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## HOLBORN VIADUCT SUBWAYS.

In the construction of the Holborn Valley viaduct, and the streets connected with it, the corporation of London determined to introduce subways for gas, water, and telegraph pipes, and thus to prevent the breaking up of the road surface, which is so often necessary with the ordinary system of placing them in the ground beneath the public way. As a means of conveying water, subways have, for some years, been used in Paris, and more recently in London. They were first introduced in London in the construction of Southwark street, from Blackfriars road to the Borough. The conveyance of gas, however, requires special arrangements for ventilation to prevent the risk of explosion, and the subways under the Holborn viaduct are believed to be the first constructed with a view to their safety when used for this purpose. The arrangements must here be explained. In the Holborn viaduct there is a subway, 7 feet wide and 11 feet 6 incles bigh, on each side of the road, running between the great arches which carry the roadway and the house vaults which support each footway. The subways are imme diately above the sewers, and are well drained, floored with large slabs of York stone, and lined with ighit gault brickis. In fach subway a 14 inch main pipe of the New River Company is carritd by iron chains $n \in$ ar to the wall neares the frontage of the houses, and above it 10 inch gas main*, belonging to the City of London and Great Central Gas Companies, are supported on iron brackets projecting from the wall; on the oprosite side of the subrray a pipe, containing t.e telegraph wires, is carried in a similar way. All the $p$ pes are so fixed that workmen can easily examine and repair the joints; and, in anticipation of the ne w buildiags, junctions with the gas and water pipes bave been made for each house; from these junctions the pipes will be conducted through holes formed in the sides of he subways and communicating with the house vaults. Branch pipes are laid on from the subways to the street watering posts, and to the fire lydrants in the streets, and gas is laid on to the hydrants in the streets, and gas is laid on to the
sireet lamps. All the usual valves, meters, and street lamps. All the usual valves, meters, and
other apparatus are accessible within the subother apparatus are accessible within the sub-
way itself. Rails are laid along the floor of each subway, on which runs a traveling crane, to fa cilitate the removal and fixing of the gas and water mains. The subways are ventilated by $m \in$ ans of small circular gratings fixed in the footways along the center of tach subway, and by flues which run up the party walls of the houses and terminate above the roofs. Every street lamp, and every post along the edge of the foot ways, communicates also with the subways, and is so p+rforated as to act as an $\epsilon$ tficient ventila tor. Whitrever practicable, the doors of en trance are also constructed of open iron work Hitherto the ventilation has been perfectly $\epsilon$ ffi cient, and no danger is apprehended from the use of naked lights or from the gas jets by which the subways are lighted at times of inspection. One portion of the viaduct subways, between


HOLBORN VALLEY VIADUCT--SECTION OF SUBWAY ON EACH SIDE.

Farringdon road and Shoe lane, has been lighted by means of Hyatt's patent vault light, an Amer ican invention introduced into England by Mr Haywood, the engineer of the Commissioners of Sewers, who designed the Holborn viaduct. It consists of a large frame of cast iron glazed with thick bosses of glass, let into the footways, at intervals, over the crown of the arch of each subway, forming a very efficient means of lighting. In Charterhuuse street, Snow hill, and in the other sulsidiary streets, there is but one subway, of a lower form, 12 feet wide and 7 feet 6 inches high, running under the center of the roadway. In these, the pipes are laid on dwarf walls along each side of the central pathway. In all other respects, the arrangements are as nearly similar to those already detailed as the circum stances would allow.

## Jasmine Pipe Stems.

In a recent number of the Revue Eorticole, M. Barillet describes the cultivation of the common jasmine (jasminum officinale), vear Constantino ple, for the purpose of tchibouk (pipe) making. The object sought is a long straight stem, free from leaves and side branches. For this purpose the plantsare grown quickly in a rich soil, and drawn up by being grown in a sheltered situation, to whirh the sun has little access at the sides, but only at the top. Pincbing is re sorted to, and during the second year's growth one end of a thread is attached to the top of the jasmine stem. This thread passes over a pulley attached to the post to which the jasmine is trained, and from it is suspended a weight, the effect of which is to keep the stem always in a vertical direction. When the jasmine stem is about two centimeters (say $\frac{8}{4} \mathrm{inch}$ ) in diameter a cloth is w:apped around it to prevent access of dust and of the sun's rays. Twice or thrice in the year the ftem is washed with ciluron water (eau de citron), which is said to give the clear (claire) color so much esteemed, When the stem has acquired a length of some 15 fret it is cut down and perforated by the workmen, and fitted with a terra cotta bowl and an amber mouth piece. The length of the tchibauk stems varies from one to five meters ( 3 fret to 16 feet about); in the latter case as much as $\$ 100$ is demanded for their purchase.

## Annealing.

The change produced by arnealing is not well understood. Most of the malleable metals as sume two distinct forms: one crystaliine, which is the result of s low cooling, and the other fiberous which is brought about by bammering or rolling If hammered or rolled $b$ yond a certain point, the metals become so hard that they cannot be bent without breaking. If annealed beyond a certain point, the metals become crystalline. The particles of the metal change their arrangement without altering the external form. Hence it is necessary to presesve wire, such as is used in the manufacture of pins, in a dry air, or under the surface of water.


