenter by trade, who had accidentally amputated a portion of the index finger of his left hand. When he arrived at the house, Mr. J. was busily searching for the amputated portion, which was finally found among some chips near the wood block upon which he had accidentally amputated it. The line of amputation was from a point midway between the center and outer margin of the free edge of the nail, through the nail, to a point an inch and a half from the end of the finger on its inner or proximate side, involving the joint. Although a half hour had elapsed since the accident, Dr. Barry thoroughly warmed the detached portion by placing it in a bowl of moderately hot water; and having carefully cleansed the stump, he placed the parts in accurate apposition, and secured them thus by adhesive strips and careful bandaging; and he then enveloped the whole hand in warm flannel, with directions to sustain the temperature by constant warmth, which was effected by placing his bed near the stove, and his hand on a piece of wood in the oven, the temperature of which, for two days and nights, was carefully regulated by an attendant.

On the fourth day suppuration commenced, when warm poultices were applied and continued for four weeks, using as a wash a weak solution of carbolic acid before applying the poultices. Not an unfavorable symptom presented. With the process of healing, sensibility was gradually restored; and in about two months from the occurrence of the accident there was complete reunion.

It is of the same length as before, and the nail has grown out perfect. In using the finger daily in picking up and holding nails, as he does in working at his trade, it sometimes, the patient says, becomes very tender; but the finger is certainly in a much better condition than it would have been with the hardened cicatrix which would otherwise necessarily have resulted, and there is a probability that he will gradually, to a great extent at least, recover the normal mobility of the joint.—*Medical Archives.*

PROGRESS OF HOOSAC TUNNEL TO MARCH 1, 1873.—Extensions of headings in February, 277 feet; opened from east end, westward, 13,480 feet; opened from west end, eastward, 8,996 feet. Total lengths opened, 22,476 feet. Length to be opened, 2,555 feet, being 85 feet less than half a mile.

THE circulation of the blood was discovered by Harvey in the year 1619.



IMPROVEMENTS IN BAND SAWING MACHINERY

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A UNIFORM SYSTEM OF COLORS.

The importance of a uniform system of weights and measures has long since been accepted by the inhabitants of the civilized portions of the globe, and we appear likely to attain this object before the lapse of many years; but uniformity in the nomenclature of colors has not attracted so much notice, and since the immense progress of organic chemistry has given us such a vast variety of shades and tones, the want of a precise scale of designation is severely felt by the dyer and calico printer. For linear measurements and afterwards for weights, founded on cubic capacity, we can easily adopt a uniform unit. The French meter and the decimal grade are admitted on all sides to be the best. It is somewhat remarkable that we must also look to the French nation for our scale of colors. The great authority in all matters of pigments and dyes is Professor Chevreul, Director of the famous Gobelin tapestry manufactory of Paris. The researches on color made by Chevreul were of the most exhaustive character, and his treatise, published many years ago, is even now the best book extant on this subject. We find in the *Manufacturer's Review* an outline of Chevreul's classification of colors, taken from a recent work of Van Laer, which we substantially reproduce on account of the importance of the subject and its direct bearing upon the question of a uniform system of colors. The great difficulty experienced by all classes of persons who use colors, whether artists or calico printers, is to define precisely what they want. Yellow, red and blue are general terms, comprehending a variety of shades and tints, which may be approximately described as light, dark, bright, dull, and the like; but anything like mathematical precision in naming them cannot be attained. Hence, although the dyer may have the proportions for printing scarlet, yet the precise shade cannot be given for want of a suitable nomenclature. The great chemist Chevreul fully appreciated all of these difficulties and, after long years of research, finally invented a system by which we are enabled to describe 14,000 different shades of color with mathematical accuracy. He succeeded in classifying all shades of color by recognizing in each three principles of modification:

1. The kind of color: red, orange, yellow, green, blue, purple, violet, embracing 72 types.

2. The tone or degree of intensity, pale, tender, feeble, delicate, vigorous, somber, etc., embracing 21 tones.

3. The degree of purity or of mixture with gray or black: free, fresh, fine, pure, dead, dull, subdued, etc., embracing 10 degrees.

This system resembles that in geometry in which the position of any point in space is defined by referring it to three axes at right angles to each other. Seventy-two colors were arranged by Chevreul in a circle on a round table, so that 23 fell between red and yellow, 33 between yellow and blue, 23 between blue and red, thus yielding 72 types. By employing the symbols, R, O, Y, P, B, etc., for red, orange, yellow, purple, blue, etc., and making use of numerals, it is possible to designate any color. For example, sulphide of cadmium is 5 O, straw is 5 OY, sulphur, 3 Y, apple green 4 Y G, and so on through a long list of tints. "If," says Chevreul, "you suppose the color of each type to pass from pale in the center of the circle, increasingly to deep, almost black, on the circumference of equal gradations, you will have, I suppose, about twenty tones of the same type color, the first lightly colored, the second a little more, the third still more, up to the thirtieth, which will be almost black. The whole forms what I call the scale of that color. We have here already 72 × 20 divisions, or 1,440 different shades, arranged systematically in a chromatic circle. Now, if we darken all these shades by the addition of $\frac{1}{10}$ of black to each, we shall have a second chromatic circle; then by adding $\frac{2}{10}$, $\frac{3}{10}$, etc. up to $\frac{9}{10}$ of black, which will yield the fine black devoid of all color, we shall have 10 chromatic circles or 14,400 shades, or rather 14,420, if we add the 20 intermediate tones between gray and black. All the subdued colors may thus be classified with the greatest ease. By means of these ten circles, all the shades may be described, for each is defined by the type of its scale, by its tone, and by the degree of black which may belong to it. Thus the expression 3 R, 12, $\frac{3}{10}$, signifies the color corresponding to the scale 3 of red, 12 tone, subdued by $\frac{3}{10}$ of black; this is the madder red of the French uniform."

By employing a chromo-lithograph of Chevreul's circle, samples of yarn may be assigned their true places in the system, and the nomenclature becomes intelligible to experts in dyeing; and it is possible to order skeins of any conceivable shade of color. If the colors on the chromatic circles are absolutely correct in the copies distributed for sale and comparison, the unit of colors would be as well established as is the unit for the meter; but it is difficult to start with the same shade without having recourse to a uniform standard. The question arises: What shall we adopt as our standard for the primary colors? If we take certain precipitates, we know that they vary according to the amount of water they contain and the purity of material. We cannot adopt the color of plants, insects, or minerals, as they are all open to the objection of want of uniformity. Dr. Walz has suggested the colors that would be thrown upon a screen by sunlight refracted by a prism, of a fixed angle and other prescribed regulations as to width of slit, position of the tubes, etc. The violet, indigo, blue, green, yellow, orange, and red would be likely to have a constant standard when obtained in this way, and we should approximate pretty closely to a uniform system of colors. It is important to start right in the adoption of colors, and to put it in the power of everybody to make his own scale by analysis of sunlight. The suggestion of Dr. Walz is worthy of consideration.

PAPIN'S DIGESTER FOR COOKING.

A German exchange gives an account of comparative experiments made with an ordinary cooking pot and one of Papin's digesters, which merit more attention than they are likely to receive unless the facts are more generally made known. Papin originally invented the digester to extract a greater portion of fat and gelatin from bones, and it has long been employed by the chemist and pharmaceutist for this purpose, but its adaptation to the wants of the kitchen has escaped notice. The digester is a pot (provided with a pressure gage), the cover of which can be screwed down, so that the contents can be subjected to both heat and pressure. A pressure of five atmospheres is found to be convenient for cooking purposes, and a great saving of time and fuel, as well as of the aromatic and soluble portions of the viands, is effected in this way. With a loose cover, the temperature is constant at 100° C., but with the cover screwed down and under a pressure of five atmospheres, the temperature rises to 150° C., and the cooking is more rapidly and thoroughly done. With a loose cover, there is an escape of steam, and consequently of aroma; with a fastened cover, there is only slight escape of steam through the safety valve, and no loss of volatile matter. The firing must be regulated to prevent the generation of too much steam. The employment of a higher pressure than five atmospheres is not advisable, as it involves stronger vessels and greater caution.

In the experiments instituted by Professor Junichen, of Lucerne, Switzerland, the same quality and quantity of food was taken for each trial. The food was cooked in an open pot and in the Papin digester; and as gas was employed in both instances, it was possible to measure accurately the amount of fuel consumed. The consumption of fuel and the time was computed from the commencement of the boiling in each cooking utensil. The results are given in the following table:

	Ordinary cooking pot.		Papin's digester.		Saving per cent.	
	Time in minutes.	Cubic ft. gas.	Time in minutes.	Cubic ft. gas.	Time.	Gas.
Beef	150	2·49	42	0·55	72·95	77·91
Smoked pork	117	2·82	38	1·08	62·52	61·70
Potatoes	53	1·43	20	0·50	62·26	65·03
Yellow peas	113	1·70	48	0·77	57·52	54·70
Plums	24	0·59	9	0·22	62·50	62·71
Whole pears	167	3·15	52	1·22	68·86	61·27
Pears, halves	162	2·50	46	0·78	71·60	68·80
Apples, sweet	134	2·52	43	0·58	67·91	76·98
Chestnuts	147	3·12	57	0·97	60·22	68·91
Mean saving					65·54	66·09

According to these experiments, the saving of Papin's digester, in time and fuel for nine different articles of food, amounts to 66 per cent, or two thirds: that is, if an ordinary cooking utensil requires three units of time and fuel, one unit is required for Papin's digester, or one cord of wood goes as far with Papin's digester as three cords with a common cooking pot. The subject is worthy of further investigation.

DANGEROUS MINERAL OILS.

Dangerous burning oils do not appear to be confined to America, as we find in the list of English patents a curious record of nostrums which are put into kerosene to render it non-explosive. It may be well to give some of the mixtures as contained in the patent list:

1. Gasolin, 40 gallons; gum olibanum, 1 lb.; cascarilla bark, ½ lb.; Iceland moss, ½ lb.

2. White oak bark, 2 lbs.; alkanet root, 2 lbs.; alcohol, ½ liter; cyanide of potassium, 30 grammes; to be added to 3 gallons of naphtha.

3. Naphtha, 40 gallons; carbonate of soda, 3 lbs; alum, 2 lbs.; hydrate of lime, 2 lbs.; red ash, 2 lbs.; camphor, ½ lb.; oil of saffron, 12 grammes; essence of tar, 30 grammes.

4. Naphtha, 40 gallons; potatoes, 50 lbs.; lime, 4 lbs.; sal soda, 4 lbs.; turmeric, 3 lbs.

5. Gasolin, 40 gallons; sal soda, 1 lb.; cream of tartar, 1 lb.; add enough oil of wintergreen to mask the odor.

6. Gasolin, 40 gallons; sulphur 5 lbs.; iron rust, 100 lbs.; onion, 1 bushel; resin, 5 lbs.

7. Naphtha, 40 lbs.; caustic soda, 1 lb; alum, 1 lb.; salt, 1 lb.; manganese, 30 grammes; water, 120 grammes.

It appears almost incredible that recipes like the above should be proposed in the present age. They read like the absurd mixtures of alchemistic times, and ought to be exposed and denounced on all occasions. None of the additions can have any other effect than to disguise the color and odor of the burning fluid, to clog the wick of the lamp with impurities, and diminish the illuminating power. The chances of explosion are not in the least affected by them, as it is the vapor, when mixed with a proper proportion of air, that explodes, and not the oil. No oil is safe which gives off this vapor at low temperatures, no matter how many potatoes or pounds of sulphur there may be added to it. Nearly all of the patented oils mentioned above have been offered for sale in the United States under fancy names, such as "liquid gas," "aurora oil," "safety gas," "puroline," "petroline," "septoline," "hexoline," "safety oil" and the like. The agents who hawk these wares about the country display great ingenuity in deceiving their customers. They pour some of the oil into a can, and again empty it and sit down on the can while a match is applied to the opening. They have as many tricks as the Chinese jugglers, and generally persuade their victims to make a purchase. As it requires eight or nine parts of air to one of the vapor to produce an explosive mixture, and as equal volumes of air and vapor will burn quietly, they take care not to bring about the mixture that will send them up into the air, but make the proportions most favorable for their purposes. Unfortunately, when the lamp burns low, just the right proportion of air and vapor is attained to occasion an explosion, and the accident is unavoidable.

Many of the substances mentioned in the above list settle down to the bottom of the cask, and have no more effect than so many pebbles or small shot.

The only safe oils are those known to emanate from responsible, honest refiners, and none others should be trusted. Our laws are stringent enough, but these oleaginous rogues drive a coach and four through them with impunity.

SAILING FASTER THAN THE WIND.

It appears from letters which we have received that some of our correspondents are unable to realize the possibility that a sailing vessel, such as an iceboat, can under certain circumstances go faster than the wind which drives it; they do not believe the accounts of such feats, especially as there must always be some uncertainty in regard to the velocity of the wind, in cases where no special measurements were taken with an anemometer, while the velocity of the sailing boats was recorded. Since the expression of our opinion about this matter, stating that the velocity of a sailing ice boat could surpass that of the wind, we have received several letters containing arguments against that opinion; but the writers fail to consider the true conditions under which this remarkable result can take place.

In order to proceed regularly in our explanations, we must first consider the case of a boat sailing directly before the wind; from the moment of starting, the velocity will increase and consequently the pressure of the wind on the sails will diminish. This acceleration of the boat will continue till such velocity is attained that the resistance to the progress of the boat, by friction (which increases with the velocity) becomes balanced by the pressure of the wind on the sails (which diminishes with the velocity); as soon as this point is reached, the motion becomes uniform. We have here the same conditions as govern the acceleration of a railroad train, and the uniformity of motion which it will finally attain; these conditions are well recognized by all railroad engineers. An ice boat sailing before the wind, therefore, can never attain the velocity of the wind which drives it, because, if it went as fast as the wind, the pressure on the sails would cease and the motion would be retarded; then the pressure of the wind would again be felt and increase during the retardation till the conditions were again reached in which the wind pressure balanced the resistance to the motion.

If a boat does not sail directly before the wind, but at an angle of, say, 45°, the sails are set so that the wind strikes them nearly perpendicularly; therefore, in this case, the sails are placed at an angle of about 45° with the direction of the vessel. Here the law just explained will be also applicable; the velocity of the vessel will increase, and the pressure of the wind diminish till it balances the increasing resistance to the motion; and here also the vessel can never attain the velocity of the wind. This is exactly the case which some of our correspondents assumed, and in which they attempted to prove, by the application of the parallelogram of forces, that the resultant could never equal the original propelling power. After the above explanation, it is scarcely necessary to test such a case in this way, as the result may be anticipated. Besides, the application of the parallelogram of forces to the case under discussion is not legitimate, as a sailing iceboat is not really propelled by two forces. It could be applied when a steamer uses sails as well as steam; but in the case of a sailing boat, there is only one force, which, acting in a certain direction, may under certain circumstances develop a velocity greater than itself, as

may be the case with every one of the so called six mechanical powers.

The latter give the clue to the problem in question. It is identical with the case of a wedge pushed forward by side pressure. In Fig. 1, let C *c b* represent the direction of the vessel, A B the direction of the wind, and A C the position of the sail; it is clear that, by the sideward gliding pressure of the wind on the sail, the wedge A B C will be driven forward in the direction C *c*, till it has attained the position *a b c*; then, if the sails be placed at an angle of 45°, as in the figure at A C, they will when moving, in the same time as the wind through A B, through the same space, *b c*, receive no more pressure, and we have again the conditions as before: that the vessel can never attain the velocity of the wind, but only such a one in which the wind pressure will balance the resistance.

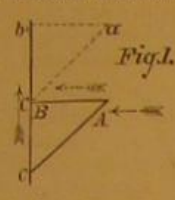


Fig. 1.

Let us, however, consider the case that the sails are set more sharply to the wind, as in Fig. 2, then A B C will move through a much greater distance to *a b c*, than the wind from A to B; and it is evident that, when the vessel has moved through the distance, A *a'*, equal to A B, the sails will have receded only a much smaller distance, and that the space passed over by the wind from A to B will correspond with a much longer distance (from A B to *a b*) and that, when the vessel has attained double the velocity of the wind, the pressure of the latter on the sail A C, *a' c'*, *a c*, and consequently the propelling power, will go on, and the wedge, A B C, will slide forward with accelerated velocity till again the resistance will be equal to the propelling power.

Fig. 2.

It is evident that in water, by reason of the leeway, the theoretical velocity cannot be as nearly approached as with a sailing iceboat, in which, when cutting the ice with sharp runners, there is little or no leeway and also much less resistance by friction than is the case in water; therefore, in the case of iceboats, the seeming paradox, that they go much faster than the wind that drives them, is often accomplished

All those experienced in the management of iceboats know this, and therefore do not need to be convinced by the above arguments, which are only intended for the unbelieving minds, who have taken the trouble to enter into correspondence with us about it.

THE INVENTION OF THE LEYDEN JAR.

Certain parts of works on physical science, written a century or more ago, are at the present day sometimes very interesting to read an account of the expressions of delight indulged in by the authors, on matters which, at present, are considered of a trifling interest compared with what is now known in regard to the sciences of nature. Priestley, in his "History of Electricity," published in London, 1767, says: "The end of the year 1745, and the beginning of 1746, is celebrated by reason of the most astonishing discoveries which have ever been made in the whole field of electrical science, namely, the wonderful condensation of this force in a glass named the Leyden jar, because it was first made by Cuneus, of Leyden, while experimenting with Professor van Muschenbroek," etc. How would the author be amazed if he could return, after a sleep of only one century, and be initiated in the since discovered mysteries of galvanism, voltaic batteries, electro-plating, electro-magnetism, dynamic electricity, the electric light, magneto-electricity, the laws of Ohm, the electric telegraph, the modern electric machine, the condenser (which is, for voltaic electricity, what the Leyden jar is for frictional electricity), the Ruhmkorff coil, the Geissler tube, the application of the spectroscope to substances illuminated by electric light, the effect of electro-magnetism on polarized light, and then finally witness the modern experiments which promise discoveries that, during the next century, will even put all these in the shade!

The history of the discovery of that form of electric induction on which the invention of the Leyden jar is founded, is thus given by Desaguillers: "Professor van Muschenbroek, of Leyden, Holland, and some of his friends, observing that electrified bodies, exposed to the air, lost their electricity rapidly, imagined that, if they inclosed a conducting body in a non-conductor, it would become possible to charge more electricity into the conductor and retain it longer. As a glass bottle was the most convenient non-conductor, and water the most common conductor, water was placed in a bottle, a brass rod put in the water, and the same charged by the intervention of this rod; but nothing particular was observed till Mr. Cuneus, who supported the glass flask by his left hand while it was being charged, supposing that the water had received as much electricity as it could contain, attempted to withdraw the brass wire with his right hand, when he was suddenly frightened by a violent shock in his arms and chest." The water served here for the inner coating of the jar, and his left hand for the outer coating; and yet, however simple and easily repeated the experiment is, there were at that time many experimenters who, after reading the published accounts and trying it for themselves, did not succeed, being still in the dark about the conditions required for success, which at the present day are so well known.

It has been proved that the discovery of the same principle and its application by Von Kleist, in Germany, in the same year, was without knowledge of the above, each investigator working independently of the other. Those who succeeded gave the most exaggerated account of their feelings. Professor Van Muschenbroek, who made the experiment with a flask of very thin glass, and therefore obtained a most powerful charge, declared in a published letter that he was so violently struck in his arms, shoulders, and chest that he lost his breath, and two days elapsed before he was recovered from his fright. He adds that he would not submit to a second shock for the whole kingdom of France.

M. Allamand made the experiment with a common glass tumbler, and says also that the shock took his breath away, that he felt such a violent pain in his arms as to fear serious consequences, but that it passed over without injury to him. Winckler, of Leipsic, tells another story. He says that when he first performed the Leyden experiment upon himself, he felt strong convulsions over his whole body; his blood was brought into a most violent agitation, and a burning fever would have been the result if he had not taken cooling medicines. He felt also a heaviness in his head, as if a large stone laid upon it; it caused him twice to bleed at the nose, which otherwise seldom took place. His wife appears to have been of an investigating turn of mind, and much less afraid than he; she took the shock twice, but Winckler says that she was then so weakened that she could not walk, and a week later, having obtained the necessary courage to permit him to give her another shock, she commenced at once to bleed from the nose.