# stintifir formiram. 

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the panic and the laboring classes.
The daily journals of the past week have exhibited such crowded columns of reports from all parts of the country, indicating the temporarily depressed condition of the manufacturing and industrial interests, that it is hardly necessary here to particularize individual cases as evidence of the prevailing despondent feeling. By far the majority of estab. lishments are retrenching: some by reduction of working force, others by cutting down hours, and more by removing a percentage from the salaries of employees. While the outlook is far from cheerful, there is a belief that the worst is over. The railroads and many of the iron founderies still take a gloomy view of affairs, and we notice that reductions take a gloomy view of affairs, and we
of expense are yet being largely made.
With all the facts in view, however, we still are inclined to adkere to our belief in the passing nature of the trouble. We find much to applaud in the course adopted by many establishments, which, trusting to the early revival of better times, are working straight on, with no greater alteration in their business routine than such as they are imperatively driven to make. So far as the producers of the necessaries of existence are concerned, we think little apprehension need be felt as to their rising superior to the disaster; but with reference to those who gain their living from the manwith reference to those who gain their living from the man-
ufacture or sale of articles pertaining to the luxuries of life, ufacture or sale of articles pertaining to the e
there is a probability of less favorable results..
To the workmen, however, the prospect is indeed dark. No pay on Saturday night means, to hundreds, no dinner on Sanday-no rent for the coming week-no fuel to keep off the bitter cold of winter. In ordmary times, these men might seek other employment, or turn to some labor, the return for which would keep body and soul together; but now, when thirty thousand operatives in this city alone have been thrust from employment, the chances of gaining comfortable support for a family are far from promising. Let employers put themselves in the places of their hands, and imagine their own feelings in so dire a strait, and then think of the hardships which, perhaps through a mere sentiment of over cautiousness, they entail, not only upon their immediate workmen, but upon their families and the host of other people dependent upon their small custom for a means of existence. It is for this reason, above all others, that we advocate the keeping open of every industrial establishment while its bare expenses can be met, no matter if not a cent of profit be made, or even if some loss accrue. Better far that the rich should sacrifice a portion of their wealth than that the poor should be left destitute or driven to pauperism.
Another lesson, and a fruitful one, is to be gleaned from the pending crisis, which the workmen would do well to take to heart. It is the utter futility and hollowness of strikes, and notably the.t of a year ago, when regarded in connection with the present aspect of affairs. It is strange that hardly twelve months should elapse before the very condition to which a number of wrongheaded men strove to reduce the employers, through coercion and an unjust exercise of power over the ignorant, should be brought home to their own doors. The defeat of the great movement of 1872 was complete enough, but it has been reserved for the panic of
1873 to give it double effect and to render its teachings 1873 to give it dould
indelibly impressed.
As to the means of alleviating the condition of those who, it now appears, are to be so sadly reduced during the coming winter, some organized plan will undoubtedly become necessary. A contemporary suggests the division of large cities into districts, and the appointment of suitable committees to visit the houses in each, in order to solicit contributions to a general fund. Our opinion is that now is the time for the trades' unions to assert themselves, and to prove that they
are unworthy of the odium under which they now labor. are unworthy of the odium under which they now labor.
Several of these organizations. during the great strike,
boasted freely of their reserve capital and of the assistance to be gained from kindred societies in Europe. Now let the International and the British associations, which send such earnest emissaries here, come forward and render that aid which they have so freely promised. If the trade associations will join forces, and labor, not merely in the interest of their own members but of all working men, they will do more towards elevating the condition of the laboring classes than they could accomplish by any number of successful strikes.

## the progress of the hell gate excavations.

General Newton, of the United States engineers, the officer in charge of the government works at Hell Gate, has recently submitted his annual report of progress made in that important undertaking. The various tunnels and galleries now aggregate in length 5,884 feet, of which 2,731 feet constitutes the advance of the past year. The total amount of stone removed during this period is 9,554 cubic yards, of which 7,619 yards were extracted by the Burleigh drill, 185 by the Diamond, and the balance by hand work. Aboutten linear feet of holes have been made in each cubic yard of rock; and to explode this large number of blasts, 11,808 pounds of nitro-glycerin, 1,218 pounds of giant powder, and 3,445 pounds of black powder have been employed. In hammer work, 9.03 feet of hole and 09 pounds of nitro-glycerin correspond to one cubic yard of rock blasted
The report speaks very favorably of the operation of the Burleigh drill, each machine, it is stated, having made for the year an average of 25 feet per shift of eight hours. The loss of steel by abrasion and drilling is estimated at $0.5 \frac{8}{4}$ ounces per linear foot, a calculation which of course must be confined to rock of similar nature to that at Hallett's Point. The balance of the report refers more particularly to the operations of the steam drilling scow during the year 1872, reference to which has already been made in these columns. Ti.ere is the usual complaint of delay and increased cost of operations, owing to the lack of necessary funds. It is strange that Congress is so apathetic in this regard. The importance of securing a free channel from Long Island Sound to the East River has been so frequently and so forci bly urged, and so much money has already been expended in fruitlessly endeavoring to secure the same, that there can be no reason for withholding the means of completing a work regarding the ultimate success of which no doubt can be entertained. Delay, as General Newton has so often pointed out, only increases expenses, and besides indefinitely defers the advantages to be gained by both city and country. We were told during last winter that at that period a sum in the neighborhood of five or six hundred thousand dollars would be sufficient for all purposes. It seems to us that both our city and state authorities should, during the coming session of Congress, especially interest themselves in this matter, and, by the exercise of their powerful influence, ensure the appropriation of the balance now needed to effect the speedy completion of operations.

## A RECENT IMPROVEMENT IN GAS MARING.

On another page of this issue will be fourd an illustrated description of an improved plan of gas manufacture, which has recently been put in practice at the works of the Citizens'
Gas Company in Brooklyn, N. Y. It is a matter of general information that the forcing of jets of superheated steam through anthracite coal, over heated metal,or through a furnace fire, is not a new idea,nor is it our intention in the present instance so to infer. Some sixty patents or more have been granted for "water gas" and kindred processes, dating as far back as 1823 . The system in general has found many opponents, notably, among otbers, the late Dr. Torrey: while Professor Wurtz, in published reports on the subject, has pointed out that it is impossible to convert the steam entirely into hydrogen and carbonic oxide. Some of the steam, he considers, is not decomposed, and, passing into the coal retorts, operates injuriously, probably by oxidizing the olefiant gas. In conclusion, the same author remarks that the greatest of practical objections is "the uncertainty of the quality of the product."
Without entering further into the details of the subject or inviting discussion of the vexed question in the present connection, we submit simply a statement of facts as laid before us through the courtesy of the President of the above named company, W. P. Libby, Esq. Whether gas experts may or may not hold that the operation and apparatus we have described are economical, remunerative, or of any advantage whatever, is not the point upon which we wish to dwell.
The books of the company, we are told, indicate no inconsiderable saving, while the aspect of the works, the $\varepsilon$ bsence of the usual complement of hands, the diminished requir. ment of coal, and finally the satisfaction expressed by the officials employing this threefold process, add still further testimony in corroboration of its apparent value and utility.

## POSTAL SCIENCE

It seems to ths that the postal regulations now in force are singularly inconvenient, not to say unjust, as regards publishers, who, in the ordinary course of their business, find it necessary to transmit large quantities of printed matter through the mails. We have already called attention to the fact that we are now preparing a special edition of sixty thousand copies of the Sctentific American, numbers of which will be mailed to persons in every city, town and village in the United States. As the recipients of these papers will in all cases be non subscribers, the postage thereon
must be paid in stamps previnus to mailing; so that, at the rate of two cents per copy, the aggregate expenditure for this item alone will reach the sum of twelve hundred dollars.

Now sixty thousand papers would supply 1,154 subscribers with one copy each per week for one year. But each person, paying at his own post office, would be charged only five cents per quarter postage, or twenty cents for the entire period. Consequently, the 1,154 people would together aggregate the sum of about $\$ 231$, or a very little over one aggregate the sum of about $\$ 201$, or a very little over one
sixth of the amount which we pay in advance in order to sixth of the amount which we pay in advance in order to
send all the numbers at once. If, as it is urged, the low rate send all the numbers at once. If, as it is urged, the low rate
of postage to subscribers has for its only end the facilitating of the dissemination of news and useful knowledge, then why is it not equally fair to further the same object by giving those who produce the means of imparting such information similar advantages? Why should we, in the present instance, be required to hand out one dollar and four cents for sending fifty-two copies of our special edition at once, when if we forward the same number of issues of our regular publication, weekly for a year, our subscriber would be taxed only twenty cents?
Again, is it not possible to simplify the mode of sending such masses of mat'er, to the interest of both government and publishers? We are now obliged to purchase sixty thousand stamps-three hundred sheets-and go to the labor of pasting them on the wrappers, after which each stamp of course has to be cancelled in its passage through the mails. It seems that it would be a much easier proceeding for the Post Office to detail one employee to weigh the entire issue, note the result, and thence calculate the charge at regular rates. This sum determined, we could pay it at once, the paper 3 would be despatched, and the proof of prepayment might simply be a hand print of "New York-paid," or something of similar kind, applied by the same people and in the same manner as they would obliterate the ordinary postage stamp. The government would thus gain the cost of manufacturing the sixty thousand two cent stamps, while we should be spared the trouble of affixing them.
In England, the sender is not obliged to stamp his matter if the postage thereon equals or exceeds one pound sterling. If, for example, he has two hundred and forty letters to forward, at the rate of a penny each, the office weighs them and receives the cash, stamping them paid in the manner above noted. Or, in other cases, if it be so desired, the pcst office will embnss stamps upon wrappers or envelopes of any size, upon any variety of white paper, without any charge other than the face value of the imprint. These plans might well be put in practice here, and it seems might prove of no small convenience. For the English newspapers even a better arrangement is in existence. Formerly there was a revenue tax on every journal, which covered its transmission, free through the mail, for any number of times up to a certain date from that of its publication. London papers were sent from the publishing offices to those of the Internal Revenue, at Somerset House, where the proper stamps were affixed; after which no further payments were required. Now, however, the income goes directly to the post office; but instead of obliging journals, like the London Times, for instance, the circulation of which outside of the capital is very large, to buy and attach innumerable penny stamps, an electrotype of the government imprint is locked up and struck off in the regular forms of the paper. An official is stationed in the press room to count the sheets printed, and the proprietors pay the tax called for by his report.
The efforts toward postal reform, which have been for so long advocated by both press and people, were well inaug. urated by our last Congress in the abolition of the franking abuse, the establishment of charges upon exchange newspapers, and the authorization of the postal cards. It remains for the coming legislature to continue the work by reducing the postage on all letters, sent within the United States, to the uniform rate of one cent; while, at the same time, we trust that the discrepancies which we have pointed out in relation to newspaper charges may be fairly adjusted. The question of increasing the facilities for transmission, by means similar to those referred to a bove, is within the author ty of the Post Office Department, and merits its careful con. sideration.

## ON THE MOLECULAR CEANGES PRODUCED BY VARIATIONS OF TEMPERATURE.

Professor R. H Thurston, of the Stevens Institute, has prepared a very interesting paper on this subject, in which is presented, in briec form, a history of the various practical experiments and the conclusions reached by different observ. rs on the abcve subject. He states that the most complete investigation ever made, particularly to determine the effect of changes of temperatare in modifying the physical properties of iron and steel, was that of Knut Styffe, the director of the Royal Technッlogical Institute at Stockholm, Sweden, and supplemented by the experiments of Cbrister P. Sandberg, who translated the report of Styffe into English.
The work of the first named engineer was done at the instance of a committee appointed by the King of Sweden. It was commenced by Professor Angstrom, continued by Herr R. Thalen, of the University of Upsala, and by Engineer K. Cronstrand, and it was finally concluded, with the assistance of Cronstrand and Lindell, by Styffe, who wrote out the results of the whole investigation and made the report public. These labors were begun in 1863, and extended over several years.
The conclusions of Styffe were:
"(1). That the absolute strength of iron and steel is not diminished by cold, but that, even at the lowest temperature which ever occurs in Sweden, it is at least as great asat ordinary tempera ture (abnut $60^{\circ}$ Fah.)."
(2). That, at temperatures between $212^{\circ}$ and $392^{\circ}$ Fah., the absolute strength of steel is nearly the same as at ordithe absolute strength of steel is nearly the same as ater."
" (3). That neither in steel nor in iron is the extensibility,
less in severe cold than at ordinary temperature, but that, from $266^{\circ}$ to $320^{\circ}$ Fah., it is generally diminished, not to an great extent in steel, but considerably in iron."
"(4). That the limit of elasticity, in both steel and iron, lies higher in severe cold ; but that at about $284^{\circ}$ Fah., it is lies higher in severe cold; but that at about 284 Fah,"
"(5). That the modulus of elasticity in both steel and ir is increased on reduction of temperature, and diminished on elevation of temperature; but that these variations never exceed 0.05 per cent for a change of temperature of $1.8^{\circ} \mathrm{Fah}$ and, therefore, that such variations, at least for ordinary ${ }^{\circ}$ purposes, are of no special importance.
The experimenter gives it as his opinion that the cause of the frequent breakage of rails in cold weather, and of articles made of iron and steel, is unequal expansion and contraction and the rigidity of supports, where, as is the case with rails, frost may very greatly affect them.
Sandberg's conclusions, from 20 experiments, are thus given
"(1). That, for such iron as is usually employed for rails in the three principal rail-making countries (Wales, France, and Belgium), the breaking strain, as tested by sudden blows or shocks, is considerably influenced by cold ; such iron exhibiting, at $10^{\circ}$ Fah., only from one third to one fourth of the strength which it possesses at $84^{\circ}$ Fah."