But everybody was not so foolishly frightened. M. Bose, with a truly philosophical courage worthy of Empedocles, wished to be killed by the electric shock, in order that the account of his scientific death might procure an article for the Memoirs of the French Academy of Sciences, but his wish was not fulfilled.

The electric shock produced by the Leyden jar attracted then so much general interest that many persons traveled around Europe and made a living by administering it, some of them pretending to cure by it all kinds of diseases.

Foremost of those who advanced this branch of science must be mentioned Gralath, in Germany, who, in 1746, gave the shock at great distances and through twenty persons at once, and invented the electric battery, consisting of a number of Leyden jars. Finally, Drs. Watson and Bevis, according to the *Philosophical Transactions*, found the modern method of covering the outside of the jars with tinfoil, while the first connected several separate masses of combustible fluid with metallic wires, and ignited them all with the same spark. After accounting for many other experiments, he says, in a prophetic style: "Notwithstanding the many great discoveries made during the latter years in this branch of natural sciences, posterity will consider our knowledge to be in its infancy; therefore we must, in so far as experiments justify us, be ready to modify or abandon our conclusions as soon as other more probable theories are proposed."

Another investigator, quoting these words fifty years later, says: "Considering the rapid progress since that time, we may hope that even the so enormously advanced science of the present day (1795) will, at some future time, be looked upon as merely in its infancy."

These prophecies have been fulfilled, and who dares to assert that the climax of knowledge has now been reached? Have not the number of discoveries and their importance been progressing, since that time, in an increasing ratio? Have not our scientists become more and more expert in the art of making discoveries and inventions? What then will posterity witness only thirty years hence, in the beginning of the twentieth century? Who can prophecy the mysteries of the future, in regard to science, which is always surpassing anything man can conceive *à priori?* Who can name a subject more interesting, more useful, more fascinating, to the lover of truth, progress, and beauty?

SCIENTIFIC AND PRACTICAL INFORMATION.

FLY WHEELS FOR STEAM ENGINES.

The rule given by Molesworth for weight of fly wheel rim is as follows: Multiply the average pressure on the piston, in pounds, by the length of stroke in feet and divide by 45 times the diameter of the wheel rim. The result will be the weight of the rim in hundredweights. To obtain the weight in pounds, multiply by 25 instead of dividing by 45.

Haswell says that the weight of the rim should be from 85 to 95 pounds per indicated horse power of the engine, and gives a rule which, algebraically expressed, is as follows:

$$W = \frac{PS}{0{\cdot}00023\ R^2\ D},$$

where W is the weight in pounds, P the mean pressure on the piston, S the length of stroke in feet, R the revolutions per minute, and D the diameter of the wheel. The late Professor Rankine gives a rule which he expresses thus: $W = \frac{mg\ \triangle E}{V^2}$, where mg has a value of from 1,000 to 1,500, and $\triangle E$ is the fluctuation of energy in the machine during one revolution. Professor Thurston gives us the following memorandum:

"The effect of a fly wheel will depend upon the proportion which the product of the weight into the square of the velocity of its rim bears to the quantity of work which is alternately stored up in it, and restored by it. The latter quantity will vary with the length of stroke of the engine, the size of its cylinder, the pressure of steam carried, and the point of cut-off. It would be difficult to construct an exact formula that would be adapted for general use, but the following rule will give good results with our best forms of engine with considerable expansion:

"Multiply together the area of piston, in inches, length of stroke, in feet, and highest proposed steam pressure; divide the product by the square of the product of the diameter of the wheel, in feet, by its lowest proposed number of revolutions per minute. Finally multiply the result by 90,000. Algebraically the rule is thus expressed:

$$W = 90{,}000\ \frac{A\ S\ P}{W^2\ D^2}$$

"This formula was first proposed in 1867, and has given satisfactory results. Its author prefers it, for ordinary purposes, to any other published.

"To determine the sectional area of the rim from its weight, divide the given weight by ten times the diameter in feet, and the result will be very exactly the cross section of the rim in square inches."

We here offer, to those of our readers who have written for the information, something of a range within which to choose for themselves. It is, of course, better to make a fly wheel a little too heavy than a little too light, while (as, for example, in cotton mills making fine goods) a perfect regularity of speed is of very great importance.

PRESERVATION OF FOOD.

A singular incident of the preservation of food in hermetically sealed vessels is mentioned in the work on the Swedish expeditions to Spitzbergen and Bear Island, in the years of 1861, 1864, and 1868, under the direction of O. Torrell and A. E. Nordenskiold.

The Æolus was, on July 13, 1861, at Shoal Point, one of the most westerly points of the island of North Eastland, which is separated by a sound from Spitzbergen. A sailor named Mattilas came on board with the news that he had made a discovery on shore. It was found to be a depot, which had been established thirty-four years ago by Parry's expedition; and in it a gun totally unfit for use, a wooden box with ammunition (cartridges, caps, and powder) in good preservation, and eleven sealed cans were found. Everybody was curious to see whether the contents of the cans had resisted decay for 34 years. Mattilas opened one of the cans, and in it was discovered roast meat, with jelly and fat, as well preserved as if it had been prepared but yesterday. On the larger cans were found the words "seasoned beef" stamped in the top part; the smaller ones had the inscription "rounds of beef." One can contained spoiled coffee. The wood of the box, as is the case with nearly every bit of wood found at Spitzbergen, has not in the least decayed.

DISTILLATION BY COLD.

At a recent meeting of the Chemical Society of Berlin, a method was proposed by Smee for the detection of organic matter in the air, and at the same time for performing distillation by cold. A glass funnel drawn out and closed at the bottom is placed in a filter stand and filled with ice. The moisture of the atmosphere condenses on the outside of the funnel and runs slowly down into a capsule beneath. The quantity of liquid obtained in a given time is measured and the ammonia in it determined by the usual methods. The quantity of ammonia affords *data* for testing the amount of organic matter in the air. Certain substances that would be destroyed by heat can be condensed or distilled in this way. For example, the volatile odor of flowers, if placed with the ice filter under a bell jar, would impregnate the water and be actually distilled by the ice. It thus appears that the condensation of moisture on a tumbler of ice water is capable of practical application.

CUPRO-AMMONIUM AS A SOLVENT FOR CELLULOSE.

We have received numerous inquiries in reference to this reagent, its preparation and methods of application. Cupro-ammonium or ammonio-cupric oxide is a solution of the oxide of copper in ammonia. If we allow aqua ammonia to trickle slowly over copper turnings, some oxide of copper is formed which dissolves with an intense blue color in the excess of ammonia. Leaving ammonia for some time in contact with the copper, and occasionally shaking the vessel to secure access of air, will also yield it. Perhaps a more rapid way is to cautiously add ammonia to a solution of sulphate of copper, then to filter off the supernatant liquid from the precipitated oxide of copper, and to dissolve the fresh oxide in ammonia. It ought to be borne in mind that the cupro-ammonium re-agent must be concentrated, as the dilute has little effect. As this is a solvent for cellulose and not for all sorts of impurities, the various substances to be tried must first be freed from extraneous matters. As much of our paper is weighted with French chalk, *terra alba* and sulphate of baryta, these mineral compounds may interfere with the experiments. Pure linen paper, such as is employed in the manufacture of gun cotton, ought to dissolve in cupro-ammonium very readily. Sea weed, grass, straw, ramie, etc., would require treatment with caustic soda to dissolve out the silica and other impurities. Peat, being nearly pure carbon, would not be readily acted upon. To waterproof the paper, only the surface is acted upon and the sheets are heavily pressed between rollers. Instead of trying tungstate of soda to render wood and paper fireproof, it would be well to experiment with soluble glass as being a much cheaper article.

It must not be forgotten that chloride of aluminum is also said to be a solvent for cellulose, and there may be cases where this re-agent would serve a better purpose than the more expensive copper salt. Sulphate of aniline yields a yellow color with wood fiber, and this reaction may be employed for the detection of the adulteration of linen paper by wood. There are doubtless many uses to which it would be possible to apply precipitated cellulose, and we trust that our correspondents will persevere in their experiments upon the cupro-ammonium solvent.

HE that has no resources of mind is more to be pitied than he who is in want of necessaries for the body.

ELASTIC WASHING MITTS.

The friction necessary to proper washing of clothes was formerly obtained at the expense of the skin of the knuckles of the operator, but this destruction of the animal tissue has long since been obviated by the invention of the corrugated washboard. In many cases, however, the board is not so convenient as a manual operation, and to facilitate the latter, an india rubber mitt has been invented and patented by Mr. Marvin Cadwell, of Lansing, Mich.

The covering for the palm of the hand is provided with

rings which engage with the middle fingers and with straps and a buckle, by which the device is attached to the hand of the operator. Each side of the palm is provided with corrugations; those on one side may be smaller and finer than those on the other, the sides to be changed in use for rubbing coarse or fine fabrics. In manufacturing the mitt, a rectangular piece, a little smaller than the portion which forms the corrugated part, is cut out of the palm, and the latter is then stuck upon the former to cover the hole thus cut out. The whole is then put into proper molds, and the corrugations and rings are formed by a press into which the molds are placed for the purpose. By this method, the palm with its corrugations is made harder and less elastic than the other portions, so that the latter can the more readily adapt themselves to the shape of the hand.

Statistics of Foreign Scientists.

M. de Candolle, an eminent Swiss naturalist, has recently published, in Geneva, a volume composed of interesting facts with reference to the eminent scientific men that have lived within the last two centuries. The *English Mechanic* of late date prints a lengthy review of the work, from which we select the following conclusions:

One question put by the author is, from what class of society do most of the scientific men of the world spring? In instance of the French Academy, he says that 37 members belong to the nobility or to rich and aristocratic families; 46 are from the middle class, and 6 from the working class. He considers from this and other cases, therefore, that the middle class is the most productive. As examples he cites Huyghens, Cassini, Newton, Cavendish, Volta, and Humboldt, as being either noble or wealthy; Leibnitz, the Bernouillis, Lagrange, Herschel, Berzelius, and Robert Brown as in the middle ranks of life, and Davy, Faraday, and Gauss as sprung from poor parentage.

M. de Candolle's observations do not confirm the view that intellectual faculties are hereditary. Of 94 foreign associates of the French Academy, he says that but 3 had sons who reached the same dignity. It does not appear that distinguished savants are specially descended from men devoted to the cultivation of the sciences, such as professors, doctors, and engineers. It is among the mathematicians that the heredity seems most marked. This is shown in the eight Bernouillis, Albert Euler, son of Leonard, and Clairaut, son of a professor of mathematics.

As regards religion, from the lists of foreign members of the Royal Society in London, the number of Protestants is found to nearly equal that of Catholics. Outside of the British Isles, it is estimated there are 140,000,000 of Catholics and 44,000,000 of Protestants, so that the latter furnish relatively three times more foreign members to the Royal Society than the former. In the roll of foreign associates of the French Academy, there are no English, Irish, Swiss, or Austrian, and but few German Catholics.

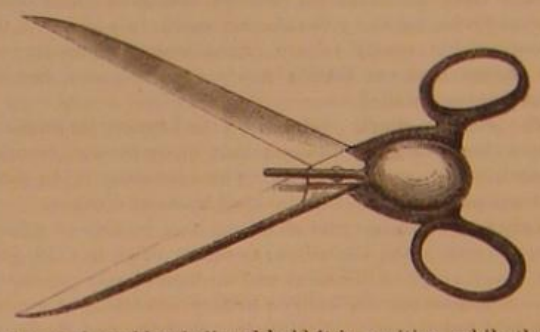
Another remarkable result is that, if the list of professions of fathers of eminent savants be studied, the profession furnishing most is that of Protestant pastor; Boerhaave, Wargentin, Hartsoecker, Euler, Campe, Linné, Blumenbach, Olbers, Wollaston, Jenner, Mitscherlich, Robert Brown, Berzelius, Agassiz, John Wallis, Fabricius, Arthur Young, Encke, Heer, Bernard, Studer, and Clausius, are all thus descended. The author also finds that a large number of distinguished scientific men are the posterity of the 50,000 refugees who were expelled from France after the revocation of the Edict of Nantes. Among these are the names of Mallet, the astronomer, Agassiz, and Desor, naturalists, and many others of note.

As to the part taken by Catholic ecclesiastics in the progress of science, it appears that the Abbé Haüy, in the beginning of this century, is the last priest who made a name for himself in the positive sciences. Padre Secchi, at Rome, is the only Romish clergyman of scientific eminence at present.

In general the smallest countries have been relatively the most productive, and among these Switzerland has always held the first rank. M. de Candolle enumerates as follows the influences which, in any country, favor the development of science: 1. A well organized system of instruction independent of parties, tending to awaken research, and to assist young people devoting themselves to science. 2. Abundant and well organized material means for scientific work, libraries, observatories, laboratories, collections, etc. 3. Freedom of utterance and publication of any opinion on scientific subjects, without grave inconvenience. 4. The habitual use of one of the three principal languages, English, German, and French, and extensive knowledge of these languages, among the educated classes.

BARBER'S HAIR BLOWING APPARATUS.

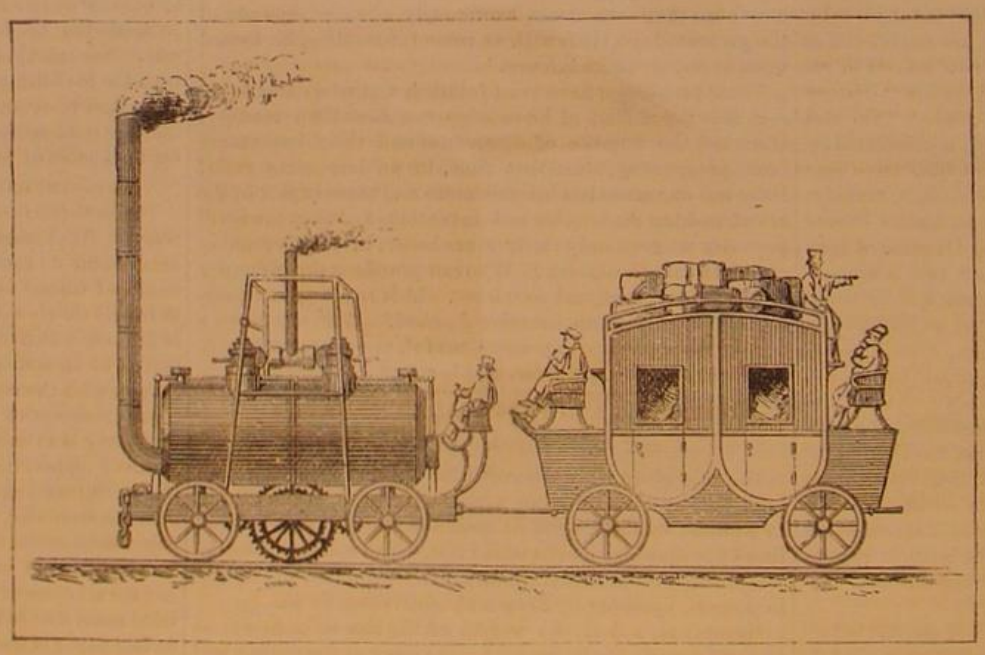
One of the most unpleasant circumstances of the hair cutting operation is caused by the short pieces of hair falling down the neck of the patient, creating irritation both to the skin and the temper. Mr. W. C. McIntire, of Washington, D. C., attaches, to a pair of barber's shears, an elastic hollow ball which is compressed by the operation of cutting; and a current of air, forced out from the ball, is directed along the edges of the blades and blows away the fragments of hair as fast as they are cut. The ball is taken between the thumb and fingers and slightly compressed, and then located between the handles; and when the pressure is relieved, the handles of the shears find their way into creases formed in



the sides of the rubber ball and hold it in position, while the ball, by its elasticity, forces apart the handles and opens the blades. The inventor claims that the improvement can be advantageously attached to shears for other than barbers' use.

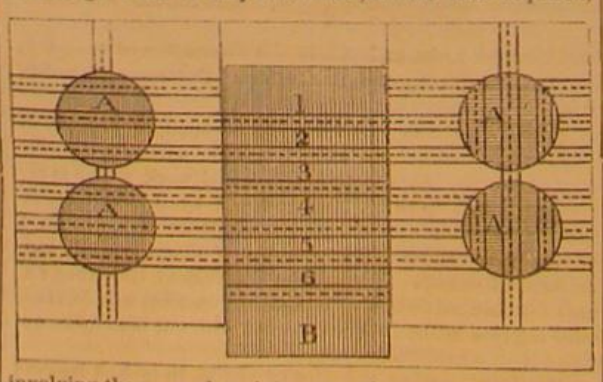
EARLY PLANS FOR RAILWAYS.

We recently referred to some of the curious pictures contained in the early numbers of the *Mechanics' Magazine*, and we now present another, being an illustration of the railway proposed in 1823, between London and Edinburgh. It will be observed that the track was composed of grooved rails, in the middle of which were teeth, and the tractive power was



PRIMITIVE RAILWAY.

obtained by cog wheels arranged on the locomotive. At suitable intervals, sliding tracks and turntables were to be arranged for the purpose of shifting the cars from one track to another. It was stated as an advantage of such a road that, instead of changing coach horses between London and Edinburgh some twenty-five times, as was then required,



involving the use and maintenance of more than 100 horses for each coach, the whole journey, with several coaches, would be performed in much less time, and with greater comfort to passengers, by means of a single steam engine.

IMPROVED FOLDING CHAIR.

A cheaply and easily made folding chair is shown in the engraving herewith, and is the invention of Mr. Charles A. Jackson, of Boston, Mass., who has patented it. A is the seat, B the back, C the front legs, and D inclined bars which, in conjunction with those portions of the side rails of the

back which extend below the seat, act as hind legs for the support of the seat when the chair is extended. The inclination of the back and seat can be varied, for which purpose notches are cut in the bars, D. It will be understood, from the illustration, that the chair, when not in use, can be folded up into a very small compass.

Manufacturing Paper from Wood.

Professor Heisch states, in the *Chemical Review*, that by Houghton's process for making paper pulp from wood, at least 80 per cent of the soda is recovered. He says: "What I mean is that, if you start with a solution containing 100 lbs. of real soda, after boiling the wood, precipitating the resin with carbonic acid, and rendering the liquid caustic by lime, you will have a solution containing about 83 lbs. of real soda, so free from resin as to be quite ready for a second boiling. The total loss, chemical and mechanical, is only about 17 per cent.

It will be some time before the salts of soda formed will accumulate in the solution to an extent to interfere with its use, and when they do so, the alkali can be recovered, by burning, far more advantageously from being comparatively free from resin."

Transparent Albumen Pictures.

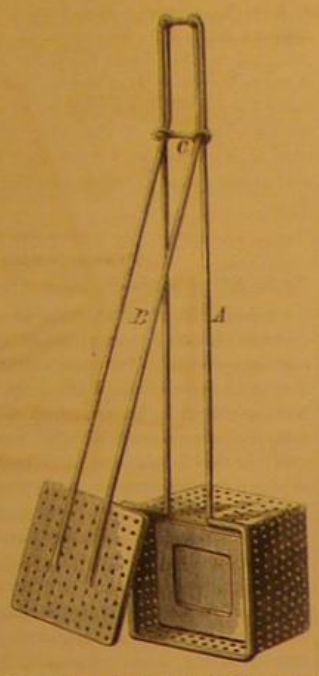
The use of transparent slides for magic lanterns makes it desirable to have a ready process for their preparation. G. Willis suggests the following: Make a solution of india rubber in benzole, of the consistence of ordinary collodion. Float a sheet of paper half a minute upon it and, after drying, albumenize in the usual way. Take the whites of eggs; for every egg add 7 or 8 grains of chloride of ammonia dissolved in little water; beat thoroughly and filter. Float the rubber paper on it in a warm place, taking care to avoid air bubbles. The paper dries rapidly, and can be preserved for a long time. The sensitizing and printing are performed as usual, only taking care to produce a much darker picture. The print is washed to get rid of the silver; it is then, before toning, laid on a glass plate and firmly pressed. After drying, the upper side of the picture is moistened with a tuft of cotton dipped in benzole; and after gentle rubbing, the paper can be removed from the plate while the picture remains on the glass. The gold toning and fixing of the picture is then performed, taking care to use a dilute soda solution, as one more concentrated attacks the picture. It must not be forgotten that an albumen picture on glass requires to be much stronger than a paper positive, and hence the necessity of a dark print. A transparency thus pressed is much finer than the slides taken in the usual way, and will bear magnifying without appearing granular.