- (2). That the ductility and flexibility of such iron is also much affected by cold : rails broken at $10^{\circ}$ Fah., showing, on an average, a permanent deflection of less than one inch, while the other halves of the same rails, broken at $84^{\circ} \mathrm{Fah}$, showed a set of more than four inches before fracture
"(3). That, at summer heat, the strength of the Aberdare rails was 20 per cent greater than that of the Creusot rails; but that, in winter, the latter were 20 per cent stronger than the former."
Sand berg suggests that this considerable decrease of tough ness at low temperatures may be due to the "cold-shortness" produced by the presence of phosphorus. Our knowledge on this point must remain imperfect until similar experiments have been made with iron free from phosphorus.
The practical result of the whole investigation is that iron and copper, and probably other metals, do not lose their power of sustaining "dead" loads at low temperatures, but that they do lose, to a very serious extent, their power of sustaining shocks or resisting sharp blows; and that the factor of safety in structures need not be increased in the former case, where exposure to severe cold is apprehended; but that machinery, rails, and other constructions which are that mashist shocks, should have large factors of safety and should be most carefully protected, if possible, from extremes of temperature.


## medical science in court.

Nearly two years ago James Fisk, a managing director of the Erie railway and a prominent man in various steamboat and other enterprises, well known, doubtless, by fame to many of our readers, was shot by the hand of an assassin. The scene of the tragedy was at the Grand Central Hotel, on Broad way, in this city. Fisk had just entered the premises, and was in the act of ascending the stairway of the ladies' entrance, when he was shot by a person standing on the
landing above. The ball entered his abdomen just above landing above. The ball entered his abdomen just above
the navel and passed obliquely downward through the intestines, lodging in the muscles of the thigh. Another ball made flesh wounds in the arm. The assassin was Ed ward $S$. Stokes, who was almost immediately arrested and lodged in jail, while the wounded man at once received medical attendance in the hotel, where, after lingering until the following day, he died.
Stokes bas had three trials. On the first, the jury failed to agree. On the second, he was found guilty and sentenced to death. But the Court of Appeals, in consequence of certain informaiities in the proceedings, ordered a new trial. This third trial has just been finished, resulting in the finding of the prisoner guilty of manslaughter in the third degree. The highest punishment of the law, four years in the State prison, was immediately pronounced, and thus has terminated one of the most remarkable cases in criminal jurisprudence.
To the superficial observer, the result of the trial seems strange enough. Here was a man ruthlessly shot down in broad daylight, and the shooting clearly brought home to the accused; yet he escapes with a comparatively slight punishment. It is even stated, on good authority, that nine of the jurors were in favor of an absolute acquittal, and consented, with great reluctance, to the verdict given. The questions naturally arise : What basis had these jurors for such a verdict, and why, if Stokes shot Fisk, was he not found guilty of murder?
The defences were: 1. That Fisk had threatened to shoot Stokes, that on this meeting he drew his pistol, when Stokes discharged his revolver in self defence. 2. That the previous threats of Fisk had affected the mind of Stokes, and vious threats of Fisk had affected the mind of Stokes, and
that at the moment of the shooting he was insane. 3. That that at the moment of the shooting he was insane. 3. That
Stokes did not shoot with intent to kill. 4. That the death of Fisk did not result from the shooting, but from poisoning py malpractice of the doctors after the shooting. It is to
the evidence pertaining to this last theory of the defence the evidence pertaining to this last theory of the defence
that we wish to direct attention, for it involves the testimony of some of our most distinguished physicians, acting in the capacity of scientific experts.
From this evidence, it appears that Fisk was attended by seven doctors and surgeons, all prominent men in this community, namely, Drs. Carnochan, Tripler, Steele, White, Sayre, Fisher and Wood. In the multitude of counsel, there is
generally supposed to be wisdom; but it seems to have
proved otherwise in this case. Dr. Tripler began operations
by deeply probing the distressing wound, an injudicious by deeply probing the distressing wound, an injudicious
proceeding, according to some of the medical experts. Subsequently Dr. Fisher, Dr. Wood and Dr. White each used the probe. Several glasses of brandy and water were administered, also chloroform and morphine. The latter was administered by the mouth, and by subcutaneous injection, six times within four hours.
Dr. Wood testified that he told Drs. Fisher and Tripler, who were the choice of Mr. Fisk as attendants, that they had two lives on their hands, Fisk's and Stokes', and must ad minister the opium with their fingers on the pulse and watch carefully the condition of Fisk's pupil and of his intelligence. He ascribed Fisk's death to shock, but admitted that the later symptoms, such as stertorous breathing, were symptoms of opium poisoning. He had heard of many cases of recovery from serious wounds in the intestines; he had seen, in cases of hernia, a portion of the intestines slough away and the patient recover; he did not, in the light of
cases, consider Fisk's wound necessarily fatal.
Dr. John M. Carnochan, the distinguished surgeon, reached Fisk's bedside some seven or eight hours after the shooting He did not think, when he saw Mr. Fisk, that he exhibited the symptoms of shock; he had reacted; he thought the giving of two and a half grains of morphia-thirty drops-hypodermically was a most dangerous way of using opium; it was, he believed, at least the cause of his premature death, that is, that it hastened his death. He thought Fisk could not intelligently have macè his will, if he was laboring under shock. He related cases, that he had known, of penetration of the bowels which had not proved fatal. On cross exam ination, Dr. Carnochan said that he found Fisk, when he reached him, in an unnaturally somnolent condition; the wound did not kill him, the morphia did: there was a possibility that the wound had something to do with it, but he had none of the usual symptoms immediately following injury from a gunshot wound; there was nothing to indicate that he was suffering in any manner from the wound; it was a very dangerous wound, but not necessarily a fatal one. Q. You would expect him to ge vell? A. Of course I would.
Dr. Gurdon Buck testified that the wound was alone sufficient to account for death, and that the use of opium he egarded as a proper treatment; but some of the symptoms agreed with those of opium poisoning.
Dr. A. B. Crosby testified that he would consider such a wound fatal.
Dr. Thompson, professor at the university, explained that death from shock arose from enfeeblement of the heart, while death from narcotism arose from coma or from the head. Probing, in abdomal wounds, while the shock lasted, he thought should rarely be resorted to. Chloroform
was contra-indicated by sheck. It should not be used while shock lasted. He thought he had seen death result from the administering of twenty drops of chloroform. He described at length the symptoms of opium poisoning, which ends in coma, and declared that, in death by shock, though ther ing was utterly inconsistent with shock. Deep breathing was the clear mark of recovery from shock. He declared that the symptoms described indicated that Mr. Fisk had recovered from shock. He thought the length of time exclud ed entirely the idea of death from peritontis, and the only conclusion was that he died from an overdose of morphia.
Dr. Macready was examined as an expert on the effect of the wound, and the effect of the morphia administered. He was inclined to think, from their describing the doses by drops, that one half mcre had been given than was supposed, as ten drops would be fifteen minims. The administering of morphia hypodermically nearly doubled its power. He was strongly of opinion, from the description of the case, that Fisk did not die from shock or peritonitis. There was not enough peritonitis to produce death, and the development of the symptoms were not those of shock. The symptoms were those of inflammation of the brain or uremic or narcotic
poisoning. There being no disease of the brain or kidneys, he ascribed the death to an excess of narcotics.
Dr. Marsh, deputy coroner, testified that he made the post mortem examination. In his opinion the death of Fisk was due to shock and peritonitis. But the latter was not sufficient of itself to have caused death. As to narcotism, he did not make any examination. Subcutaneously administered, one twenty-third part of a grain of morphia had been fatal Taken in the stomach, two grains had been fatal. fs to wounds in the abdomen, in the Crimean war ten per cent of
those wounded had recovered; in the recent rebellion war, twenty-five per cent had recovered.
Judge Davis, in submitting the case to the jury, made an elaborate and excellent charge. He solemnly warned them against allowing themselves to be influenced by any feelings of prejudice either for or against the prisoner. They must be wholly governed by the evidence before them. In reference to that branch of the defence here under consideration, properly was very clear and explicit. "If morphine, improperly administered, either as to the manner or as to the
quantity, caused the death of James Fisk, Jr., on the 7th of January, 1872, not as an accelerating cause, but an independent cause, being in itself the sole agent producing death a that time, then the prisoner is not chargeable with the death, because another and an independent agent produced that result, in which his act-the wound he caused-did not occur. I charge you, as the law on this subject, that if yo he sole cause of death, and at the same time that the prisner intended to kill, that he fired the fatal shot with intent o kill, and inflicted a wound with that deaign, then it is your
duty to convict him of an attempt to commit murder in the irst degree." In view of this charge, and the medicai evi ence, it would seem as if the jury had reason for giving the verdict they did, independent of the other points of the defence, which were well sustained.