The process has this advantage, that a supply of the rubber paper can be kept on hand, ready for sensitizing the same as ordinary albumen paper. The india rubber paper can be coated with chloride of silver collodion, printed, and transferred as above. Greater precaution is necessary in the latter case in toning and fixing, as the collodion print is more easily attacked than the albumen film; hence the albumen process is preferred by most photographers.

TO CEMENT GLASS ON BRASS.—A cement is used by Puscher which is particularly serviceable, says the *Druggist's Circular*, in attaching the brass mountings on glass lamps, as it is unaffected by petroleum and all of this class of burning fluids. It is prepared by boiling three parts of rosin with one part of caustic soda and five parts of water, thus making a kind of soap, which is mixed with one half its weight of plaster of Paris. Zinc white, white lead, or precipitated chalk may be used instead of the plaster; but when they are used, the cement will be longer in hardening. It has a great adhesive quality. The possibility of dissolving it to remove the mountings, will recommend it to many persons.

SOAP HOLDER.

Every one is familiar with the fact that in handling wetted soap it slips from the hand, flies just where it is not wanted to go and, in short, creates considerable annoyance. To obviate these difficulties is the design of the novel device herewith illustrated. It consists of a box of perforated metal provided with a detached cover of the same material. A wire, A, passes around the receptacle, and projects from it to form a handle. A bent wire, B, attached to the cover is hinged to the wire, A, and both wires are inclosed in loops formed in the ends of a yoke, C. When the latter is pushed down, the cover is held tightly against the box, and the soap which is placed therein is retained in position.



When the yoke is raised, the various parts appear as represented in our illustration.

When closed, with the soap on the inside, the box is dipped in the water and shaken until the requisite lather is obtained. It is then removed and placed upon the washstand.

This device was patented through the Scientific American Patent Agency, May 7, 1872, and is the invention of Mr. Jacob A. Camp, of Sandusky, Ohio.

The Vienna Exhibition.---Trials of Agricultural Machinery.

The trials of agricultural machinery will take place on the Leopoldsdorf estate, in the Marchfield, near Siebenbrunn, which is a government railway station situated at a distance of about eighteen English miles from Vienna, and, if necessary, also on the Guttenhof estate, likewise situated on the government railway, at a distance of nine English miles from Vienna.

The periods of the various trials have been fixed as follows:

A. *from the* 18*th to the* 22*nd of June.*

a. All hoes and such like implements will work in fields on which potatoes, turnips, and other cattle foods, and Indian corn are grown.

b. Also root-cutting, chopping, and crushing machines, kibbling mills, maize disgraining machines, and oil cake crushers, which are worked either by hand, winch, or by steam power.

c. Deep plowing in two year clover lands and manuring in fallow land will be done with steam plows.

B. *From the* 25*th to the* 30*th of June.*

All kinds of grass-mowing machines, hay turners, and hay rakes will be tried.

C. *From the* 14*th to the* 18*th of July.*

Thrashing machines for corn, wheat, and barley, straw elevators, corn-cleaning machines and sorting apparatus, worked either by hand, winch, or steam power, will be tried.

D. *From the* 21*st to the* 25*th of July.*

Will be tried:

a. All kinds of steam plow work.

b. Ordinary plowing on pasture land and in the field.

c. The work of sowing machines.

d. Harrowing and rolling.

The separate days on which these various trials in the field will take place, will be made known in due time.

The transport of the machines to and from the trial fields, as well as the motive power, fuel, and attendants, required for working them on the fields, must be provided by the exhibitors themselves.

A particular place will be assigned in the Exhibition grounds for repairing the machines and implements which may have been damaged in appearance, etc., during the trials, before they are brought back to their stands in the Exhibition. Without this renovation the machines that have been tried will not be allowed to be returned to their place. Should the necessary repairs be done carelessly or be neglected altogether by the exhibitor, it will be undertaken at his cost by the general manager.

All steam plows will receive

a. For deep plowing in two year clover land, 36 acres. (One German acre = 1·422 acres English).

b. For plowing in the manure, 30 acres.

c. 100 acres for stubble plowing.

d. 36 acres for the trial of weeding implements and machines, and

e. Appropriate spaces for steam harrowing and other work.

For practice grounds, about 10 acres will be allotted to each steam plow.

For plowing trials with ordinary plows will be assigned 13 acres of pasture land; about 50 acres of corn stubble field, and about 10 acres for plowing in the manure.

For testing all kinds of mowing machines will be available: 80 acres of rye field, 40 acres of wheat field, 40 acres of barley field, 12 acres of pasture land, and 30 acres of clover land.

For practice ground the exhibitors will have 18 acres of rye land, and an appropriate piece of pasture land.

For thrashing machines there will be provided:

4,000 }
2,000 } mandels (each mandel numbering 15 sheaves)
2,000 }

in order that each thrashing machine, and likewise the cleaning and sorting machines, may be able to work several hours.

The quality of the material of the machines, excellence of construction, the applied draft or steam power, the consumption of coal, the indications of the steam engines, the whole performance as to quantity and quality, will be set down in tables, and serve at the consultations of the jury as helps and guides for the award of the prizes.

A New System of Telegraphy.

A correspondent, J. H. M., asks, if the telegraph business of this country is to be controlled by the Government, would it not be well to have cables, consisting of hundreds of small insulated copper wires, laid along the roads leading from the principal cities, from which a number of wires could diverge to make connections with the villages and small cities along the route. The number of wires used in a branch connection should be proportioned to the size of the place with which communication was desired, and these wires should be controlled by a Government official in each city or village. Any firm or family in the city should be allowed, for a moderate payment (say $10), to have a wire from the store or house to the Goverment office, the business of the official being merely to connect the local wire with the wire from the cable leading to the place with which it was desired to communicate. This system, J. H. M. thinks, would make the telegraph an indispensable convenience in every house.

GROCER'S SAMPLE CASE.

Our engraving illustrates a new box or case to be used by grocers and others for containing spices or other goods, protecting them from injury, and also displaying the prices of the same. The box is provided with a suitable glass cover, which is slid into its place and held in the grooved sides. This can be withdrawn by pulling it toward one end of the case, or it may be locked by means of the slide or catch, A.

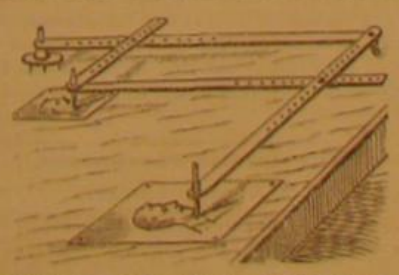
Fig. 2 *Fig. 1*

Fig. 2. An inclined plate is arranged with projecting arms, which enter sockets on either sides of the box, and serves to support a card suitably inscribed with name, price, or other information.

Patented through the Scientific American Patent Agency, January 14, 1873. For further particulars address the patentee, Mr. N. B. McCreary, Phelps city, Atchison Co., Mo.

THE PANTAGRAPH.

In response to inquiries for further information regarding the pantagraph, or instrument for copying drawings on an enlarged or reduced scale, described in a former number of this journal, we give herewith another engraving, which



shows its operation more clearly. The apparatus is very easily constructed from wood or metal. Some care should be taken in making the joints, in order that they may work very easily without shaking.

THE SPIRIT LEVEL.—The following is written on the back of the model of a spirit level, deposited in the Patent Office and patented by C. W. Evans, February 13, 1855: "What is the most effectual spirit level you ever saw? Give it up? Rum!"

SCREW DRIVER ATTACHMENT.

This is a convenient and handy little countersink tool, to be attached to an ordinary screw driver and remain permanently affixed thereto, each implement being as readily used as if it had a separate handle. The reamer or countersink is placed alongside the screwdriver, and a slot in its shank provides for its being slid down when required for use, and up out of the way when the screw driver is needed. The inventor, Mr. W. G. A. Bonwill, of Dover, Del., proposes to use his improvement in conjunction with gimlets and other tools in use by carpenters, the application of it to which will readily be suggested in practice; but it will be found in its most appropriate place on a screw driver, that the hole, after being bored, may be reamed before the screw is inserted. It is a neat and convenient arrangement and will find favor with workers in wood.

Medical Uses of Carbolic Acid.

1. It is not proven that carbol is a general disinfectant.

2. It is of the greatest use to disinfect wounds.

3. It accomplishes this by destroying pus, etc., and by preventing inflammation.

4. Its use in wounds moderates pain.

5. Its use on the skin relieves itching, and produces an anæsthesia sufficient for minor cutting operations.

6. It seems to be of use internally, in certain cases, in scaly skin diseases, and at least as a moderator of pain in cancer.

7. It has not proved of decided use in other diseases.

Correspondence.

The Japanese Show at Vienna.

To the Editor of the Scientific American:

For the last few days there has been on exhibition in Yedo, in one of the old mansions of the Ex-Daimio of Satsuma, the collection of articles intended for the Austrian exhibition. This collection, the first of its kind ever made by the Japanese to be sent abroad, deserves some notice; and as many of our readers will not have time or opportunity to visit the Vienna exposition, a sketch of the collection may not be without interest to them. To us, who have lived some time in Japan, and have done our mite toward helping the Japanese to civilize themselves, this exhibition in Yedo is an event of great importance. It is only eight months since that the Japanese government resolved to send a contribution to the Vienna exposition, and the work of collecting and preparing such a contribution was a new one; but the commissioners have been so tirelessly diligent that Japan's offering will occupy no mean place among those of other nations. The Mikado and the Imperial household visited the exhibition a few days ago, and his visit is thus described:

"His Majesty, on alighting from his carriage, was shown by the Vice President into the exhibition, and examined the first division of it, group by group, manifesting great interest, and asking a number of questions, which were answered by the Vice President and by Mr. Tanaka, a Japanese naturalist who has studied in Paris. The rest of the Japanese commission and the European staff attended His Majesty through his inspection of the rooms. His Majesty devoted much time to the examination of the minerals and geological productions collected from the several provinces and departments. After an hour and a half's visit, His Majesty retired to the private apartment which had been prepared for his convenience, and rested for half an hour. During this time the plans and photographs of the Vienna exhibition, the catalogues, and other papers connected with the Japanese department were laid before him. After partaking of some refreshments, His Majesty resumed the inspection of the remaining groups, and visited the articles prepared for the London exhibition. His Majesty then made a tour through the garden, and saw the collection of live animals which has been collected from various provinces of Japan, and then took his departure, attended to the entrance hall by the same officials who received him on his arrival.

Most of the contributions are made by the provincial or departmental authorities, or have been purchased by the commission; but some of the specimens have been sent in by private and official contributors. The exhibition has been enclosed in a large square, surrounded by gardens laid out in Japanese style. After reaching the large gate, the first thing the eye meets is a pair of enormous paper lanterns, with a diameter of at least twelve feet, painted with dragons in brilliant colors. The articles themselves are arranged inside the buildings, grouped in accordance with the classification of the Vienna exhibition; and although everything has not yet arrived, it is undoubtedly one of the most perfect and beautiful collections of Japanese products that has ever been brought together."

The first room was devoted to the mineral and mining products of Japan, which were rich in coal, copper, lead, silver and gold, and gave great promise of what Japan shall be able to do when a new system of mining is carried out all over the country. The iron ore, though abundant, consists chiefly of the magnetic oxide, and, considering the cost of fuel in Japan, is rather costly to smelt. If, however, coal beds continue to be discovered in as rapid a rate as heretofore, the

iron industry in Japan will assume vastly larger proportions than at present. Nine tenths of the iron used in the arts of Japan now is mined and fabricated in England. The geology and mineralogy of Japan are well represented, and the arrangement is all that could be desired. The collection of pearls which were ranged in small phials, and were from the size of a nit to that of a bean, showed clearly that this hitherto neglected branch of industry should be cultivated. It seems tolerably certain that the seas around nearly the whole of Japan produce pearls. Little attention has thus far been paid to this source of wealth. The display of raw silk, woven silk, dyed and figured crape, satin, and many different varieties of manufactured silk was very large. In addition to these, silkworms' eggs on cards, hundreds of boxes of cocoons, the *larvæ*, grubs and moths in all stages and of many varieties of these insects were exhibited. Even the "wild" silkworms, that produce a kind of rough silk that cannot be reeled, were exhibited in all their developments. Then followed silk reeling and silk weaving machines, raw silk or "cotton" silk, which is produced by forcing the worm to spread his silk over a flat surface instead of winding it into a cocoon. Every detail of the silkworm rearing and of the silk manufacture was thus fully exhibited. The collection, arrangement and quality of the *materia medica* and cereals of the country were most excellent. In wax, both vegetable and insect, Japan excels, and the display of ornamented candles was unusually good. In paint, lacquer and coloring materials, Japan can surpass the world if she will. There were all shades of the famous lacquer varnish, produced from the Japanese varnish tree, *rhus vernicifera*, which grows from 15 to 20 feet high and produces a white, cream-like sap, which turns black in the air. Further on the display of lacquer work, such as boxes, cabinets, and miscellaneous articles, numbering hundreds in all, were exhibited. The gold lacquer and inlaid work of all kinds will be highly admired. Some of these specimens are several centuries old; and in Japan, old lacquer is always sold at fancy prices. Of animal skins, there was a good assortment. And of fancy-painted leathers, very soft and smooth dressed leather, calf-skins, and made boots and shoes, there were enough to show what strides the natives, under foreign instruction and often by sheer imitation, have succeeded in doing. Leather had scarcely a name in Japan five years ago, but now leather workers are honored, wealth is being produced, new industries are springing up and the demand for leather is enormous. The government has its own tanneries and foreign shoemakers who instruct the natives. In bronzes, considering the capacity of Japan and the curious skill of her artists and molders in this line of work, the display was not large. Two of the vases, however, in steel and bronze were works of consummate art. In steel and iron, though the swords, needles, and saws challenged admiration of their purity, polish and temper, the collection showed the very backward state of the iron and steel industry of Japan. Not to detail to a wearisome extent, wood and stone carvings, colored stone, mosaics, basket work, tortoiseshell, horn and ivory inlaid work, ivory carvings, fans, silk flowers, toys, personifications (of character, rank, costume, history, etc.), in wax and papier maché, extremely fine, were all appropriately represented. An imitation human skeleton, neatly mounted, deceived even a skillful physician of many years' experience of Japanese and Chinese "humbugs." In cut crystal, a perfectly pure globe, seven inches in diameter, was shown, and several others four inches in diameter, beside all kinds of ornamental forms, and some uncut specimens of this mineral ice. In the peculiar gold and silver, inlaid, intaglio, metal, mosaic, cameo and chain work, the special fitness of the Japanese for delicate, nimble and cunning work was admirably shown. The glass industry in Japan as yet is in its babyhood. All the varieties of textile fabrics, hemp, cotton, etc., and what little machinery they have, were shown. And the paper whose softness and lightness are unrivaled, with their pulp, calendering, and drying processes were shown, and are slow enough in action to drive the owner of a steam paper mill mad. But wait a few years. Oiled paper coats, hats, clothing carpets, boxes, etc., wall paper in many varieties, (as on Japanese walls, made in squares of 18 inches) were in their appropriate places

From Yezo the specimens were numerous and of a highly interesting character, with many photographs of the Ainos, wild inhabitants now being civilized by the Colonization Department. These Ainos are hairy men in a very low state, who are supposed to have been the aborigines of Japan. In entomology, conchology, ichthyology, etc., the collection was good, but not what it might have been had more time been given, nor what it surely will be. The porcelain, which cost the Government $200,000, and was made especially for the Vienna Exposition, was characteristic and its decoration very fine. There seems to be no danger that Sevres or Dresden will lose their laurels in comparison, however. What is very commendable about the exhibition is that the Japanese, much against their first inclination, have been prevailed upon to send very much that will illustrate genuine Japanese life, customs and products. The collection will not only give the world's people, who go to Vienna and London, a good idea of the actual condition of Japan, and of the nation in its developing or transition state, but will also exhibit the actual needs of the country. A tolerably good collection of plants and live animals also accompanies the commission. Among the most interesting specimens of things purely Japanese are models of the great pagodas, temples, dwelling houses, and fireproof storehouses. In a future number I may speak of the structure of these fireproofs, and how they are made so, and of the pagodas and houses, and how it is that they have resisted the fires above and the earthquakes beneath during hundreds of years.

"From what has transpired, we cannot be wrong in already congratulating the Japanese Vice-President and commission on the success gained; and the establishment which His Majesty has visited on this occasion seems not only intended as a temporary erection, but for future exhibitions, and the specimens collected are proposed to become the nucleus of a permanent exhibition, on the plan of the English South Kensington Museum. The visit of the Emperor may be considered as laying the foundation of an undertaking from which, if it be properly managed, Japan will derive considerable advantages in the future."

It is with much regret that I find I cannot depict to my satisfaction the exhibition as I saw it with my own eyes.

Yedo, December 26, 1872. W. E. G.

Construction of Dwellings.

To the Editor of the Scientific American:

Having noticed in recent numbers of the SCIENTIFIC AMERICAN a number of communications in regard to the construction of dwellings, I send you a description of one which I propose to have erected for myself, hoping the suggestions contained herein will be of value to some of your readers. The method of construction is briefly as follows:

The foundation having been built in any approved manner, there is to be erected upon it a frame work composed of sills, studding, etc., the same as for an ordinary dwelling house. This being done, the entire frame is to be filled in with brick work only four inches thick, care being taken to have this filling flush with the outer and inner surfaces of the studding. The structure is then to be weatherboarded in the usual manner, and the plastering applied directly upon the inner side of the filling, it being understood that the studding is to be of the same thickness as the brick work. The sills will prevent dampness passing up from the foundations into the filling, and the external sheeting will exclude moisture from the joints of the same; thereby ensuring a perfectly dry and comfortable house. The filling, which can be composed of inferior material, will prevent rats and other vermin running through the house; and the said filling will also add greatly to the safety of the structure, as it is well known that the open spaces between the studding, weatherboards and lathing are simply flues which serve to conduct fire from the lower to the upper parts of the building with fearful rapidity. In case of an external fire, the weatherboards would consume but slowly, on account of their being backed up closely by the brick filling, which would prevent a rapid spreading of the flames.

As far as economy is concerned, such a building would be about as cheap as a frame house with double weatherboarding and lathing, and in some sections of the country, it would be much cheaper. The durability of the structure could not, it appears to me, be questioned, as the frame work would preserve the integrity of the filling and maintain it securely in position for an indefinite period.

Can you or any of your numerous readers see any practical objection to such a structure? J. H. L.

Cincinnati, O.

Using Corn as Fuel.

To the Editor of the Scientific American:

On page 16, of the present volume of the SCIENTIFIC AMERICAN, I find a paragraph with the above heading, and I wish to correct the impression, conveyed in that article, that western farmers are depleting their timber lands. I can speak for Iowa and Nebraska. I came to Tremont county, Iowa, in 1856, and at that time timber land was held at thirty dollars per acre, and prairie at from three to five dollars per acre. At this time timber land can be bought for from fifteen to twenty-five dollars an acre, and prairie is at least twenty per cent higher in price than forest. We have more acres of timber, and what we have is constantly improving since the fires have been controlled. The burning of corn in Iowa does not imply that the "wood land is sadly depleted," but it implies that we have millions of bushels of corn that we can neither sell nor feed to our stock. When spring opens, we shall still have several million bushels of corn on hand in this county, not reserved for our stoves but waiting for a market. Last summer I rode through a patch of corn containing at least eight square miles, all in one field, and it equaled the corn mentioned in "Corn as Fuel" in quantity and excelled in quality.

We have wood, we have coal, we have land as fertile and as easily tilled as any, east or west, and we can raise any amount of grain. What we need is a market. It takes about five bushels of corn to pay for sending one bushel to where it can be used. The railroads promised to help us if we would help them; but they have been an injury so far, and will be in the future unless controlled in some way.

H. D. I.

Singular Phenomenon.

To the Editor of the Scientific American:

On the evening of November 7, 1872, about 9.30 P. M., as I was walking upon the highway near La Grangeville, Dutchess county, N. Y., and carrying a light to direct my steps in the darkness, I observed on the instant that the light I was carrying was overcome by some more intense light, and instantly took a sweeping look overhead, expecting to see some large luminous body passing through the heavens. I did not catch sight of any such body; but in the southwest, at an angle of about forty-five degrees with the horizon, I saw what I at first supposed was the fiery train of a meteor, or something of that kind, intensely bright and apparently about equal in length to five diameters of the full moon when rising. The line of light, intense as it was, seemed to maintain its position and brilliancy for several seconds, and then seemed very gradually to grow broader, and proportionally to lose its intensity, and finally it seemed to drift like a luminous mist into the form of a sickle. At first I and my companion halted and stood for a short time to observe this strange but beautiful sight; and afterward, when I had continued my walk for a quarter of a mile or more, I could still see some remains of the misty drift. What I have endeavored to describe was witnessed by another gentleman who was going from the same meeting and in an opposite direction. G. P.

Transplanting Trees.

To the Editor of the Scientific American:

On page 132 of your current volume, I noticed an article on transplanting trees; and as I have had some experience and opportunities for observation, I will with your permission give my views. I not only agree with the writer that the top ought to be trimmed sufficiently to "preserve the relative proportion with the root," but I would go further and say that I have found it best to cut the top entirely off, at the point where you want your tree to branch, thus leaving only a straight pole. You will have a better looking tree, and in less time than if the limbs had been left on; and the chances of the tree's living are much favored by this method. Another very important matter is the time of transplanting. With the sugar maple, to which my experience has been chiefly confined, care should be taken that transplanting, and consequently trimming, should not be done while the sap will run, else, as is often the case with the grape vine, the tree will "bleed to death." I think the best time is when the leaves are just beginning to open, which is just after the flow of sap, and before any new growth has been made. In taking up the tree, preserve as far as possible all the fine fiberous roots; a long large root, destitute of fibers, is of very little account, and may be cut off, if troublesome to get out of the ground. All broken roots should be smoothly cut off before setting; and one other matter, very generally neglected but highly important, is to cover the roots with wet straw immediately on taking them from the earth, and to keep them so covered during transportation, and then taking out only so fast as you are ready to put them in their places. I would give very little for trees which had been carted several miles with the roots exposed to the sun and wind for a half day or more. The roots should not be exposed to rain to wash off what little soil may adhere to them, but should be kept, just as nearly as possible, in their natural condition, neither frozen, dried nor washed. It is best, if possible, to select trees that have not grown in dense thickets, but have had considerable exposure to the sun. Some recommend setting the tree out with its points towards the same points of compass as they were originally, thus exposing the same side to the heat of the sun; but I do not know that it is essential. They should be put at about the natural depth in the earth, and I think should be mulched slightly with some material that will allow the rain to pass through freely, but prevent the ground about the roots becoming too hard and dry. No manure should be used. I know a lot of yellow willows which were set a year ago with neither root or branch, being simply cuttings, six or eight feet long and from two to six inches diameter. They branched profusely and appeared to thrive; but this year will tell the story. Such practice would not apply to the sugar maple, however. M. A. G.

Electrical Disturbances.

To the Editor of the Scientific American:

In your journal of February 22, I notice an account of electrical disturbances on telegraph lines in Iowa on January 8, and I have frequently observed phenomena of the same description in Nebraska and Iowa. They always occurred during wind storms blowing from west, north west or south west, and generally with a change of temperature from mild to cold. My theory is that the cold volume of air rolls down from the Rocky Mountains over the Nebraska plains eastward, bearing with it the electrical condition of higher tension of that altitude. The velocity with which it is carried eastward, combined with excessive dryness of the atmosphere, prevents or retards its ready union with the opposite electricity of the earth, and it consequently takes its course through the best conductors it can find. The storm may move eastward as a cyclone and thus, through its possibly comparatively small area, not noticeably affect north and south lines, while it affects east and west lines as it moves forward.

I base this on the fact that these disturbances always occur during a wind storm from mountains, with decrease of temperature and dryness of the air. W.

THE DANGERS OF OCEAN TRAVEL.—A correspondent, W. F. G., points out the dangers of ocean-going ships, laden with material very easy to burn, even if not dangerous from spontaneous combustion; and he asks what would be thought if the railroad companies should build two story cars, the lower floor being devoted to highly inflammable goods and the upper floor to passengers? Yet, he says, this is exactly the arrangement on an ocean steamer. He suggests the employment of separate vessels for passenger traffic, and states that ships of higher speed than any now in use could be built specially for the purpose.

THE first regular bank was established at Venice, in 1157. The bank of Genoa was established in 1407; that of Amsterdam in 1609; England, 1694.

A New Gas.

To the experimental works at Battersea we were recently invited, says *Engineering*, to witness the process of manufacture of a new gas, and we there found, in a retort house adjoining the water company's boiler house, a bench of three iron retorts, set with a furnace in a manner similar to those used in ordinary gas making. From the boiler house a pipe is lead to the two lower retorts, to which steam is supplied, the steam being superheated on its way, and delivered directly on to a mass of highly heated coke and iron. The charge for each retort is 1¼ cwt. of coke and 1 cwt. of iron. From the two lower, the gas is led into the upper retort, which contains a charge of charcoal, and from which the mixed gas issues. The composition of the gas at the point of issue is hydrogen, carbonic oxide, carbonic acid, and sulphuretted hydrogen. The steam is thus thoroughly decomposed, and the result in chemical language is stated to be $H^2O + C = Co + H^2$, which constitutes what is termed heating gas, and which is well adapted for that purpose. Before it can be used, however, it has to be deprived of its sulphuretted hydrogen. This is taken out by passing the gas, after condensation and while on its way to the gasholder, through a purifier charged with oxide of iron. The gas is certified to be perfectly free from bisulphide of carbon, that *bête noir* of coal gas manufacturers. The carbonic acid and oxide are allowed to remain in the gas, the concurrent testimony of several medical and scientific men, including Dr. Frankland, being to the effect that the removal of the acid is unnecessary in a sanitary point of view, whilst the illuminating power of the gas is sufficiently high notwithstanding its presence.

The gas has now to be converted into an illuminating agent, and this conversion is effected by passing it through rectified petroleum spirit of the specific gravity of about ·680. This change from a heating to an illuminating gas causes an increase of 25 per cent in the volume of the gas, which passes on from the hydrocarbon spirit to the meter. The ultimate result of the manufacture is a gas containing 12 per cent of carbonic acid, and which, when consumed in an argand burner at the rate of 5 cubic feet per hour, is stated to have an illuminating power of 16·6 candles burning 120 grains of sperm per hour. The economy in labor is apparent at the works, where one man was barely occupied in attending to the setting of three retorts. The experimenters estimate the saving in labor, when working the process on a large scale, to be 29 men in 30; or, in other words, they state that one stoker can do the work of 30, the retorts yielding more than twice as much gas as in the ordinary process; and the retorts require to be charged and drawn but once in 36 hours, instead of every 6 hours as in coal gas making. With regard to cost, we have it on the same authority that the heating gas costs 7d. per 1000 feet only, and the illuminating gas 1s. 7¼d., or in round numbers 1s. 8d. per 1000 feet, inclusive of the cost of raising steam, materials, wages, and all the various items of wear and tear. A comparison of this price with that of ordinary coal gas shows very favorably for the invention, as at the present time, with gas coals at 26s. per tun, it costs 2s. 4d. per 1,000 feet. The new gas, therefore, possesses a great advantage over the other, where gas coals cost more than 20s. per tun. It is found that 1,000 feet of the heating gas will absorb 1½ gallons of the spirit, and that 2 tuns of coke will produce 132,000 cubic feet of gas.

The practicability and economy of the process having been thus far affirmed, let us now look at the question from another point of view; let us see how far this gas is likely to be affected by storage or transmission to great distances. In other words, is the product a permanent gas? This question is best answered by the statements made by the investigators who affirm that the gas is permanent, and that it can be conveyed to any reasonable distance without its character becoming altered. Theoretically, this affirmation is reasonable, inasmuch as the union between the lighter permanent gases, such as hydrogen marsh gas and carbonic oxide, and hydrocarbon vapors is very intimate. Then again, the new gas and ordinary coal gas being of nearly the same specific gravity, it should follow that to whatever distance the latter can be conveyed the former can be carried. What has really been done towards determining both these points is this: the gas has been stored over water in a holder placed out of doors for two months, and at the end of that time no deterioration of illuminating quality, nor any mechanical separation, could be detected by Dr. Louttit on a careful examination. As regards its conveyance, Mr. Quick and Mr. Spice had 1000 yards of 3 inch gas main laid on blocks on the surface of the ground at Battersea, the pipes being laid with a number of bends and curves, rises and falls, to represent what would occur in actual practice. The whole of the pipes were exposed to every variation of temperature, and throughout the experiments the weather was exceptionably cold and wet. The result, however, was that no perceptible loss of illuminating power could be detected, a proof of the permanency and retaining power of the gas. Moreover, the investigators submitted the gas to the severe test of a sudden reduction of temperature from about 60° to 30° Fah., without finding any sensible diminution of its illuminating power.

So far, then, everything has been done to elucidate the question as fairly and as practically as possible; and, notwithstanding a critical discussion, which took place at the inspection on Saturday, and which was courted, the fact remains that a sound gas is produced at a cost considerably lower than that of coal gas. The new gas manufactured at the experimental works is used for lighting the adjoining boiler and engine houses; it gives a pure light, and has a much less offensive smell than coal gas, than which it is said to be less explosive. The gas can be applied to heating purposes, and the pipes carried on to the illuminating burners, the gas on its way being passed through the spirit. There are many applications for such a doubly useful gas, and it now only remains for it to be put to the test of actual commercial manufacture to prove it either a success or a failure. In view of the results obtained up to the present time, and the care exercised in the development of the invention, there appears to be every probability that it will succeed. We may add that the new gas will be represented at the Vienna Exhibition, where plant is about to be erected for the production of 30,000 feet per day.

Chats with Sedentary People.

John Smith, a book keeper, asks what he shall do. Dyspepsia, nervousness and all that sort of thing have got hold of him. He has no time to get the fresh air, no time to exercise—no time for anything in fact; and would I advise him to change his occupation?

"John Smith, what time are you due in the counting room in the morning?"

"About half past eight."

"Could you put it off till nine?"

"Well, perhaps so, if I didn't let my work get behind hand."

"And you want to know whether you had better change your business? I advise you against a change. A man should not change his occupation lightly, and you, John Smith, need not change yours on account of your health. If your counting room is light, the business is a healthy one. Book-keepers may be as healthy as cartmen, if they are willing to embrace their opportunities. Now, listen to me.

You are occupied, say, eight hours a day as a book-keeper. More? Well, say nine hours. This leaves fifteen hours. You are in bed eight hours. Now, you have seven left for recreation, and yet, John Smith, you think you have no time for exercise and healthful amusements. Two hours are quite enough for the exercise and out-door life which will keep you in high health, and then you will have three hours left for social enjoyment, saying nothing of the entire day, Sunday. Let me tell you how to manage it, and I will premise that the advice I am about to give you is exactly adapted to half the population of this city.

1st. You must retire at nine o'clock every night.

2d. During the spring, summer and autumn you must rise at five o'clock. During the winter, at six o'clock.

3d. Beginning moderately, you will soon enjoy two hours of out-door walking and recreation before breakfast. Ninety-nine persons in a hundred, including both sexes, between ten and sixty years of age, will, if they begin the early morning exercise gently and prudently, within three months rejoice over a happy change in their health and spirits, and they will mourn over the great loss for so many years of those precious hours of the early morning."—*To-Day.*

Starch Sugar and Starch Sirup.

Before the Society for the Promotion of Trade in Prussia, Professor Dr. Weber gave a discourse on the manufacture of starch sugar and starch sirup. According to his assertions, agriculture has in latter times gained considerably in extent, and the production of starch and glucose has risen in an important degree. With regard to the preparation of glucose, he mentioned that the process usually practiced at present—heating a thin paste of starch with a little sulphuric acid, neutralizing the liquid with lime, and evaporating to the consistency of sirup, was discovered by Kirchoff in 1811, and that, by the introduction of the filtering process and employment of vacuum apparatus, it has now made important progress. In Alsace, special value is attached to the utmost purity of the products. The sirups made there are transparent, and without any after-taste. These superior articles are obtained by the most careful and repeated filtration of the liquors with animal charcoal. The results of the filtration processes differ more or less as dextrin remains in the liquid, fluid or solid products, sirup or starch sugar. The sirup is employed principally in Germany for the preparation of beer, and for adulterating the Indian sirup, and also honey. The purest Alsatian syrup is employed for confectionery and also for the making of liqueurs. Starch sugar serves as a substitute for wine must, and also for the making of sweetmeats. It prevents the crystalization of the sweet mass. Of late, large quantities of it have been exported to England and used for brewing purposes. From the purest sugar, the extensively used sugar color is prepared by heat.

With regard to the situation of the manufactories, it was remarked that this industry was developed first to a greater extent in those parts of Germany where the potato is specially cultivated. There are large manufactories of this kind in Brandenburg, Frankfort on the Oder, Kustrin in Silesia, and also in Saxony. At present the raw material (moist starch) is packed in bags and transported to manufactories in East and West Prussia. To the manufactories in Alsace is assigned the preponderance of the starch produced over those in the Vosges.

The ministerial director, Moser, remarked, in addition to this discourse, that the sugar color mentioned by the lecturer is as present much used by the French sugar makers for coloring raw sugar in order to make it appear of less value, according to the well known system of classification adopted in France for assessing the duties. Afterwards, on the exportation of the refined article, the duty is restored in proportion to the real percentage of sugar. The German, especially the Rhenish, refiners maintain that they are wronged by this process, as, on account of the very low duty on the raw product it is possible for the French refiners to bring the sugar into the market at a lower price than they themselves are able to do. In consequence of the complaints received, the Government is at present occupying itself with this question.

Mercury.

It would be difficult to say which of the properties of mercury first strikes us as its most remarkable peculiarity. That it is the only metal liquid at ordinary temperatures, is scarcely more noticeable than its great weight. Its singular mobility, to which it owes its common Saxon name of quicksilver, is but a consequent of the two first mentioned properties. Its chemical power of forming two series of salts, unlike in their reactions and in their physiological effects, is almost without a parallel. Its compounds are very sensitive to heat, says a correspondent of the *Boston Journal of Chemistry*, the iodide changing color like a chameleon. The sulphocyanide is used in making the curious but dangerous toy called "Pharaoh's serpents," because of the ease with which it is decomposed by heat. The one very unfortunate property is that it gives off diffusive vapors at all temperatures, even when frozen, which requires a cold of 40° below zero Fahrenheit.

Professor Hyrtl delivered a lecture on mercury in Vienna recently, when he exhibited the leg bone of a man, whose death had undoubtedly been hastened by mercury. On striking the bone heavily upon the table, out fell thousands of little, glittering globules of mercury—bright, metallic mercury,—which rolled about upon the black surface before him, collecting here and there into drops. This mercury had been absorbed during life, undermined his system, and finally proved fatal to him.

The mortality among those who work in quicksilver mines, or in the works where it is reduced, is known to be frightful. In the mines of Idria the men work alternately one month in the mines and one in the smelting house. Of 506 men employed there in 1858, not less than 122 were salivated, and even cattle in the neighborhood of the works were similarly affected.

The use of mercury for reducing gold and silver by the amalgamation process is also dangerous, unless great care is taken. The manufacturer of barometers and thermometers is exposed not only to the visible vapors of the heated mercury, but still more frequently to those which rise from the metal spilled on the floor and spontaneously evaporating. A Vienna professor of botany, while conducting a series of experiments on the respiration of plants, used mercury to close the bell jars and separate them from atmospheric air. The volatilization of this metal in his laboratory caused him a long and dangerous illness.

The latest method that has been proposed for rendering the vapors of mercury, ever present in a looking glass factory, less hurtful is chloride of lime. The chlorine uniting with the mercury forms calomel, which is not absorbed through the pores of the skin as the metal is. For washing the hands and clothing it is, no doubt, useful: but whether it will accomplish all that is hoped for it, remains to be tested by actual and prolonged use.

Ammonia in Suspended Animation.

We learn from Australian journals that the value of the injection of ammonia, as recommended by Professor Halford in cases of snake bite and suspended animation, has been again demonstrated. A lady in Melbourne recently swallowed by accident an ounce of Browne's chlorodyne, which is a mixture of chloroform, morphia, and prussic acid. When seen by her medical attendant, she was, as he imagined, on the point of death—cold, insensible to everything, and giving only occasional gasps as signs of breathing. Recollecting a former case in which a young man who had taken chloroform was revived after death had apparently occurred, the doctor mixed half a drachm of the liq. ammon. fort. with one and a half of water, and within the space of one minute injected the whole into a vein of the arm. In a few minutes the pulse returned, the breathing became natural, and by twenty minutes the whole body had regained its natural warmth; but perfect consciousness did not return for some hours afterward. The patient made a rapid recovery. Two further instances have also been reported in which the timely use of the injection saved the victims of snake bite from the death which threatened them.

A New Form of Fire Escape.

A correspondent, E. H., suggests the use of a pulley attached to the eaves of a building, over the sheave of which a wire rope is to run, one end of the rope being connected with a small windlass in the basement, and the other to a light iron box or frame. Firemen could travel up and down the side of the house, enter the windows of each floor, and rescue the inhabitants; and the windlass would be worked by men in the basement, and would be protected from danger from heat, smoke, and falling timbers. E. H. claims that his method would be far superior to ropes and ladders, of which women, children, and sick persons are too timid to avail themselves.

AT a recent meeting of the faculty of the Stevens Institute of Technology, Hoboken, N. J., resolutions of regret and condolence on the death of the late Professor Rankine were passed, and were then forwarded to the Council of the University of Glasgow and to the family of the deceased.