## THE GOVERNMENT BOLLER TESTS.

We have already announced the appropriation by the Government of $\$ 100,000$ to be expended in an extensive and exhaustive series of boiler trials at Sandy Hook and at Pitts. burgh. Although it was intended to conduct these tests dur ing the past months of September and October, it has been found that the extent of the necessary preparation has caused an unavoidable delay, existing up to the present time Now, however, it seems that the experiments will be begun at once, and some 20 workmen are engaged at Sandy Hook setting up the ten boilers to be employed. The latter are of the best material and construction, and will be placed in the position in which they are usually located upon steamers. The bomb proof shelter is to be built at a distance of 360 feet from the boilers. Suitable pyrometers, thermometers, and other necessary instruments will be supplied, and self. egulating gages are to be buried in the earth near the boilers.
The Government Commission consists of the following gentlemen: Supervising Inspector Addison Low and C. W Copeland, of New York, J. H. Robinson, of Boston, Super vising Inspector John Menshaw, of Baltimore, J. V. Holmes, of Ohio, Benjamin Crawford and Supervising Inspector John S. Devinney, of Pittsburgh. The experiments will be mainIy to determine the truth or fallacy of the various theories as to the causes and conditions of boiler explosions, which theories are briefly
First: Explosions caused by the gradual increase of steam ressure.
Second:
Second: Those caused by low water and overheating of the plates of the boiler.
Third: Those caused by deposit of sediment, or incrusta Fourth : Those caused by the generation of explosive gases within the boiler.
Fifth: Those caused by electrical action.
Sixth: Those caused by the percussive action of the water case of rupture of boiler in the steam chamber-Clark \& Colburn theory
Scventh: Those caused by the water being deprived of its
Eighth : Those caused by the spheroidal condition of the
Ninth Those caused by the repulsion of the water from he fire surface or plates.
The Sandy Hook trials will extend ever several days, and the results will be duly noted on these columns. The Pitts burgh tests will begin on November 12; and on their comple ion the Commission will return to Sandy Hook, with a view of experimenting upon various safety valves.

## SCIENTIFIC AND PRACTICAL INFORMATION.

spiritualism not patentable.
Spiritualism fails to meet with official recognition in the Patent Office of the United States. "Psychic stand" was the name of the device on which a Massachusetts inventor wanted a patent, because, as he stated, it would spell out words and sentences known as spiritual communications "through an alphabet not only invisible to the operator, but the very location of which he cannot know." "Moreover, he added, "the mode of its operation precludes all possibil ity of trick or imposture." The obdurate examiner, how ever, not only refused to perceive the peculiar merits of this useful invention, but gave, as an opinion, that spiritual manfestations are "largely mixed with ignorance, deception, nd fraud." The Office, it is stated, offered to issue letters pat ont on the contrivance as a game table, thereby adding insult o injury on the exasperated inventor, who, shaking the dust of the capital from his feet, departed in a state of indigna tion bordering on absolute ferocity. The alleged offer of the Patent Office to issue the patent for a game table seems to us quite improbable.
that easterly current.
An attempt was recently made at San Francisco to find the easterly current, and by its aid to reaci New York by bal loon in a few hours' time. The machine took a fine start, having on board three passengers, who, instead of finding the breeze they wanted, struck a westerly current and came down in the Pacific ocean, happily near the shore. The baloonists were received by boats and had a narrow escape.
Donaldson made another ascension a few days ago from Newark, N. J. He found the easteriy current, which took him over the cities of New York and Brooklyn, landing him near Roslyn, L. I. In attempting to reach the earth, the car was swept violently against a stone wall, and the aeronaut was considerably bruised.
petroleum in burmah.
According to the report of Captain Storer, agent for the British Government, there are at present about 150 wells worked at Yegnangyoung, which yield 62,500 barrels of oil a year. At Pagan there are about 50 wells. The oil from these wells is obtained in a more liquid state, and more resembles naphtha. It is of a brackish nature, and is better suited for lighting purposes than the Yegnangyoung oil.
Tre back page of the special edition of this paper, to be published about November 15, has been all taken by advertisers; a few more advertisements will be received for the inside pages and Business and Personal column. For terms, ee inside. Order immediately.