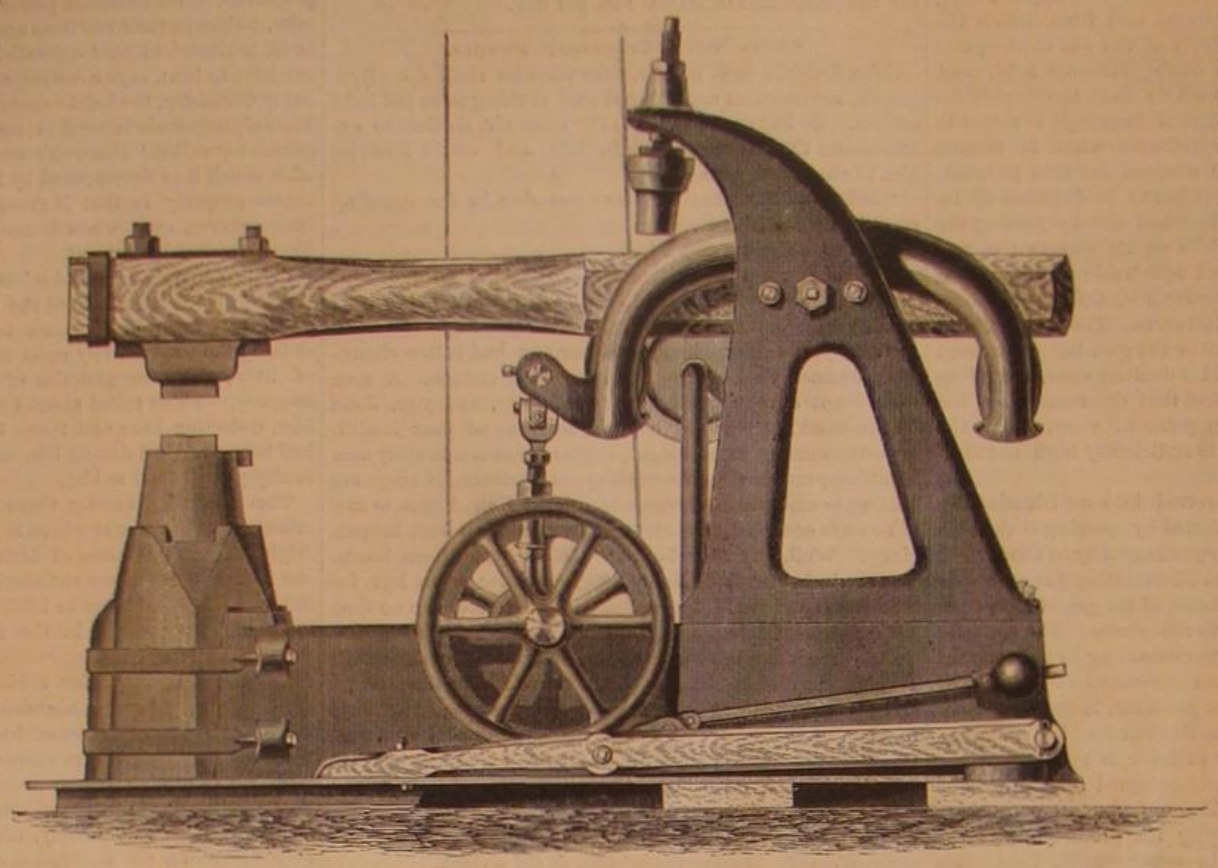
TOBACCO SMOKE.—Tobacco smoke does not contain, as it is often supposed, nicotine; but ammonia, pyridine, picoline lutidine, collidine, formic, acetic, propionic, butyric, valerianic, and carbolic acids, and creosote.—*Eulenburg and Voht.*

BRADLEY'S CUSHIONED HAMMER.

This invention, illustrated herewith, is a hammer claimed to be especially adapted to all work which requires a continuous, exact, positive, forcible, and yet elastic stroke. The anvil and anvil block are of cast iron, and are made separate and adjustable. The latter has a separate foundation independent of that of the main bed. The hammer is nicely balanced, swings upon two adjustable hardened steel centers, and is put in motion by a broad steel eccentric which operates in connection with the yoke and rubber cushions, and is adjustable and governs the length of stroke.

The cushion at the apex of the standard serves to assist the lower rear cushion in heavy work, and also to check its upward motion. It is claimed that no bind or friction can result from an unequal adjustment by the set screws on the top of the yoke, thereby twisting the latter as the universal joint connection regulates the result upon the broad eccentric below, leaving it to work free from incumbrance.

The power is applied and regulated by the use of a foot treadle running around the bed of the hammer, in such a manner that the operator can stand in front or on either side. A gentle pressure on the treadle brings the tightener in connection with the belt upon the pulley, and thus varies the stroke in proportion to the pressure applied. On removing the foot, the treadle flies up, bringing the brake upon the balance wheel, arresting it instantly, and leaving the hammer up, as it cannot stop with the dies closed.



BRADLEY'S CUSHIONED HAMMER.

The advantages claimed for this machine may be briefly summarized as follows: It is adjustable in line of action, length of stroke, rapidity of motion, and weight and force of blow, all of which may be varied and controlled at the will of the operator. It has been found well suited to the exceedingly difficult swedging of cotton spindles. Its cost of repairs is alleged to be small, and its durability great, while it is compact, portable, and has but little friction and no stubborn jar. The resting of the main bed and its uprights upon a foundation separate from that of the anvil relieves it materially from the concussion of the hammer. The force and power of the blow is greatly influenced by the reactive and united action of the cushions. So harmonious is this combined action upon the motion of the helve, that it is stated that an observer holding his hand upon the working parts when under the most rapid and violent movement can hardly identify the strokes of the hammer.

Further information regarding this invention may be obtained by addressing the Bradley Manufacturing Company, Syracuse, N. Y.

IMPROVED WASH BOILER ATTACHMENT.

Our engraving illustrates a device which may be placed in any ordinary wash boiler serving to clean the clothes by causing currents of hot water to pass through them in one direction. Figs. 1 and 2 are longitudinal and transverse sections of the apparatus, clearly showing its interior arrangements.

A is an oval rim, of a size suitable to fit within the boiler. Attached thereto are the two bottoms, B and C, the former of which is funnel shaped and open in the middle, so that the water above it may flow down into the space between the two bottoms. This space communicates with two boxes, D D, which are situated beneath the bottom, C, and in the sides of which are arranged valves, E E. The clothes to be cleaned are laid upon the rack, F. G G are hollow pillars, in the upper parts of which orifices are made.

The seeds being placed in the receptacle, H, heat is applied. The steam generated first closes the valves, E E, then, with the hot water, ascends the hollow pillars and, escaping through the apertures, falls upon the clothes. As soon as the pressure in the chamber, H, is diminished, the valves, E E, are opened by the weight of the water within the boxes, D D. It is claimed that, in this manner, a constant circulation will be maintained, and that the clothes will be rapidly, effectually, and economically cleansed without becoming injured or being unnecessarily handled.

Patented through the Scientific American Patent Agency, December 17, 1872. For further particulars address Messrs. Tinner & Tregear, Stockton, Pa.

Comedy and tragedy were first exhibited in Athens, 562 B.C

Method of Discovering Alum in Flour or Bread.

M. Buchner, says *Les Mondes*, in the course of recent investigations, has determined that a single drop of alcoholic extract of campeachy wood, placed upon pure flour or bread, causes a brownish yellow stain, and that if the flour contains alum in the proportion of one or two per cent, the color will turn to a grayish blue or violet gray. With one half per cent of alum, the tint is reddish yellow with a border of gray blue, and small blue spots can be discovered in the disk of color by examining it with a lens. One quarter per cent of alum is the limit of the reaction where the blue border is no longer visible, although the small spots are faintly discernible.

A New Method of Viewing the Chromosphere.

A paper on this subject was recently read before the Royal Society by J. N. Lockyer and G. M. Seabroke. An artificial eclipse is produced by covering the sun's disk by a disk of brass. It is, in fact, the replacement of the moon by another sphere or semisphere (or rather a disk, in this method). The idea occurred to both authors at different times. The image of the sun is formed on a diaphragm, having a circular disk of brass (in the center) of the same size as the sun's image, so that the sun's light is allowed to pass. The chromosphere is afterwards brought to a focus again at the position usually occupied by the slit of the spectroscope, and in the eyepiece is seen the chromosphere in circles corresponding to the C and other lines. A certain lens is used to reduce the size of the sun's image and keep it of the same size as the diaphragm at different times of the year; and other lenses are used to reduce the size of the annulus of light to about $\frac{1}{8}$ inch, so that the pencils of light from either side of the annulus may not be too divergent to pass through the prisms at the same time, and that the whole annulus may be seen at the same time. There are mechanical difficulties in producing a perfect annulus of the required size, so one $\frac{1}{4}$ inch diameter is used, which can be reduced virtually to any size at pleasure. The proposed photographic arrangements are as follows: A large Steinheil spectroscope is used, its usual slit being replaced by the ring one. A solar beam is thrown along the axis of the collimator by a heliostat, and the sun's image is focussed on the ring slit by a 3¾ inch object glass, the solar image being made to fit the slit by a suitable lens. By this method the image of the chromosphere received on the photographic plate can be obtained of a convenient size, as a telescope of any dimensions may be used for focussing the parallel beam which passes through the prisms on to the plate.

Complete Drainage of Dwelling Houses.

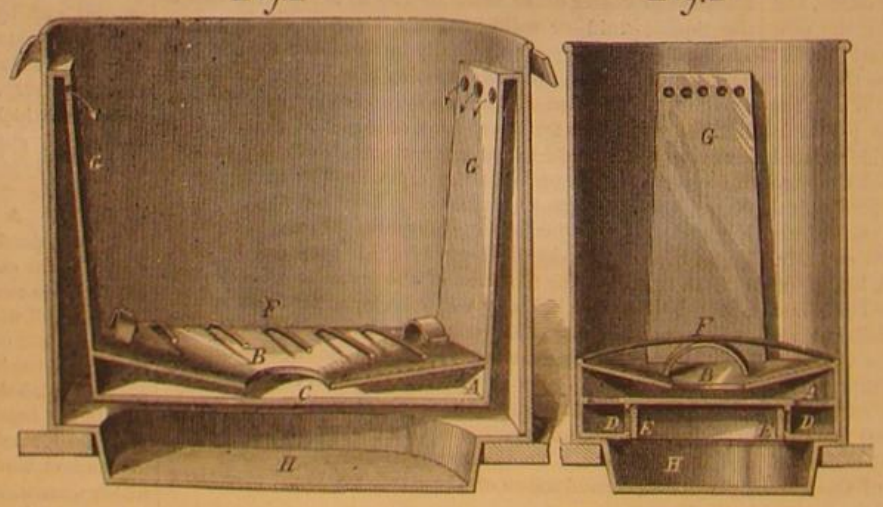
The importance of good drainage is advocated as follows, in the last issue of *The American Builder*:

Where the geological character of the ground is such that nature has not made ample provision for removing the surplus water at all seasons of the year, a builder cannot expect to have the advantages of a dry cellar and a dry yard unless a system of complete drainage is commenced below the foundation of the lowest stones or bricks of the cellar wall. Many builders have made the grave mistake of deferring all provision for drainage until after the superstructure was finished.

Very few builders, either in the country or city, can be induced to introduce a proper system of drainage beneath and around a dwelling, or a large barn. For this reason, the proprietor himself, or some competent representative, should supervise this important part of the building, as soon as the excavation for the cellar is completed. A deep ditch should first be sunk so that water will flow readily away from the cellar to some distant point, where it will mingle with some stream. Before any part of the foundation wall is laid, let a channel be sunk about three inches deep around the outer edge of the excavation, partially beneath the bank of earth, for receiving the water that would otherwise come in contact with the foundation wall and find a passage into the cellar. The most convenient way to sink such a channel is to make a sort of a rammer of a stick of hard timber. Should the earth be exceedingly compact, as the substratum is in many sections of the country, it may be necessary to use an old axe for cutting down the sides of the channel, after which the middle can be removed with a sharp pick. When the channel is completed, let two or three pails of water be poured into it at the highest point; and if it does not flow readily away into the ditch, let the channel be sunk deeper in places until the grade is uniform. Then let drain tiles two inches in diameter be laid with much care in the channel, and be covered with gravel. If the drain tiles are thoroughly burned, and if they are laid as suggested, the drainage will be complete as long as the building endures. One or two poor drain tiles, however, will spoil an excellent job, as they will disintegrate and obstruct the watercourse. After the foundation walls are carried up above such a drain, the excess of water in the earth, that would come in contact with the walls, will form direct passages through the ground to the tiles, and will quickly pass away without wetting the walls. By this means the earth around the building will never become excessively wet, even while protracted storms prevail; the walls of the cellar will never become damp or covered with mildew, and the cellar bottom will always be dry.

To keep the watercourse of the drain tiles always free from silt, the waste water from the cistern should be directed into the tiles, at the highest point of the drain. During heavy showers of rain, the tiles would be thoroughly cleansed of all silt, several times every year. But it is difficult to introduce such a system of drainage after a building is erected.

Fig. 1 Fig. 2



WASH BOILER ATTACHMENT.

Minnesota Tree Planting.

The Minnesota newspapers are calling upon the State Legislature not to adjourn without taking some action in the matter of appropriating a sum of money for the purchase of seed trees to be distributed to each town throughout the State. They especially urge that trees be planted on the prairies of the State, for the benefit of the farmers who fill up the broad stretch of land between the railroad and river, so that they may thus fence their roads and farms with forest trees. Already has this been done to some extent. The system has been adopted on all the lines of the St. Paul and Pacific Railroad, and already have many miles of trees been planted. The same course has been pursued by farmers in the neighborhood of Hutchinson, who have set out from 1,000 to 20,000 trees each.

BLASTING IN A COAL MINE—WAITING FOR THE BLAST. [See page 184.]

BLASTING IN A COAL MINE.

"Down in a coal mine" is a locality which, although immortalized in a popular air groaned out at the rate of some twenty times a day by wheezy hand organs under our windows, is not the most inviting place in the world to eke out one's existence. We descend the shaft with a disagreeable feeling of going, we know not whither, save somewhere into the depths of a black pit which yawns beneath us. Once at the bottom, there is a damp oppressive feeling in the air; the rock overhead drips dirty water down upon us, and occasionally an icy stream crawls down our back, sending a disagreeable shudder from head to foot. Of course we get bewildered; the light from the little lamp in our oil skin hat is very dim and smoky, and casts a sort of uncertain radiance for about three feet in advance, throwing great black shadows which leave us in a kind of unpleasant doubt whether or not we shall suddenly step into some abyss and disappear forever into the bowels of the earth.

We trudge through countless leads, now scrambling over timbers, then compressing ourselves into incredibly small compass in order to crawl through the narrowest of openings. There is a conglomeration of coal dust and mud under foot that sticks to our shoes like glue. We trip over the rails, and bruise every square inch of our bodies against the sharp angles of the rough walls, while our hands and faces, within a very few minutes, partake of the somber hue of our surroundings.

Soon we encounter a party of miners, rough hardy looking men, far healthier than we should believe would be the case with beings whose labor is carried on away from the light of day. They are preparing a blast, our guide tells us, and we draw near to watch the operation, but speedily retire in dismay at the apparently careless handling of the powder in close proximity to the unguarded flames of the lamps. The men manifest no concern, and all are coolly smoking or chatting.

Now, the charges are ready, and one of the miner's lights the fuse from his pipe. We scramble precipitately to a safe position in total disregard of either dirt, wet, or bruises; and then, in a state of suspense, we stop our ears and wonder whether the smoke will leave us entirely or only partially suffocated. The men lounge lazily out of the way, forming a little group by themselves—just as the artist has sketched them in the engraving—and puff quietly at their pipes.

A flash—then a deep muffled explosion, which echoes through the long caverns, and is followed by the rumbling and crashing of the falling *debris*—clouds of dense sulphurous smoke fill the chamber, rising up to the roof and curling away toward the shaft. We get down close to the floor with a handkerchief—a very grimy one by this time—over our nose and inwardly yearn for one breath of fresh air. Meanwhile the blasters wait until the smoke disperses, and the atmosphere becomes less stifling; then they resume work. Some pile the detached bits of coal in heaps, and others fill the tubs which travel on the rails in the foreground of our picture. Then the mules are signalled for, and we can hear the noise of their hoofs approaching, mingled with the sounds of blows and an alarming chorus of expletives on the part of the drivers. The animals are attached to the tubs, and, after arguing some time with their attendants, mule fashion, by drumming on the wagons with their heels, refusing to stir, or manifesting an unconquerable disposition to lie down, they are at length persuaded, through the agency of a club or by being banged about the head with a lump of coal, that resistance is useless, when they reluctantly start off on a slow jog trot. We follow them to the shaft, leaving the miners swinging their picks or hammering at their drills, apparently careless of the dark heavy atmosphere around them.

Cold Ablutions in Fever.

In a valuable article contributed to one of the French medical journals by Dr. L'Ambert, he presents the following conclusions concerning the use of cold ablutions in fever, as practiced in France: They are especially useful in typhoid and the eruptive fevers, and strongly indicated in malignant cases. They act upon the chief and most constant phenomena of these diseases, are especially anti-febrile, and reduce the temperature materially. They favor the re-establishment of a full, profound, regular perspiration; render the secretions more active; make the skin supple, moist and fresh; favor the outcoming of the eruption; allay cerebral and other nervous excitement, suppressing headache, coma, delirium and restlessness, and induce sleep; cause the pulse to fall eight to thirty beats. From two to eight hours is the duration of their action, the ablutions to be repeated two to four times in the twenty-four hours. They have no influence upon the length of the sickness, but render it milder, and are readily applied as cold baths or by wrapping the patient in a cold wet sheet.

Relics of the Mound Builders.

In making an excavation on the bank of the river at the Rockwood landing, Roane county, East Tennessee, a few days ago, says the Nashville *Republican Banner*, a human skeleton was exposed. The burial case was earthenware, of the same kind or character as that found in the mounds and along the river bottoms. From this fact it is reasonable to conclude that the skeleton belonged to the race of mound builders, as this kind of pottery is found in all the mounds of the country. This race was so far anterior to the Indian race that their oldest traditions give no account of them.

The skeleton was five and one half feet long. The bones were large and heavy. The arm bones were disproportionately long. The right one was broken near the shoulder, and was probably the cause of the individual's death. The most peculiar feature about the formation of the skeleton was that the arm at the shoulder connected with a short strong bone that was connected firmly with the sixth joint of the backbone, counting from the head.

The head was small and round. From the impressions in the soil, the hair had been thin and hung as low as the shoulders.

Photographic Reproduction of Diffraction Gratings.

Experiments made by Hon. J. W. Strutt, some months since, with a view to the production of photographic copies of diffraction gratings ruled upon glass, have given interesting and valuable results, of which he gave an account in a communication read before the Royal Society, June 20, 1872. The account is republished in the *Philosophical Magazine* for November, 1872. The ruled plates were laid upon glass plates sensitized in the usual manner, and the prints were made in the same manner as from ordinary negatives. Both wet and dry sensitive plates were used, with but little difference in the results. The photographic gratings have brilliant spectra, and were but little inferior to those ruled upon glass. In the course of the experiments, trial was made of plates covered with a film of bichromatized gelatine. The gratings thus made possessed a high degree of transparency, and were found to be better than the ordinary photographs; and although there was some uncertainty attending their production, the best obtained appeared to be even superior to the originals on glass. They give very brilliant spectra, and the definition of the lines is surprisingly good. They can be used very conveniently in an ordinary spectroscope, by putting them in the place of the prism. Gratings having 6,000 lines to the inch are now successfully made; and as their cost is trifling compared with that of the ruled ones, they will be much more accessible to experimenters. As the thickness of the glass upon which they are mounted is small, the absorption of the rays is very slight, and they offer considerable advantages in researches upon radiant heat, as they may replace to a large extent the costly and inconvenient prisms of rocksalt.

An Illustrated Daily Paper.

The *Daily Graphic* is the title of a new daily illustrated evening newspaper, which has recently made its appearance in this city. A daily paper with large engravings illustrating scenes of the day, such as the inauguration parade and scenes at the great ball, is a new feature and another advance in journalism.

The pictures are produced by the photo-lithograph process, one entire side of the sheet being transferred to stone, from which it is printed.

The initial numbers are well edited, but we could wish the illustrated portion better executed. Experience will probably remedy some of the defects. It is too early to venture an opinion as to the financial success of the paper, but the enterprise is laudable; and with $500,000 to back it (which we understand it has), we heartily wish the new comer every success.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON THE STRENGTH OF BRIDGES AND ROOFS, with Practical Examples, for the Use of Engineers and Students. By Samuel H. Shreve, C. E., etc. New York: D. Van Nostrand, 27 Warren Street.

In this comprehensive work, the author applies the simpler processes of algebra to the discussion of the subject of strains in single span trusses, and deduces many formulæ for practical application.

ILLUSTRATED SEED CATALOGUE AND AMATEUR'S GUIDE TO THE FLOWER AND KITCHEN GARDEN, FOR 1873. B. K. Bliss & Sons, 23 Park Place and 20 Murray Street, New York.

One of the handsomest of the many works of similar description that have come under our notice. It is lavishly illustrated, not only with excellent wood cuts, but with three double page finely executed chromos of groups of flowers. There is a large amount of valuable information for the horticulturist, besides the usual descriptions of plants, seeds, garden implements, etc. The book is mailed for the nominal price of 25 cents, which can hardly pay the cost of printing.