## AMERICAN LIGHTHOUSES.

Last year the Lighthouse Board of the United States had under charge 179 s $3 a$ and lake coast lights, 394 river and har bor lights. 22 lightships, and 33 fog signals operated by steam or hot air engines, besides large numbers of unlighted beacons and buoys. Naturally the great diversity of the necessitat-d the di vision of the work of superintendence into thirteen districts, each with its own engineer, have own engineer, have led to considerable variety of design and we illustrate herewith two of the lightrouses lately erected by the Board, the first engraving showing the Race Rock ligtthouse, and the stcond engrav ing that at Tbimble ing that at Shoal, at
Roads, Va.
Roads, Va.
The Race Rock lighthowse, at the eastern entrance to Long Island Sound, is one belonging to the third district, of which Colonel I. C. Woodruff is engineer. The general derign of the structure is sbown by the engraving, and we need merely add here that the foundation consists of about ten thousand tuns of riprap stones, weigh ing from three to five tuns each. The
condtitions under which the American lighthouses have to be erected, and the fact that the great extent of coast ha


LIGHTHOUSE AT RACE ROCK-EASTERN ENTRANCE TO LONG ISLAND SOUND
portion. Whenever one of these dorsal or ventral organs is uncovered, its moist and brilliant surface darkens in color, and slow icregular movements, due to the contraction of tne striated muscular bunches which are inserted in the lower face, supervene. Sections of the different grgans show that they are lenticular in form, about one third as thick as broad, and are contained in a deep adipose envelope. The latter is entirely formed of very large cellules, containing numerous fatty glo bules, as in the adi pose tiesues of insects; and it has very many healthy vessels rest of its structure restaf en The tissue propor (se mi-transparent and
damp, forming the central portion) is the most volumi nous. It is composed of cellules which do not differ sensibly from those which constitute the lumi nous organs of the lampyrce. These cel lules are closely con tiguous to each oth er;and between their adjacent faces, are found only wind pipes and nerve tubes, with the ex ception of which the mass of the tissue thus constituted may be subdivided into lobes and lobules.
Brown and Linnæus have already pointed out that the luminous production of the pyrcphorus is governed by its will The light appears
foundation was completed in November, $1 \dot{3} 71$. The Thimble Shoal lighthouse is in the fifth district, of which the engineer is Major Peter C: Hains. This light has been erected to tass 1e: of the Willoughby Spit light ship, and it is situated on the shoalest point at the entrance to Hampton Roads. A start was made with this lighthouse in May. 1872, and on the 10th of June of that year the platform, which the screwing of the piles into the shoal was carried on, was completed. The shoal proved to be very hard consisting of fine compact sand, but by the 1st of August 1872, the last pile was planted. Th libht is of the fourth
order, and the gential derign of the structure is very neat.

We may add, says Engiueering, to which jo:rnal we are indebted for the illustrations that the Hustrans, that the cbairman of the En gineering Comitte Lighthouse Board is G+neral Barnard, and the engineer secreta ry, Major George H. Elliot.

## The Cocuyo.

M cocuyo. manos has recontly succerded afier siderable trouble transporting from Cuba to France some fifteen hundred liv ing cocuyos. These insects he has submitted to the French Academy of Sciences, for dissection and general examination general examination

The cocuyo appears in Cuba generally toward the end of
April, after the first rains, and abounds in wooded places and cane ficlds. It emerges at twilight, but its nocturnal promenade jasts barely over two or three hours. In hollows of trees, under masses of shrubs, among the young portions of cane plantations, it finds favorite places of concealment, freding upon tender leaves, the soft substances found in old trunks of trees, and analogous materials. It appears that dampness is a condition essential to the insect's existence. At about the end of July, the cocuyo disappears; but insects may be kept imprisoned in baskets or cages, if carefully guaded and nourished, until September or October. The cocuyo should not be confounded with the aquacero, $a$


LIGHTHOUSE AT THE THIMBLE SHOAL, HAMPTON ROADS, VA.
first at the center of the organ and then extends oper it number are confined together. The claws form its offensive firsl arm, with which it of ten penetrates the neck of its adversarv so completely as to separate the thorax from the body. It frequently loses its weapons by the operation, M. de'Dos Her manos mentions instances where the insect has nevertheles continued to exist for some months afterward. The mutila tion of the members doubtless hastens death, the approach of which can be foretold by the darkening of the eyes which. when the cucayo is in a state of health, are of a yellowish rface, becoming more brilli area enlarges. It is well known that, during repose and
outside of all nervous influence, the electrogeneous apparaoutside of all nervous influence, the electrogeneous appara-
tus of fishes passes to a state of electric tension more and tus of fishes passes to a state of electric tension more and
more pronounced, from which the fishes free themselves sudmore pronounced, from which the fishes free themselves sud-
denly when they so desire or when under the experimental influence of such and such physico chemical action. Now in the present case, consider the investigators, the probabilities are that the phospho rescent tissue produ ces little by little a sub stance which accumu lates slowly in the pro ducing cells themselves independently of all nervous influence,by operations of the same order asthose of various secretions, and that the only act by which the discharge takes place is voluntary. The prin ciple which renders lusainous during several minutes the sub stance of broken cel lules acts like noctilu cine, a nitrous coagu lable phosphorescent principle obtained by Phipson from the luminous mucus of cer tain scolopendræ, fish es, etc. It is a natural principle of little sta bility, of which the chemical and mole cular segregations take place as scon as it becomes free, and which manifests itself by a production of light lone, without heat nd in a manner simi lar to that caused by
hite. MM. Robin and Laboulbène have taken up these interesting insects as subjects of investigation, an'd we find their report in full in a recent issue of Les Mondes. Several cacuyos have been diss.cted, and it is stated that, independently of the two pbosphorescent organs (which are very ap parent in the form of oval shaped dusky yellow colored spots, situated one on each side of the dorsal face, behind the corselet), there exists a third, different from the others. The latter appears to be a large plate, of a yellowish white tinge, placed on the ventral face of the body, between the thorax and abd,smen. The insect exposes and render it lu m'nous at will, especially when the elytræ and wings are $m$ nous at will, especially when the elytræ and wings ar he accidental decomposition putrid or ar to that caused by of tissue, mucus, sugars, etc. The abundance of urates in the substance of the cel ules where the disengagement of light takes place, it is be lieved, indicates that uric acid is one of the crystalizable components resulting from the photogenic decomposition of the above mentioned coagulable substance, since it is gradually eliminated, like the crystaline principles of similar dis assimilations.

In St. Andrew's church, Dublin, an excessive reverbera tion of sound has been checked by stretching wires across the building.

A NEW IMPROVEMENT IN GAS MANUFACTURE. $\mid$ hydrocarbon vapors which otherwise would be lost; third $\mid$ er holes in their upper surfaces, communicating with other There are few subjects of public importance which are and last, naphtha gas, or any of the petroleum products, apertures which, when several tiles are laid side by side, jnst at present engaging a greater share of the attention of which may be made of almost any richness that it is possi- form two longitudinal passages through them. Thus arscientific men than the economical production of illuminating $\mid$ ble to burn, is led into this mixture, insufficient proportion $\mid$ ranged, three retorts are placed in each bench, in the usual gas. The English technical journals-owing in no small mea- to produce the requisite degree of illuminating power. In manner, and, when in use, are filled with anthracite coal. sure to the recent coal famine, coupled with the knowledge of other words, coal gives coke for fuel to run the works, and Once in a day, the coal is raked back, and about a bushel of $^{\text {and }}$ the fact that, of the hundred millions of tuns yearly drawn common gas; hydrogen takes up the carbon vapors, and anthracite is thrown in; and once in each week the retort from the mines of the kingdom, fourteen per cent of the aggregate amount is used for lighting purposes, and hence rendered unavailable for industrial or domestic employment-have, of late, been filled with references to the manufacture of gas from petroleum products, resinous subistances, and from coal by improved and less expensive systems.
In our own columns we have already presented our views, as well as those of many valued correspondents, regarding the advantages to be derived from the generai adoption, in this country, of processes for the atilization of other materials than coal for the purpose noted. Sev eral valuzble systems have been patented; and notably some for the use of petroleum and other hydrocarbon oils are in actual employment Of the relative merits of empliferen in which they are held by those using them, it is not our intention here to speak. Suffice it that, considering any or all in comparison with the employment of coal solely, the question of cost of transportation of the latter forms an important ar gument in their favor; and hence, so far as we can learn, gas companies and engi neers generally manifest no lack of wil lingness to entertain or experiment upon suggestions or inventions having for thei first object the reduction of this very ma

Fig. 1.
 are refilled.
From an ordinary cylindrical boiler, steam is led to a superheater, and thence to the vertical pipe, marked $A$ in our large engraving (Fig. 4). Following its courss for the retort on the right, the steam escapes from tube, A , into two pipes which lead to the dryers, the ends of which are represented at B. Near the junction of the pipes with tube, A, are placed suitable valves to regulate the supply. The dryers, B, are made double; that is, the steam enters an inside metal tube, by which it is corried back five feet into the bench, and then passes to and through an inclosing metal tube, back to its staring point. This is intended to prevent any wet steam from reaching the clay su perheaters or retorts in the bench; and finally, the stcam passes out by two upwardly leading pipes, which terminate each just above a retort, at C. At the latter point, each pipe connects with a short tube which joins it with clay superheaters placed just above the retorts, so that the steam, enter ing at C , travels to the rear of the euper heater, which is five feet in length, and then returns, highly heated, in an orening par allel to the front, making its exit by the tubes, D . In the latter it is conducted down under the lower portion of the retort into the longitudinal passages formed through the tiles. Hence, it escapes up through the perforations and through the incandescent
terial item of expenditure.

As an instance in proof of this latter assertion, the Citi zens' Gas Light Company, of Brooklyn, N. Y., have recently Fig. 2.

adds heat to the flame, thus creating more perfect combus
-
ion and naphtha increases the lighting power to any de tion; and naphtha increases the lighting power to any desired standard.
Using coal alone, we are told that 9,026 feet of gas per tun was about the yield with the full complement of benches Now, 13,000 feet of coal gas and hydrogen mixed is produced, or an average of about 6 feet per pound of coal, which may be increased by increasing the hydrogen.
As the hydrogen and naphtha processes are quite distinct, we shall refer to each in detail, separately. In our large engraving (Fig. 4) the artist has shown the exterior of the hydrogen bench, and in the smaller engraving (Fig. 2) is represented one of the retorts here used. The latter, though of the general shape and of the same material as the ordinary gas clay retort, differs from it in that it has a diaphragmex tending horizontally across the center, forming a double rotort, and is, besides, covered at the bottom with tiles, one
of which is represented separately. The diaphragm is perintroduced, in their works, apparatus for the manufacture
of hydrogen, by the decomposition of steam under the Gwynne-Harris or American hydrocarbon process, and ulso for the preparation of naphtha gas, both of which products of which products are mingled with that obtained in the ordinary way from coal. As a result, we are tcld that, as against 28 benches or 140 retorta in use in October, 1872, at present but 14 benches are em. ployed, two of ployed, two ot which generate hydrogen, $t$ wo naphtha gas, and the rest coal gas, supplying the full amount required, and yet working only from 14 to 15 hours per day. The process, brief ly stated, is three. fold: first, coal which produces the ordinary quan tity of gas, but of inferior quality, is carbonized in se parate retorts; se cond, hydrogen, generated in the manner about to be described, is mingled will the mingled with the coal gas, giving it high incandes-
cent power, and, cent power, and,
besides, taking $u j$


DMPROVEMENT IN GAS MAYUFACTURE.-THE HYDROGEN RETORTS
coal, and is decomposed, forming hydrogen and carbonic ox ide gas.
The gas thus gencrated by this American process passes into the hydraulic main, and thence is conducted to mingle

Fig. 3.