The second number of the PRACTICAL MAGAZINE has been forwarded to us by the American agents, Messrs. James R. Osgood & Co., of Boston. The handsome appearance and substantial character, shown in the first number, are well maintained. We observe that this number contains reproductions of engravings of Ladd's napping machine and the system of earthwork used by the Brooklyn Improvement Company, both of which were originally published in the SCIENTIFIC AMERICAN.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From February 12 to February 13, 1873, inclusive.

AUTOMATIC VALVE.—J. L. Kitson, G. W. Carr, Philadelphia, Pa.
LAWN MOWER.—E. G. Passmore, Philadelphia, Pa.
PROPELLER ADJUSTER, ETC.—J. M. Dodge, Newark, N. J.
SAIL SEWING MACHINE.—K. C. Barton, Philadelphia, Pa.
UTILIZING HEAT.—J. Kidd, New York city.
WASH BOILER ATTACHMENT.—C. Lawrence, New York city.

PATENT OFFICE DECISIONS.

HOSE COUPLING.—LAWTON AND BLISS.—EXTENSION.

LEGGETT, *Commissioner:*

This case falls at the first step in its consideration. It appears by reference to the rejected application of V. Fogerty, filed May 19, 1858, cited by the Examiner, that the device was not new at the date of the original grant of the patent. Yet the patent was not only granted, but it has been reissued, litigated, and sustained in Court. It is now for the first time suspected to be defective. These facts call for a close scrutiny and a careful comparison of the patent and reference, which I have made, and I fully concur with the Examiner's opinion that the two cases show substantially identical devices. Fogerty's application, it appears, was not before the Court. If it had been it must obviously have defeated the patent, for the reissued claims are exactly applicable to Fogerty's coupling as to the patentees. The only difference between the two devices is that the latch in one is held in place by a spring, and in the other by a screw; but the patentee does not limit himself to the use of a screw, and if he did it would be immaterial. The common screw and the common spring, when used merely for the simple function of pressing and holding a latch in place, are as perfect mechanical equivalents as it would be possible to mention. The extension must be refused for want of novelty in the device at the date of the grant of the patent.

IMPROVEMENT IN CULTIVATORS.—AUGUSTUS ADAMS.—APPEAL.

THACHER, *Acting Commissioner:*

Applicant presents two claims—the first for a draft hook of peculiar construction "as a new article of manufacture," and the second for what may be construed as a combination of this hook with several other devices.

The Examiner refuses to consider both claims in the same application, taking the broad ground that "an article of manufacture" must be covered as an entirety by a single claim, and that no other claim can be entertained in the same application.

It is a little remarkable that this position should be again assumed after the decision of the Commissioner in the case of E. R. Sumner, C. D. 1871, p. 180, in which this doctrine was strongly condemned in an appeal from this same Examiner, on nearly the same question. It is true that was not a precisely parallel case, but the principle announced undoubtedly applies to the present application, and should have controlled the Examiner in his action thereon.

The error is occasioned by a mistaken impression as to the phrase "article of manufacture." A strange hallucination appears to exist in the minds of many as to the effect of these words, and their presence in a claim is supposed, in some miraculous manner, to change the nature of the invention. This is all a mistake. The same rules apply in determining the patentability of an article of manufacture as in any other case—there must be the same evidence of invention, the same proof of novelty.

Suppose the words "article of manufacture" stricken from the first claim in this application and the device claimed simply as a draft hook, the nature of the invention and the character of the claim would not be changed in the least; but no one would then think of objecting to the second claim because the hook had been claimed as entirety in the first. This is precisely what the claim covers in its present form, and the error of the Examiner's decision is just as palpable in the one case as it would be in the other.

I remark in conclusion that the combination of parts mentioned in the second claim appears to be perfectly legitimate; but that, if any of these parts are not represented by the model, it should be amended by incorporating the missing devices. The decision of the Examiner is overruled, and he is instructed to proceed with the examination of the case.

SAW MILL CARRIAGES.—PATTEE VS. RUSSELL.—APPEAL.

THACHER, *Acting Commissioner:*

The facts which I think may be considered in proof in this case, from a just balance of all the testimony, are as follows: Russell made a model in 1865 which illustrates the invention, and laid it aside until February, 1871, when he put the invention in practical operation in a mill, and he filed his application for patent August 21, 1871. He also made another model in 1867, but this constituted no advance toward giving the public the benefit of the invention, and may be regarded as an immaterial fact.

Pattee completed his invention in 1870, put it in practical operation during that year in a lumber mill, (where it was examined by Russell,) and applied for his patent September 12, 1871, twenty-two days subsequent to Russell's application.

Upon these facts the Examiner of Interferences and the Board of Appeals have found that priority of invention is with Pattee, by authority of the law as laid down in Ransom vs. The Mayor of New York, 1 Fish, 272, and other cases in which a like doctrine has been announced.

"If the plaintiffs, after they had perfected their invention, unreasonably delayed their application for a patent, and other persons, before such application was made, actually perfected and applied the same invention to practical use, and gave the knowledge thereof to the public, and the plaintiffs, after the knowledge of such subsequent invention or discovery and its public use, failed to make objection and to apply without unreasonable delay for a patent for their invention, they cannot sustain their patent." (Ransom vs. Mayor of New York.)

There is no doubt but this is the law and that it governs the grant as well as the validity of patents. The only question is whether it applies to the state of facts in proof in this case. Here on the part of Russell, if the testimony he adduced is to be believed, is an invention completed and reduced to form in a working model, which clearly illustrates it, in 1865. He is engaged in business that affords every opportunity and offers every inducement to him to reduce it to practice and give the public the benefit of it; yet he suppresses it for a number of years, until finally he sees it constructed and put in public use by an independent inventor. He examines it carefully, inquires as to its efficiency, and for the first time appears to appreciate it, but still does not assert any right in it. During this period of delay it is shown that he was paid over seven thousand dollars in money, and no obstacle appears to have precluded him from seeking a patent or otherwise giving the public the benefit of his invention. To be sure, it appears that he ultimately preceded Pattee by a few days in his application for a patent, but it was more than a year after he was cognizant of the manufacture of the machinery for Pattee, and nearly a year after he had seen and examined it in public use in Pattee's mill. The fact that he was first in the Office by a few days should therefore have very little weight. In view of the preceding delay of several years, which is a circumstance of some importance, and his failure in fact "to give the public that consideration for the grant of exclusive privileges upon which all valid patents must be based," namely, knowledge of the invention, I think there was unreasonable delay after his knowledge of what Pattee had done.

Pattee, therefore, has been correctly held, upon the facts in proof, to be, in contemplation of law, the prior inventor. The decision of the Board is affirmed.

DECISIONS OF THE COURTS.

United States Circuit Court—Northern District of New York.

HARVESTERS.—WILLIAM A. KIRBY *et al. vs.* THE DODGE AND STEVENSON MANUFACTURING CO. *et al.*

WOODRUFF, *Circuit Judge:*

The complainants herein complain that the defendants have infringed and are infringing their rights as assignees of a certain patent granted to Byron Densmore on the 10th of February, 1852, for a new and useful improvement in grain harvesters, surrendered and reissued to the complainants January 28, 1862, and thereafter, on the 30th of January, 1866, extended for the term of seven years from the expiration of the first term, namely, from the 10th of February, 1866.

The defendants deny that Byron Densmore was the first inventor of the improvement described in the reissued letters patent, and aver that such reissue was fraudulently and illegally granted, and was obtained in order to include, and does include, things not invented by Densmore, and not intended to be patented by him, and such reissued letters patent are for a different invention from that originally patented, and are invalid and void.

They also allege that the improvement described in the reissued patent had, prior to February 10, 1852, been invented, and was known and used by other persons who are named in the answer. That it was described in certain letters patent also mentioned.

They also deny that they have made or sold any machines whatever containing the said alleged invention of the said Densmore, as set forth in the specification and specified in either of the claims of said reissued patent, and deny that they have in any manner whatsoever infringed the said letters patent.

The infringement alleged relates solely to the first claim in the reissued patent granted to the complainants, "as follows:

"Hanging the driving wheel in a supplemental frame or its equivalent, which is hinged at one end to the main frame, while its opposite end may be adjusted and secured at various hights, or be left free as desired, whereby the cutting apparatus may be held at any desired hight for reaping, or be left free to accommodate itself to the undulations of the ground for mowing, substantially as described."

My conclusions are:

1st. That if the claim of the patentee, in the reissued patent in question, be regarded as a broad claim to hinging the frame of the cutters to the wheel frame, and making it adjustable by changing the relative elevation of the two frames, the patentee was anticipated by McCormick, and the utmost that the patentee could claim was the particular or special arrangement of the two frames which he used.

2d. That if the patentee had invented, before or when his patent was granted, a means or mode of bringing the cutters to the ground so as to follow with equal approach to usefulness and practicability, been long before invented by McCormick, and that in this view, also, if such patentee had any claim, it is at the utmost to the special arrangement or position of the parts.

3d. That in fact, the patentee, when the patent was granted, had made no invention which permitted the cutters to vibrate so as to follow the undulations of the ground when in use, and showed no such invention or device by his specification, drawings, or model.

And 4th. That, in so far as the reissued patent claims or purports to secure such a device as is last named, it is for these reasons invalid.

The claim of the complainants, in their reissued patent, which the defendants are charged with infringing, has been above quoted; the second and only other claim therein is for a wheel, provided with a crank and lever at the outer end of the cutter bar to adjust the hight thereof, as described.

It is a remarkable fact that, whereas the original pattern related to other devices and with great particularity described them, and contained, in all four claims, stating severally what the patentee claimed as his invention and wished to secure by patent, the reissue makes no claim whatever to those devices. It abandons all of them, and sets up claims entirely new and relating entirely to other and distinct parts of the machine, which are for a totally different purpose, and possess wholly different functions. When to this is added that the new claims embrace what did not, in fact, appear at all in the specifications, drawings, or model of the original patent, and, if construed broadly, embraced what Densmore had not himself invented when that original patent was granted, and that if he had, in any sense, made the discovery, it was not new, it is speaking mildly to say that great suspicion attaches to the case of the complainant in any of its features.

The bill must be dismissed with costs.

David Wright, of Auburn, for complainants.
George Harding, for defendants.

United States Circuit Court—Southern District of New York.

MACHINE FOR STRETCHING HAT BODIES.—THE EICKEMEYER HAT BLOCKING MACHINE COMPANY *vs.* H. O. PEARCE *et al.*

BLATCHFORD, *Judge:*

This suit is brought on reissued letters patent granted to the plaintiffs, as assignees of Rudolf Eickemeyer, December 1, 1868, for an "improvement in machines for stretching hat bodies," the original letters patent having been granted to said Eickemeyer, February 28, 1865.

The operation of stretching a hat body in the machine is as follows: The former is first allowed to descend to such a position as to permit the hat body to be put on and drawn tightly over it. The hat body, wet with hot water or steam, is put on and the former is raised up by depressing the outer end of the treadle or lever. When the hat body comes in contact with the clamp ring the weight of the ring and of the attached head piece causes the ring to hold the hat body with sufficient firmness against the circular portion of the former to prevent it from slipping between the ring and the former, and the continued upward movement of the former, produced by a suitable pressure upon the outer end of the lever or treadle, brings the hat body into contact with the two series of rollers, which are thus made to press upon and stretch the portions of the hat body which are between the rollers and the corresponding ribs of the former into the recesses. Such portions are thereby stretched over the ribs. By this means the hat body is brought to a suitable shape for blocking and shaping the crown and brim of the hat.

The specification states that fixed round edged surfaces may be substituted for, and would be the equivalents of, the two series of rollers, but that the inventor prefers to use the rollers, as, by preventing friction upon the hat body, they prevent it from being torn in the stretching operation.

The principal ground of defense urged is that, before Eickemeyer made his invention, one John Hutchinson, at Matteswan, New York, invented and constructed, and successfully used, in a crude way, instruments for stretching the tips and the brims of hat bodies, which instruments had the same mode of operation as that of instruments found in the defendants' machines. The date of Eickemeyer's invention was the summer of 1864. The identical instruments which Hutchinson used are produced. They were used by Hutchinson in 1860. They are, and always were, detached parts, and never were organized into a machine working automatically.

The description given of the use of the devices is that they were tried to see whether they would block a hat or not; that they were not operated continuously; that sometimes Hutchinson would make an alteration, and then another trial would be made to see whether the alteration was any improvement; that but one brim stretcher was made, and that of wood, which was broken several times in operating it; that the tip stretcher was of wood, and was tried on a few tips, and was broken in use and never repaired; that Hutchinson had the idea of constructing a machine embodying the principle of such devices, but had no definite plan as to the appliances by which the machine was to work out such principle; that nothing was done toward carrying out such intention; that the devices were tried in 1860, prior to, but not later than, June; that they were then stowed away in a closet, where old books and papers were kept, in a factory where Hutchinson continued to be employed for two years afterward; and that they remained in that closet, unused, for three years and a half, and were then removed to another place, whence they were taken to be used as evidence in favor of parties defending this suit. These devices of Hutchinson amounted to nothing, and were practically useless, for the reason that they were not combined in an organized machine. They lacked the combination and arrangement of them which Eickemeyer made, and which secures circumferential equality of action of the stretching devices on the material and accuracy of operation, by means of the concentric approach to, and recession from, each other, of the ribs and stretching devices. The equable intervention of the ribs between the stretching devices is an essential feature of the patent, due to the mechanical organization. There is no such feature in Hutchinson's devices, because there is no mechanical organization capable of developing such feature. Whether the ribs and stretching devices in Hutchinson's tools will move concentrically or not is a matter of accident, and dependent on the skill of the person handling the tools, and the equability of intervention of the ribs and stretching devices is equally a matter of accident and skill in handling.

There is, therefore, nothing in what Hutchinson did that can interfere with the second and third claims of the patent, which are the only ones involved in this suit.

There must be a decree for plaintiffs for a perpetual injunction and an account of profits, and an ascertainment of damages, with costs, in respect to the second and third claims of the patent.

Geo. Gifford, for complainants.
C. M. Keller, for defendants.

Recent American and Foreign Patents.

Improved Tube Cutter.

Edward Manuel, Milwaukee, Wis., assignor to himself and George Guy, of same place.—The object of this invention is to produce a tube cutter which can be set to cut a tube from within, and the knife of which can be gradually forced out to finally cut entirely through the tube within which it revolves. Devices of this character have been made with a cutting tool or chisel arranged to project laterally through a slot in a tube, and made adjustable therein by means of a spindle fitting in said tube. This improvement relates particularly to a spring and ratchet connection between the tube and spindle.

Improved Machine for Pointing Pickets.

Alpheus B. Corby, Binghamton, N. Y.—This invention has for its object to furnish an improved machine for pointing pickets. The base or frame of the machine is made with an upwardly projecting part to receive the knife lever which is pivoted to it with a bolt. To the lever, near its pivoting point, is securely attached a knife, which is made with a concave or inclined edge, so that it may operate upon the picket with a drawing cut. The base frame is also made to receive the angular picket holder, which may be adjusted at such an angle with the plane of the knife as will cause the pickets to be pointed at any desired taper. In using the machine for pointing square pickets the holder is adjusted at the proper angle, and a gage is adjusted at the proper point. The picket is then placed in the angle of the holder and pushed down till stopped by the gage. The lever is then pressed down, cutting one side of the said picket. The picket is then turned one quarter of a revolution and a cut is made upon the second side, and so on, the beginning of each previous cut serving as a guide for beginning the next cut.

Improved Counter Gage and Shears.

Nelson Stow, Binghamton, N. Y.—This invention consists in applying to the ordinary shears or cutters used upon store counters a thumb piece and lever by which the movable cutter is easily opened and closed to make a cross slit or nip in the edge of fabric at the point up to which said fabric has been measured.

Improved Liquid Fuel Steam Generator.

Oliver W. Ketchum, Toronto, Dominion of Canada.—This invention consists in the method of burning liquid fuel, as coal oil or petroleum, under a pressure of air from one pipe that supplies the supporter of combustion and under pressure of air from another pipe upon the hydrocarbon which is used as the combustible. The air and the oil being forced together from different directions, are thus brought into contact, closely intermingled, and the combustion made complete, uniform, and perfect.

Improved Railway Snow Plow.

William Walker, Fort Bridger, Wyoming Territory.—This invention relates to a new machine for removing snow from railroad tracks, and consists in providing pivoted platforms with sides so hinged as to form extensions thereof when the platforms are tilted, and thus perform the office of chutes for delivering the snow at a suitable distance from the track. These hinged sides are held vertical and the platforms horizontal by the same means or devices. It also consists in combining said platforms and hinged sides with series of levers, whereby the tilting of the platforms and letting down of the sides are performed simultaneously, and finally in the use of a hinged check plate applied to the front of each platform for the purpose of yielding to the entering snow, but preventing the snow from falling out at the front end. The apparatus is attached to the front of a locomotive engine and pushed forward into the snow. When filled it is either drawn back to a convenient dumping place or immediately dumped on the spot by tilting the platforms and letting down the plates.

Improved Device for Pitching Boats.

William H. Richardson, Stillwater, Minn.—The object of this invention is to provide means for expeditiously pitching the seams of boats and marine vessels of all kinds, also the seams of floors or platforms when the same are to be made watertight; and it consists in a rectangular shaped vessel, open at the top, with a circular bottom. Beneath the bottom is the lamp chamber and lamp. A wheel which revolves in the vessel by means of a shaft is made in two parts, so that a rim of cotton is confined between the parts and forms its periphery. The diameter of the wheel is such that it runs near the bottom of the vessel. The pitch is kept in a liquid state in the vessel by means of the lamp in the chamber. A discharge tube is provided, made in two parts, the outer of which is curved and removable. On each side of the vessel are two more discharge tubes, which may be closed by the slides on the inside. A brush with a hollow handle or stem fits either of the three tubes mentioned. In using the article it is held by the handle and pushed along with the brush in the seam. If it is the deck of the vessel, the brush is attached to the curved spout or tube. If the side of the boat is to be pitched, the spout is closed and the brush is attached to one of the side tubes, the other side tube being closed by the slide. If it is the bottom of the vessel, then the wheel is employed, and the machine is run along with the cotton rim in the seam.

Improved Harvester Cutter.

Warren Wasson, Phineas F. Powers, and George W. Dungan, Genoa, Nevada.—This invention has for its object to improve the construction of harvester cutters so that they can be conveniently detached and attached, when desired, and will be securely held in place. The cutter bar is made in two parts which are placed side by side. The edge of one of the parts has a tongue formed upon it, and the adjacent edge of the other part has a corresponding groove formed in it, into which the said tongue fits. The heads have each a horizontal recess at each end, so that when a blank has been placed down over them the edges of the blank slots will be opposite said recesses. By this construction, when the two heads are carried in opposite directions by the movement that carries the parallel bars, the blank will be locked in place by the edges that enter recesses. Upon the rear side of the head is placed a lever or key which is so arranged with a pin that the latter will act as a crank or cam when the lever is turned in either direction to move the parts upon each other. Through the inner ends of the heads of the parts and lever is formed a hole to receive the box or bushing in which the end of the pitman works. In the rear part of each of the cutters is formed a rearwardly inclined slot to receive the rearwardly inclined square projection formed upon the rear part of the cutter bar. By this construction, as the lever is turned outward, the rear part of the cutter bar will be drawn inward and the forward part will be pushed outward, carrying the cutters with it, thus bringing the projections into the enlarged part of their slots and allowing one or all the cutters to be detached. The cutters are slightly curved or arched transversely, so that when lying free they will rest only upon their side edges. When the cutters have been arranged in place by reversing the operation above described, the cutter will be locked in place. The projections also draw down the middle parts of the cutters, so that their elasticity may take up any wear and prevent any rattling. A false or blank cutter is provided, which is slightly curved transversely and has a slot formed in it of such a size as to allow it to be slipped down over the heads when the lever has been detached, and does not interfere with the movements of the heads upon each other.

Improved Ironing Table.

Abraham Wechsler, New York city.—The object of this invention is to provide a table which is especially adapted for ironing shirt bosoms and other articles, and which, when not to be used for ironing purposes, can be folded together and used as a dining or kitchen table. The invention consists in having a table with a movable iron board fitted to support shirt bosoms in position for ironing, which board, when not required, can be withdrawn and replaced by an extension top, whereby the table is converted into a dining or kitchen table.

Improved Harrow.

Hiram Cartwright, Owatonna, Minn.—This is a double harrow, being made in two sections which are identical in form and size, and in themselves presenting no particular novelty. The sections are so arranged that their rear inner ends come nearly in contact, and so that, in being drawn forward, the entire ground covered by the harrow is operated upon. The sections being separately jointed to and connected with the draft bar, the harrow is very flexible and will conform to the inequalities of the ground, and is made to pass obstructions with great facility.

Improved Hand Corn Planter.

Louis H. Richards, Rising Sun, Md.—This invention has for its object to furnish an improved machine for dropping corn which shall enable the seed to be dropped uniformly, and any desired number of kernels at a time. The seed hopper is attached to a bar, and may be enlarged by suitable means to any desired extent without materially increasing the weight. In a slot in the lower part of the bar is pivoted a wheel in such a position that its upper side may enter and fill a recess in the bottom of the hopper. A cup is secured in a recess in the face of a wheel to receive seed from the hopper and discharge it upon the ground. The wheel is kept from carrying out any more seed than enough to fill its cup by the suitable cut off attached to the bar. Another bar is so arranged that its downward movement will revolve the wheel in such a direction that the cup will discharge its contents upon the ground. A handle is provided for convenience in carrying and operating the dropper. Suitable mechanism actuates an arm in the hopper to prevent the seed from becoming clogged, and to keep it stirred up, so that it will pass freely to the dropping wheel.

Improved Steam Plow.

Albert E. McGaughey, East Minneapolis, Minn.—This invention relates to a new arrangement of plows to be operated by steam power with the object of carrying on the operation with the smallest attainable loss of power. The invention consists principally in rotating the plows at once around a horizontal and around a vertical axle, and utilizing about one third of their horizontal sweep for active work in the ground, thus producing curved furrows. While in the ground each plow does not turn with its horizontal axle, but only on the vertical. At the end of each furrow the plow which made it is swung on the horizontal axle and thereby carried off the ground, making one entire revolution around the horizontal axle, and meanwhile about two thirds of a revolution around the vertical, before re-entering the ground. By this means great power in plowing is utilized. The invention further consists in such a connection of the horizontal plow pivots or axles with the pinions or wheels turning them that the turning will only take place after the completion of the furrows, and not during the making of them. For this object spring clamps are used.

Improved Ice Cream Freezer.

Georges Guinot, Milton, Florida.—This invention relates to a new apparatus for producing ice cream or other substances by the rotation of a cylindrical vessel within a congealing substance. The tub is provided with a false bottom in which a vertical central pin, carrying at its upper end a disk, is centered. This disk serves as a direct support for the freezing cylinder and has three holes formed in it for the reception of as many pins that project downward from the bottom of the vessel. Thus, when the latter vessel is placed upon the disk so that its pins enter the holes of said disk, the cylinder will be centrally supported in the tub, and will, when revolved, carry the disk around with it. The upper part of the vessel is furthermore guided or centered in an annular plate, which is secured in the tub. A handle actuating bevel gearing rotates within the tub. A vertical shaft or rod stands in the center of the cylinder and extends through the top or cover of the same into the cover of the tub, within which the squared upper end of said rod enters in such manner that it cannot revolve while the cylinder is being revolved around it. The rod serves to support a series of vertical scrapers which are set obliquely against the direction of rotation of the cylinder. The crank handle is revolved with suitable rapidity, and the cream thereby carried around, within, and by the cylinder, being meanwhile thoroughly and constantly plowed and displaced by the scrapers which remain stationary within the revolving cylinder.

Improved Railway Tank Feeder.

Augustus Grochau, Duluth, Minn.—This invention consists of a water tank with a piston floating therein upon the water, and a frame above the piston adapted for receiving a railroad engine and tender. These force the piston down by their weight, while the piston forces upward the water to the tender. The piston with the load on it is graduated in the time of its descent by a system of eccentrics and a regulating lever, manipulated by an attendant.

Improved Hub for Vehicles.

Howard M. DuBois, Philadelphia, Pa., assignor to himself and W. Filter, of same place.—This invention consists of a wood hub with a deep groove with sloping sides turned in at the center, in which is fitted a metal mortise ring in two semicircular parts, whose mortises are to receive the ends of the tenons; and over this another mortise ring, for the ends of the spokes above the tenons, is shrunk on so as to bind very tightly on the inner ring and secure that firmly in the groove. The said inner ring has ribs or keys extending transversely across the face, for which grooves or notches are provided in the inner face of the outer ring, in which the keys wedge hard when it is shrunk on. They also cause the mortises of both rings to coincide.

Improved Tool for Paring Horses' Hoofs.

John C. Johnson, Sulphur Springs, Ind.—This invention relates to a new and improved instrument for trimming the hoofs of horses preparatory to shoeing. The clamp bar has upon its end a serrated clamp block, which is held to the hoof with one hand, while the knife is operated with the other hand in paring the hoof. The clamp is attached to the shank of the blade by a bolt. The end of the clamp bar is forked so that the shank of the blade has play up and down on the bolt, and the bolt hole through the shank is somewhat larger than the bolt, so that the blade may be raised in position, as the case may require. By this means a right or left cut may be conveniently made with the single edged cutter.

Improved Water Heater for Steam Fire Engine Boilers.

Edward A. Russell, Milwaukee, Wis.—This invention is a water heater standing on the platform or coal reservoir of the engine, and is connected to the boiler of the engine by pipes and with a smoke pipe from its top to the chimney in the engine house, and is so arranged that the engine can be drawn out with the heater, leaving the smoke pipe standing in its place. The fire to heat the water being all the time ignited, and the heater being of the same strength as the boiler, it can remain in position and be perfectly safe while the engine is working.

Improved Tire Bender.

Joseph Tomlinson, Onslow, Iowa.—This invention relates to a new apparatus for bending wagon tires, and has for its object to permit in one machine the production of suitable circles to fit all sizes of wheels. The invention consists in constructing the tire bender of three rollers, which are adjustable toward each other, in order to vary the size of the circles in which the tire is bent in passing between them. The invention also consists in the application of lateral rotary guides which can be adjusted to fit tires of suitable width and to properly guide the same while passing through the machine.

Improved Bee Hive.

H. Peter Simmons, of Paterson, and Albert J. King, of Hudson, N. J.—This invention has for its object to improve the construction of bee hives, and it consists in the combination of rollers with the top of the hive and with bars provided with recesses for the same, for the purpose of locking the top in its normal position, and raising it off the base when it is to be moved laterally, also a strip secured to the central elevated portion of the bottom board in combination with the bottom bars of the comb frames, said strip and bottom bars being provided with beveled notches in order to keep the comb frames in proper position and to reduce the surface to which the bees might apply glue or propolis, and also suitable arrangements whereby the top may be moved over the comb frames, and allowed to drop into place without injuring the bees.

Improved Nail Plate Feeder.

Royal C. Grant, Middleport, Ohio.—The invention relates to those devices which are used to feed to a nail machine a plate from one end of which nails are successively cut. The invention consists in turning the nail plate over, or one half way round, so that there is only required a single cutter which is neither vibrated laterally nor has any motion outside of a single plane or direction. It also consists in the peculiar arrangement of mechanism by which the holder may be conveniently revolved from the same shaft that actuates the cutter. It consists, also, in a peculiarly constructed plate holder, which, by means of a recess and spring catch, is enabled to be attached to and detached from the carrier. It consists, also, in a spring lever and stud, or rack bar, for locking and unlocking the pawl-throwing-out mechanism. It consists, also, in a spring guide for the nail plate, whereby it is allowed to turn readily and also to adapt itself to plates of different width. It consists also in arranging the detent pawl beneath the feeding pawl so as to perform its own function as a detent and also when thrown out to carry the feeding pawl.

Combined Atmospheric Exhaust Pump and Funnel.

George H. Randall, Forestville, Md.—The invention relates generally to funnels through which liquids are poured into vessels, but more particularly to those used with sirup, molasses, and other viscous fluids. The invention consists in making funnels with an external sleeve closely joined to the funnel body, and extending down the nozzle for a sufficient distance to enable its end to reach within the jug, demijohn, barrel, cask or other receptacle for the liquid, and in connecting the chamber thus formed between nozzle and sleeve with an air exhaust pump.

Improved Broom.

James Standish, Eureka, Nev.—The brush holder or broom head is formed of sheet metal, and corresponds in shape to the top portion of an ordinary broom. The same is provided with a screw socket to receive the broom handle, and with a wedge block, by which the brush may be secured in the head. The block is adjusted by the handle when screwed out or in.

Insulated Battery Cup Holder.

James H. Thomas, Baltimore, Md.—Telegraph battery cup or tumbler holders have been provided with tubular or perforated shanks or stems for the purpose of conducting the moisture or overflow from the cup to the floor. Aside from certain other disadvantages resulting from this construction, the injury to both the battery and floor, or article which chanced to be placed in proximity, renders it highly objectionable. The object of this invention is to furnish an insulated holder adapted to remedy such difficulties; and, to this end, a saucer shaped or inverted conical holder is provided with perforations in the bottom and a chamber beneath the same, to receive a cup into which the overflow of the battery tumbler will pass.

Box for Preserving Cake and Bread.

Albert R. Ledoux, Cornwall Landing, N. Y.—This invention has for its object to furnish an improved box for preserving cake, bread, and other articles from becoming dry and being thus injured. The invention consists in placing a pan containing a moist sponge and covered with a perforated plate to support the articles to be kept moist within the box.

Improved Adjustable Journal.

Moses Jackson, Bavington, Pa.—This invention relates to shaft and wrist journal bearings, and consists in a mode of compensating for the wear by means of a right and left hand screw and tapering journal. A conical sleeve screws on a stem. The rounded or beveled end of the stem fits in a concavity of the washer, and both are radially grooved to prevent them from slipping on each other. The washer fits in the concavity of the sleeve, and is interposed between the head of a bolt and the head of the stem. A bearing washer has ribs or flanges which are set into corresponding depressions to prevent it from turning. The stem has exteriorly a right hand screw thread, while interiorly it has a left handed screw thread. The parts cannot become disengaged or even loose otherwise than by wear, owing to the reverse threads on the screw and stem.

Improved Bolt Cutter.

Joseph Tomlinson, Onslow, Iowa.—This invention relates to a new and very simple bolt cutter, in which a sliding jaw is used under a fixed jaw somewhat in the style of a monkey wrench. The two cutters have L-shaped cutting edges, so that they can cut from either the front or one side of the instrument. They can be reversed, if necessary, so that either side of the instrument may be used. This is an improved feature, inasmuch as it permits the application of the instrument close to the surface, and the cutting of bolts or pins that could not be cut so close by other means. By means of straps a lever is connected with the shank, so that, when said lever is swung, its connection with the shank and slide will cause the slide to move down or up, as the case may be, and to cut when the lever is swung down. This connection of the lever with the two cutters is one which gives great power, and allows the application of a hand instrument in places where such instruments were hitherto not found sufficiently strong.

Improved Fruit Jar.

Mrs. Ella G. Hallen, Carlisle, Pa.—The invention relates to fruit jars, and consists in a hollow glass stopper having a single central opening at the bottom, and in a jar having blown lugs on the inside and a plain ring on the outside.

Improved Cotton Press.

Robert Powers, Charleston, Miss.—This invention consists of a large revolving nut, through the center of which the screw works, confined between the cross bars in the top of the vertical press frame. The latter rises and falls by the turning of the nut, which is effected by a belt worked by a small pulley on a counter shaft, one end of which runs against the end of another shaft, which may be the ordinary band wheel shaft of a horse power for driving a cotton gin, and is to be provided with a clutch of any approved kind by which it can be readily connected to said shaft to be turned by it or disconnected. The two shafts have each a bevel pinion, near the ends facing each other, with which there is another pinion arranged in such manner on an adjustable support that it may be readily brought into gear with them. The aforesaid clutch is then disconnected, to reverse the motion of the nut and raise the follower, after it has been forced down to press the bale, by the direct action of the driving shaft on the counter shaft, through the medium of the aforesaid clutches.

Improved Cooking Utensil.

Joseph Mansfield, Jefferson, Wis.—This invention relates to a new case or inclosure for receiving and holding gridirons, and has for its object to permit a full control over the iron during the broiling process to prevent the escape of all the juice from the meat that is being broiled and the entrance into the room of smoke or gases from the fire. The invention consists in the arrangement of a supporting plate for the gridiron, and in the application thereto of a cover or covering attachment, whereby the gridiron is protected and the heat retained.

Business and Personal.

The Charge for Insertion under this head is **$1** *a Line.*

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Notes & Queries

B. O. M. asks how to prepare calf skins for drum heads.

R. B. C. asks: With what force does iron expand when heated?

R. says: Please tell [me the cheapest cement for stopping the cracks in a leaking roof.

W. B. W. asks: Will hot lard or tallow draw the temper of a steel blade? May a knife be so spoiled in frying meat?

G. W. H. says: Can you tell me of anything that will color butter, without rendering it unhealthy or affecting its flavor?

J. M. L. says: I have about 20 barrels of dirty olive oil, gathered from journals of shafting. How can I clean it so as to use it again?

P. A. B. asks how to soften leather that has got hard, such as pump valves. He has tried oil, water, and kerosene, and neither will soften it.

W. E. G. asks: Does boiling pickles in a brass kettle render them injurious to health, and will a brass faucet in a vinegar barrel injure the vinegar?

W. E. G. says: One friend contends that coal, stone, iron, and other minerals were formed or made in their present state when the earth was made; I differ with him. Who is right?

R. says: How can I dissolve bones to be used as a fertilizer? I saw it stated somewhere that to boil them in lime and ashes in an open kettle would cause them to be easily pulverized. Please tell me the cheapest manner in which they can be pulverized?

J. B. M. asks: What is the result produced by hardening cast steel in water strongly impregnated with salt, and what would be the difference if sal ammoniac were used in place of salt?

I. M. I. says: What will be the resistance of the atmosphere to a flat surface containing one thousand square feet, moving at the rate of thirty miles an hour?

M. E. P. asks: What are the best materials for soldering iron and steel, and how are they used? How can I temper a large irregularly shaped punch and die without springing them?

J. H. S. asks: What flux is used in the manufacture of steel plow shares, where the wing and land side are so nicely welded together? I have tried pulverized borax with poor success. What was the cause?

S. asks: How can I make a red stain that will give, when burnished, a bright clear color? Aniline gives too dark a shade. How shall I go to work to make a burnish ink that will polish well?

J. A. W. asks: 1. How can I put a thin coating of gum on a small piece of leather, convex on one or both sides. The gum is to be as soft as that used for pencil rubbers. 2. How can I make a composition of gum and leather filings (leather sawdust or fine ground leather)?

L. M. L. says: I believe that limestone could be successfully employed for the production of steam in a furnace suitably constructed for the purpose. I would like to know if any of your readers can give me information of any experiments on the subject.

A. W. T. asks: What is the method of polishing or varnishing walnut picture frame moldings, used by the manufacturers thereof? The operation is very quickly performed, requiring but one day's time, and the polish is quite bright and durable.

J. S. B. asks: Can you advise me how to paint muslin or paper with adhesive, elastic, white and insoluble paint that will not crack or injure the appearance of the other side, without using gum or oil combinations? Can glue or starch paint be made elastic and insoluble?

J. B. asks for information in reference to mills for grinding spices, gum arabic, and substances which contain large proportions of oil. He has a burr stone, a cast iron and a steel mill, but they all gum up and are useless for pulverizing oily sticky substances.

W. B. W. asks: Will some one please give a cheap and simple plan for operating a horse hay fork, by which the load may be carried perpendicularly ten or fifteen feet and thence horizontally or at a little inclination for any required distance, and dropped at any point along the line, at the discretion of the operator?

J. T. T. asks for the best plan for hanging wall paper on a horizontal rough ceiling, so as to prevent the paper from breaking at joints. Which is the best width for the paper, 6 or 12 inches?

A. B. J. asks: Would the addition of oxygen to the usual air blast of a blast furnace lessen the amount of coal necessary to smelt a given amount of ore; if so, what proportion less coal could be used by increasing the oxygen, or even by using all oxygen for the blast?

W. B. W. says: A rope fastened at one end will support vertically a given weight. What is the comparative size of another, supported horizontally by its extremities and sustaining the same weight in the middle? Or, what is the comparative strain upon two ropes, sustaining an equal weight, the one supported vertically and the other horizontally?

W. M. remarks: E. H. R. says that the stoppage of the breath from any cause is immediately followed by insensibility, both of body and mind. That being the case, I would like to ask how it is that, if the head be cut off a chicken, the bird will plunge about, using both legs and wings violently for nearly five minutes, appearing to be in great pain. Surely decapitation must stop the breath.

W. E. G. says: Some of my friends contend that a ball shot from a rifle *or* pistol will penetrate deeper into wood or other objects at a distance of fifty paces than it will at ten paces; in other words, that the velocity of a ball increases up to within a certain distance. I differ in opinion with them; who is right?

J. C. B. asks: 1. Ought drinking water, standing in a pail, to be covered to prevent absorption of noxious gases in a room? 2. Is it true, as stated in Report of Agricultural Department, 1869, p. 364, that "milk and coffee, when mixed and taken together, constitute a new composition which is absolutely indigestible, nothing in reality but 'leather soup'?"

J. B. says: In walking through one of the rolling mills, I saw what is generally called a collar, that is, a piece of iron, coming out of the rolls, from some cause or other turned over the roll, instead of taking the usual course. The men working at the rolls at once commenced trying to slack up the screws, to extricate this ill formed piece, but failed in the attempt. Several others came with a long wrench, and then the screw could not be slackened until something like three quarters of an hour had been spent at it, and of course the iron was wasting in the furnaces during that time. Are there not holsters different to the ones with the screw on the top?

J. A. B. has sunk a well 4 feet in diameter to a depth of 60 feet; 50 feet through clay and 30 through gravel, without striking water; and he wishes to convert it, if possible, into a cistern. Can this be done by cementing the lower half (in the sand) or by applying a coating of tar to the kerbing, and nailing on securely tongued and grooved flooring, leaving the part through the clay with its present lining (kerbing)? What is the best way of making corners water tight? If these plans are not feasible, what is the best way to make a water tight cistern to keep water pure enough for farmyard purposes?

E. L. asks: Can some of your readers tell me how to mount the pollen of the "morning glory" on a portion of the calix of the same flower, so as to keep it looking fresh for future microscopical examination? I tried several times to mount the pollen by shaking it upon a piece of the deepest red of the calix, but the latter always shrunk or dried down in a few hours so as to spoil it. It makes a most beautiful object for the microscope, when freshly mounted.

C. J. asks whether the force of a permanent magnet is affected by electrical conditions of the atmosphere. "I have such a one, whose force, in sustaining weights suspended from the keeper by a basket, seems to be very variable and, possibly, depending upon electrical atmospherical conditions. Is this substantiated by any good evidence?" Answer: The best plan is for our correspondent to perform a careful series of experiments with his magnet and report the result. In this way, by a comparison of facts, we may build up a theory and finally establish a law. Whenever there is electrical disturbance, change the weights on the keeper and thus determine whether the strength of the magnet is increased or diminished, and see if the electrical changes stand in the relation of cause and effect.

C. W. H. asks if the pressure is the same in two steam domes, one the ordinary construction, the other separated from the boiler by a bottom diaphragm through which is a small orifice for the admission of steam. Answer: The pressure is the same in both.

S. asks: What is the best coating preparation for iron, to prevent rust or oxidation from exposure to water or moisture? Answer: In New York city the iron buildings are protected by several coats of oil paint. If the articles are small, varnish can be taken. A coating of paraffin will serve where the temperature remains low.

R. B. C. asks: What is the best solvent of caoutchouc, that will evaporate and leave the caoutchouc firmly adhering to the substance on which the solution is placed? Answer: The best solvent for india rubber is bisulphide of carbon, or benzole.

G. F. P. D. says: The need of ventilation is particularly noticeable during these long, cold winter evenings, when we are confined within the limits of four walls and require gas light, which I think is the chief cause of the vitiation of the air. The conditions are these: The room is heated by a low down grate (and by that only) and during the day the air is noticeably pure and unobjectionable; but after the gas has been lighted for an hour or two, the air has a dry and burnt feeling which is very disagreeable as well as unhealthy. I wish to ask if you can suggest a remedy. I have seen an advertisement, in some English publication, of a self ventilating gas burner, which carried off the products of combustion. Are such to be found in our American cities? How does the amount of carbonic acid and other impurities given off by said gas light compare with the exhalation from a human being, as far as the contamination of the air is concerned? Answer: Attempts have been made to carry off the products of combustion of gas burners by means of siphon tubes suspended over each jet. It worked tolerably well in public halls, but is hardly feasible for private houses. The only safe way is to have ventilators extending to the outer air in which an artificial draft is produced by a single burner. The products of the combustion of illuminating gas are chiefly carbonic acid and water; if the gas is impure, sulphurous acid is also formed. The exhalation from respiration, in addition to carbonic acid, contain organic matter and are far more unhealthy than the products of burning lights; both will prove fatal if pushed too far, so that it is only a question of quantity. All sitting and sleeping rooms should be provided with ventilators, the form of which must be determined by the position of the rooms.

G. H. H. asks: 1. If a ship is sunk in mid ocean or any where in very deep water, will it sink until it comes to the sand at bottom of the ocean? 2. Will a mast sink in the ocean or will it float on top of the water? Answer: The question of the ship revives a very old discussion. It is generally conceded that at great depths the water must become more dense than on the surface, and a point could be reached where the ship would have the same weight as the displaced water and in consequence would remain at rest in any position in which it was placed, the upward pressure exerted upon it being equal to its own weight. There must be a depth below which the ship would not sink. A mast will float until it is water-logged and finally ground up by the action of the waves.

R. M. S. asks: What three articles will dissolve iron, lead and copper the quickest? Answer: The best solvent is nitric acid aided by gentle heat. The operation must be performed under a flue, or in the open air, as the fumes are poisonous.

R. D. says: How many horse power will it take to blow a furnace for making pig iron from the ore with a capacity of 4, 6, 8 or 10 tuns per day, respectively? Answer: In such cases as *this*, consult a well known and experienced constructing engineer. Each individual example will require an engine precisely adapted to its work. The larger size would, we presume, require a 16 inch high pressure cylinder, carrying 60 or 70 pounds steam. The smaller might require 14, 12 and 10 inch cylinders.

J. H. M. says: On one shaft I have two pulleys 12 inches, and 6 inches respectively. On the other, I have one pulley 36 inches in diameter from which I belt to the 12 inch. I want to know the size of the other pulley on the shaft with the 36 inch pulley, so that the belt can be shifted from the 36 and 12 on to the 6 and the one required. Answer: The rule involves an awkward algebraic expression which requires too much mathematical work to be generally used. The quickest and most satisfactory way is to lay out the pulleys on the drawing board and alter the radius of the unknown one until it fits. See our reply to F. E. D. (February 22, 1873) for the easiest method for general work.

S. A. R. asks: What will remove sediment which has accumulated in pipes caused by the evaporation of caustic soda, in solution, the same being formed in layers on the inside of pipe and burnt on by the action of fire on the outside? This sediment or inside coating is known in chemistry as black ash. Answer: It would be necessary to know more about the composition of the sediment before prescribing a remedy. We generally understand by black balls or black ash the sulphate of soda (salt cake) calcined with lime or coal, as obtained in the manufacture of soda ash.

J. H. S. says: There is, in the capitol building at Washington, D. C., a round room, in the center of which is a series of circular shelves in the form of a pyramid, on which are placed a number of glass jars, from which numerous wires extend down to the floor. Please explain the object and working of the above apparatus. Answer: The jars compose the cells of the galvanic battery by which electricity is generated for lighting the gas jets throughout the building.

A. S. R. says: In telegraphic communication, does electricity travel, that is, does electricity generated in a battery in Washington go to New York when the Washington operator communicates with New York? Will you give the facts concerning the time required, if any, for electricity to travel a given distance? Is it a substance, and, if not, how does it make a hole through a quantity of solid paper when it passes through it? Answers: As physicists are still speculating about the nature of electricity, and have still to confess that they have no real knowledge of it, we cannot say whether there is any actual movement of electricity, from place to place. It is thought probable, by the leading scientific men of the day, that electricity is a kind of motion and not a material substance. This motion has immense rapidity. Wheatstone, a well known English electrician, found the velocity of frictional electricity, which is similar to the lightning, to be 288,000 miles a second. In the telegraph, the speed is vastly less, in consequence of the lower intensity of voltaic electricity, and of the resistance of the circuit. It may become exceedingly small, and even imperceptible, in some cases of high resistance. Wherever it meets and overcomes resistance, heat is developed, and where it has intensity enough to overcome any resistance, it breaks a path for itself. The hole in paper is either produced by this mechanical force or by the sudden and violent expansion of air or moisture by the heat produced.

R. says: A. and B. want to draw the dirt from the bottom of a well by horse power. Two pulleys are required. A contends that large pulleys, and B, that small pulleys, will run the easier. Which is right? Answer: The larger the sheaves, as a rule, the easier is the work done.

S. asks: Do the wheels of a car slide or slip on the rail in going round a curve? Answer: Yes.

D. W. asks: 1. Do steam ships on the ocean use fresh water or salt? If salt, do they neutralize the salt so as to prevent the incrustation of the boiler with salt? How much fresh water is the Great Eastern supposed to need per trip? 2. Is any compound known by which black or brown hair can be bleached or turned white or nearly so? If so, please give the recipe. Answers: 1. Engineers of our ocean steamers now usually fill their boilers with fresh water before starting on their voyages, and as their engines are now fitted with "surface condensers" almost invariably, they use no salt water at all. Loss of the fresh water by leakage is replaced by water distilled by apparatus with which every steamer is also supplied. The Great Eastern probably uses 7½ pounds of feed water per pound of coal, and at 15 tuns coal per hour, this would make nearly 115 tuns of water per hour or 2,700 tuns per day. In this case, salt water is fed into the boiler and it is prevented from accumulating by blowing out a certain proportion of the brine and supplying its place by the fresh water from the hot well. 2. We have a belief that white hairs are honorable, but have not felt sufficient enthusiasm in that matter to make the inquiries or investigations presupposed by our correspondent's question.

W. & I. say: We disagree upon a point. W. claims that even the very center particle of a revolving shaft revolves with the shaft. I claim that as the direction of the motion of the upper and lower sides of the shaft are opposite, the center must be a medium or changing point between the two directions of motion, and consequently must be still and does not revolve. Answer: The central particle turns on its own center. We prefer to give out time and space to those desiring useful information rather than to the decision of such questions as this.

H. D. asks: What causes a grindstone to burst, and is there any danger from one which is 5 inches in diameter and 1 inch thick? Answer: It is a well known law of nature that every moving body requires the exertion of a definite amount of force to produce any given change of velocity or a known change in the direction of its motion. Its effort is always to move in a straight line and at uniform velocity. This is due to the property called inertia, and the effort to resist any force compelling a body to revolve in a circular arc is called centrifugal force. In a swiftly revolving grindstone, this centrifugal force sometimes becomes so great as to overcome the force of cohesion which binds together the particles of the stone, and the grindstone bursts. We should not like to drive a grindstone 5 inches in diameter over 1,000 revolutions per minute, but should consider a good stone safe at that speed, and have seen them driven much above it.

G. W. would like to know what is the best way to compress oxide of magnesium in place of lime, for oxyhydrogen light. Answer: It has been done by means of the hydraulic press, and cylinders have been sawn from the compressed block; but it is apt to crumble and blow away, and is not so serviceable as the lime light.

S. C. D. says: Please explain the process for nickel plating, published on page 177 of your volume XXV. What is meant by "pure sulphate of the protoxide of nickel by crystallization with 300 parts, by weight, of pure ammonia to form a double salt?" What is meant by "ammoniacal solution;" is it aqua ammonia? Does "platinum positive pole" mean to use platinum for an anode? Is 1,000° Fahr. correct? Answer: The best salt for nickel plating was found by Dr. Isaac Adams, of Boston, to be the double sulphate of nickel and ammonia. To prepare this compound E. D. Nagel, of Hamburg, Germany, takes 400 parts by weight of pure crystallized sulphate of nickel which he dissolves in 200 parts of concentrated aqua ammonia; the double salt thus formed is subsequently dissolved in 6,000 parts of water and an extra quantity (1,200 parts) of aqua ammonia of specific gravity 0·909 added. The amount of water and extra ammonia to be taken ought to be determined by experiment. The object of the additional ammonia is to prevent the solution from becoming acid. An ordinary battery or small quantity may be employed, and, for the anode, platinum; for the cathode, it is usual to take a bar of cast nickel. Dr. Adams found the best temperature to be 100° Fahr. His process was patented March 22, 1870.

J. D. sends a mineral specimen found in coal and asks what it is. Answer: The mineral you send is iron pyrites, and not quartz, as you suppose. It is of no special value.

O. C. H. says: I am doing a little lumbering and am interested in your answer to B., page 74, present volume. Would you be kind enough to give the answer in figures? Answer: The cubic contents of a stick of timber 8 inches square at one end, 4 inches square at the other, and 24 feet long, in cubic feet, is: $\frac{1}{3}[(\frac{2}{3}\times\frac{2}{3})+(\frac{1}{3}\times\frac{1}{3})+(\frac{2}{3}\times\frac{1}{3})]=6\frac{1}{3}$, and $6\frac{1}{3}$ feet, cubic measure, being multiplied by 12, gives 74 feet, board measure.

T. C. says: How is coal smoke generally burned, and what per cent of the coal is lost in smoke? Would there not be less danger of burning out a boiler, if the coal were fired in 2 or 3 different paces under the boiler, instead of firing in the usual way at one end of boiler? Please give your opinion. Your opinion is good stock in this part of Kansas. Answer: It affords us great pleasure to learn that our opinion is such "good stock." We shall hope to keep it well "above par." The direct loss, in heating effect, by smoke is rarely very large. Burn it by allowing a stream of air to enter through a large number of small holes in the furnace doors and have a good combustion chamber behind the grate bars. Probably the usual method is, on the whole, the best plan of firing.

G. R. says: We have, in connection with our boiler, a smoke stack which has three elbows, a part of which is built up a hill on the ground. In order to give the fire place of the boiler more draft, we desire to put an air blast from a fan either into the smoke stack or fire place, and desire your opinion as to which is best. If turned into the fire place from the ash pit, we suppose it would be necessary to close the latter with plank. Answer: Enter the blast at the ash pit, closing latter carefully. In using it, always be careful never to leave ash pit closed for a moment, when the blast is not on, as it may melt down the grate bars.

G. M. says: I have two water gage glasses; one is on the boilers in the usual way, and the other is carried from the boilers to the engine room, distant about 40 feet. This one I cannot get to work right. First I ran a ¾ inch pipe from near the bottom of the boiler that I might get the water as free from agitation as possible; then I ran a ½ inch pipe from the top of a steam drum above the boilers, the two pipes joining at the gage glass in the engine room, which I had carefully levelled from the other gage glass on the boilers. But I could not get it to work well. The water seldom came into the glass, and I could not get it to rise to the same level as in the boilers or to remain steady. I then removed the ¾ inch pipe which I had near the bottom of the boiler and put it on a level with the water pipe belonging to the gage that is on the boiler. I also removed the ½ inch pipe from the steam drum and put a ¾ inch pipe on the top of the boiler. But that has done no good, so that the water gage in the engine room is no good to me, nor has it been since I put it up. Can you tell me what is wrong? I would mention that the water pipe where it leaves the boiler drops down to the floor and then rises up to the glass in the engine room; has that got anything to do with it, or has condensation in the steam pipe? Answer: We suspect the trouble to be either condensation in the steam pipe or the formation of a "trap" by some bend in that pipe. The pipe conducting the water is probably all right. Make the steam pipe as large as cost will allow, with no bend in which water can settle, and cover with felting. If the gage can be made to work at all, it will work then, we suspect. Run the levels again to be certain that the gage has been set at the proper hight.

W. R. S. says that J. L. B.'s information as to putting glass jars on a wet cloth while filling with hot fruit is worth the price of our paper for a whole year to any housekeeper. "But a more convenient mode to fill fruit jars is to use a damp twisted rag long enough to reach around the jar. This makes a sort of handle by which the jar may be held while the hot fruit is poured in; and it is equally effective in protecting the jars while standing on the table. It has occurred to me that a strip of copper made in such a manner as to clasp the jar firmly, and having a suitable wooden handle, would protect the jar quite as well as the wet cloth, and be much more convenient. I believe I never broke a test tube over a spirit lamp when using a test tube holder. This subject evidently has something to do with the conduction and perhaps the radiation of heat; and it will allow of much investigation."

T. F. asks: Suppose that B. invents a machine, exhibits a model and drawings to a few friends, and gets them to sign a paper saying that they saw it at a certain date, but is unable to go any farther with it. Four or five years afterwards, a man, who has never seen or heard of B, invents and patents the same thing; can B use or sell his invention? Answer: B may use the invention, but is liable to a suit from the patentee. B's defence is prior use, which, if proven, will prevent his being mulcted in damages. But it does not possess B with any claim to his opponent's patent. B should apply for a patent and have interference declared. If B proves to have been the first inventor and has not acquiesced in the sale of the patented article for more than two years prior to his application for a patent, the Commissioner will grant him a patent, with which he can go before the courts and have his opponent's patent decreed invalid. After these proceedings, B, being the lawful patentee, can use and sell; and he can prevent the first patentee from doing either.

C. H. S. asks: Is there any process known, by which corn meal and spring wheat flour can be kept from heating and consequent souring, without destroying its essential qualities, as is done by kiln drying? Answer: By using air pipes so as to introduce air into the mass of flour, you can prevent heating and souring.

W. G. W. asks: How can I get or prepare the white paint used to color boxwood for drawing on? Answer: Moisten the block with water, and rub with enamel off a common card.

H. T. W. says: 1. I want to make a pine bath tub to be used without a lining. It will be made tight jointed, of course. What material can I use for an inside coating, something penetrating, to render it water tight and prevent all soakage? 2. Is whiting as good or better for first coat of wood house, than yellow ocher? 3. What is the better kind of timber for flooring next to yellow or southern pine, to be oiled and polished? 4. In what manner must a floor be oiled and polished so that it will always be clean and bright and not gum up or become begrimed? Answers: 1. Cover the inside of the tub with hot paraffin. 2. Whiting is probably as good as ocher for the purpose mentioned. 3. Walnut. 4. Use linseed oil and polish by hard rubbing with canvas.

J. C. R. asks for explanation of the diagram of a pantagraph, published on page 99 of our current volume. Answer: See the reply to S. A. T., on page 155, and page 179 of this issue.

A. J. B. asks, among other questions: What did Blanchard invent? Answer: A nail making machine, a shaping machine of universal application, an eccentric lathe, and other contrivances too numerous to describe. We are unable to give information as to the leather machinery.

J. D. asks how to mend rubber boots. Answer: See page 155 of our volume XXVI. For other information, ask the photographers of your neighborhood.

W. T. B. says, in answer to J. A. P. who asked for the best preparation for filling the holes and seams in burr stones: As you cannot readily find any thing hard enough, after it is dry, to wear equal to the face of the stone, or that will stay in the smooth scaly holes for any time, I think it quite as well to use nothing. But on the skirt of the stone, where the seam is large and runs near the edge, just feather-edge it, on the work side, like the furrow.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On an Improved Steam Engine for Yachts. By H. S. T.

On the Construction of Cheap, Safe and Durable Dwellings. By J. H. L.

On the Acid Relation of the Elements. By W. C.

On the Revelations of Science and Theology. By A. L. L.

On the Boiler Question. By C. P. E.

On Devices for Warming and Cooling, and Other Mechanism. By E. B.

On the Manufacture of Combs. By E. H. B.

On the Prismatic Railway. By E. C.

On the Elements of the Universe and their Relations. By E. D. S.

On Fog Trumpets. By E. H. K. B.

On the Reasons why Great Fires are Difficult to Control. By S. P. G.

On the Possibilities of Producing Perpetual Motion. By L. R.

On the Practice of the Sand Blast Proces for Engraving. By W. A. M., Jr.

On the Bursting Strain of Cylindrical Boilers. By B. B. V.

On the Strain in Cylindrical Boilers. By R. S. F.

On Heat Phenomena. By J. R.

On the Polar Sea. By J. H. F.

On Trade Unions. By A. M. D.

[OFFICIAL.]

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February 18, 1873,

AND EACH BEARING THAT DATE.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

24,094.—HEATING FEED WATER.—J. F. Brooks. May 7.
24,162.—PLATFORM SCALE.—F. M. Strong & T. Ross. May 7
24,192.—EDGING BOOT SOLES.—M. Wesson. May 7.
24,257.—SEAT FOR CAR.—T. T. Woodruff. May 14.

EXTENSIONS GRANTED.

22,901.—WATER WHEEL.—J. Temple.
23,085.—LAMP.—E. J. Hale & C. H. Chandler.
23,105.—STEAM VESSEL.—J. Montgomery

DISCLAIMER.

22,902.—WATER WHEEL.—J. Temple.

DESIGNS PATENTED.

6,412 to 6,415.—CARPETS.—J. Fisher, Enfield, Conn.
6,416 to 6,424.—CARPETS.—O. Heinigke, New York city.
6,425 to 6,428.—CARPETS.—H. Horan, Newark, N. J.
6,429 & 6,430.—CARPETS.—L. G. Malkin, New York city.
6,431 to 6,435.—OIL CLOTHS.—C. T. & V. E. Meyer, Lyon's Farms, N. J.
6,437 to 6,448.—CARPETS.—E. J. Ney, New York city.
6,449 & 6,450.—CARPETS.—H. Nordmann, New York city.
6,451.—SEWING MACHINE FRAME.—J. O'Neil, N. Y. city.
6,452 to 6,454.—CARPETS.—J. H. Smith, Enfield, Conn.
6,455.—OTTOMAN.—J. D. Ladd, New York city.

TRADE MARKS REGISTERED.

1,130 & 1,131.—CLOTHES WRINGERS.—Bolley Washing and Wringing Machine Co., Woonsocket, R. I.
1,132.—PLUG TOBACCO.—Earickson & Harris, St. Louis, Mo.
1,133.—COAL OIL.—W. A. Kowalski, New Orleans, La.
1,134.—SAUCE.—J. K. MacGowan & Co., Philadelphia, Pa.
1,135.—PAINT.—Prince's Metallic Paint Co., Weissport, Pa.
1,136.—TOBACCO.—Walker, McGraw & Co., Detroit, Mich.
1,137 to 1,139.—TOBACCO.—Allen & Ellis, Cincinnati, Ohio.
1,140.—WHISKIES.—Flack Brothers, Canton, Md.
1,141.—BOOTS AND SHOES.—Burt & Mears, New York city

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PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

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To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should besecurely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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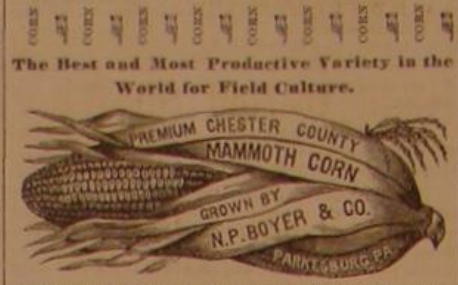

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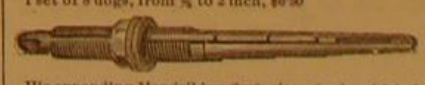

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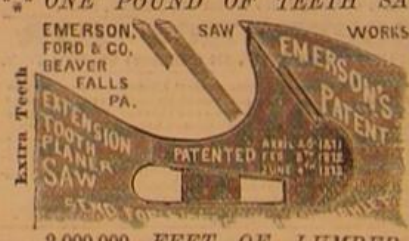

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