with the gas generated by the bituminous coal retorts. The product of the two hydrogen benches is in the nfighborhood of 100,000 feet per day, and its extimated cost is, at outside figures, 30 cents per 1.000 feet. The naphtha em. ployed is deposited in a suitable reser voir at some dis tance from the works, whence it pumped as desired intoa tank, marked A in Fig. .. This receptacle reccives its supply in order $t)$ deliver it hy the pipes, $B$, into the two huge cylindr: oul stills. Witlin the latter is a worm pipe which is filled with steam frem the boiler by the pipes, C. By means of a fan blower in the engine room, a current of air is driven into the stills by the pipes, D, which mingles with the rapor of the naphtha given off through its heat ing by the interio steam coil. The gas then rasses from the stills by tubes, $E$, into the works, whereiten ters peculiarly ar ranged retorts, one of which is shown in Fig. 3. It will be noticed that the vapor is conducted
to the back of the receptacle by a pipe, whence it escapes. After heating, the gas is conducted to a condenser, where it passes through a series of pipes surrounded by cold water, and fron which it is drawn by an exhauster and carried to the station meter, whence it goes to the main to mix with the coal and hydrogen gases. About 300 feet of gas per minute are thus made, a gallon of naphtha giving some feet. This is of a uniform quality of 22 candle power
The mixture of the three gases, as supplied to consumers, averages about 18 candles; and by carefully observing proper proportions in combining them, we learn that a very fine silver white light is obtained
The process is unquestionably one of considerable economy to the gas company, as is evident from the large saving in the number of handsemployed, due to the decreased number of benches used. Moreover, the raw material for the hydrowen, or anthracite gas, costs almost nothing, and a por tion of the anthracite coal used is available for re-employ. ment as fuel under the steam boiler. Naphtha is not costly; no cannel coal is required, and the gas coal, as we have already observed, is of the type only serviceable in its pro duction of the usual quantity of inferior gas. The mainobject of the bituminous coal benches, where hydrogen and naphtha are used, is to make coke for fuel to run the works.

## dutregpoutemte.

The Perpetaal Motion Seeker.
To the Editor of the Scientific American:
Pernaps no enthusiasts are more contemptuously regarded by society in general than those who waste their energies in searching for a perpetual motion. Even persons who have little or no knowledge of the principles of mechanics never fail, upon a mere mention of the subject, to testify unmeasured disapprobation of the fruitless scheme, and, as a term of reproach to any whose visions appear to be Utopian, speak of their efforts as "savoring too much of perpetual motion." of their efforts as "savoring too much of perpetual motion."
Orthodoxy regards the viotim of this hallucination as an Orthodoxy regards the viotim of this hallucination as an
object of horror, his pursuit showing that he believes he can create; men of science avoid him altogether, or, at best, regret the ignorance that prevents him from appreciating the fact that motion is an equivalent term for expenditure; and the whole world expands into a broad smile when the victim of this very prevalent mental disorder reveals the weakness that possesses him. It is lamentable and extraordinary that at this day, when no end of opportunity is afforded to even the poorest person to thoroughly educate himself in all branches of knowledge, no less than one hundred thousand individuals in the United States alone are wasting time and substance in this seductive and barren pursuit. So infatuated do they become by long application that defeat but stim. ulates desire, until, disappointed, impoverished, disheartened and despised, the poor victim often seeks the suicide's grave. An opportunity was afforded me some months since to interview a veritable perpetual motionist, who was said to have expended fourteen thousand dollars in constructing models, and who now believel himself upon the verge of
reaping the reward of his exertions. A ride upon a street railway car to the end of the route, and a walk across open lots brought us to his cottage, whither he had retired from the crowded city, as he explained, that he "might uninterruptedly pursue his invention to a successful conclusion." We were permitted to enter the workroom containing his last model. It consisted of the usual combination of gear wheels, balance weights, springs and compensating levers; it was of very large dimensions, and so elegantly made that we at once recognized him as a superior mechanic. He experienced much satisfaction in explaining the principle of
its operation; he talked learnedly of " the surplus power retained by relative levers of unequal fulcrum ;" he was querulous on the subject of a criticism which his views had evoked from some previous visitor; he spoke feelingly of the " untimely death of Thomas Babbage, who was called away on the very eve of completing his calculating machine, thereby giving a victory to those who doubted his ability to accomplish the object of his ambition"; and he expressed a hope that he himself might live to rebuke a cold world, by giving it what it scorned to believe possible, a powerful selfmotor. His wife. a pale anxious woman, had left the sewing machine at which she had been at work (and which was doubtless the chief support of the family) and, accompanied by her little son, listened to the conversation. Our failure to acquiesce in her busband's views gave her a moment's apparent concern; but the cloud passed quickly from her mind, and she manifested the touching confidence of a woman's loving nature. George Howard is dead. His woman's loving nature. George Howard is dead. His
model was purchased by a speculator who is now applying a model was purchased by a speculator who is now applying a
secret actuating attachment, prepa-atory to exhibiting it, in our large cities during the coming winter, as a real perpetual motion.

Forfex.

## The Lamp and the spectroseope

To the Editor of the Scientific American:
For the benefit of those who have met with difficulties in examining a spectrum, ciused by extraneous light emitted by the Bunsen flame used to render the substance under examination incandescent (especially when the flame is colored by the salts of strontia, lithia, etc.), and also the light emitted by the flame used for illuminating the scale, permit me to describe a simple piece of apparatus which very effectua ly shuts off the extraneous light.
While recently engaged in examining the spectra of the al kalies and alkaline earths, I was exceedingly annoyed by dificulties from the above named sources; and I cut a circular piece of cardboard about nine inches in diameter, with a
the collimator tube, carrying the slit and the prism of comparison. This entirely conceals the light of the Bunsen flame. If you cut a second piece, of a similar size and shape, and slip this on the eye piece of the telescope, or on the tube carrying the scale, by inclining it at a proper angle (which may readily be determined by the experimenter) a point will be reached which shades the eye from the second light. One of the chief merits of the plan is that, instead of keeping one eye shut, as was formerly the case, both eyes can be open, thereby not tiring the disengaged eye.
By employing this device the faint lines in the spectrum, as, for instance, the faint yellow line of lithia, are more distinctly shown than by any other means. C. A. Davis.

Philadelphia, Pa.

## Elliptic Pulleys. Scientific American

Elliptic pulleys, such as here shown and now used at this place for driving automatic machines requiring a differential movement, are found efficient substitutes for elliptic gearing; and where applicable, they will be found preferable for obvious reasons. The diameter of the upper pulley should be a mean between the transverse and conjugate diameters of the elliptic pulley. The distance between centers of shafts, as now used, is about twenty times the difference between the transverse and conjugate diameters of the elliptic pulley. Ordinary leather belts are used.
New Britain, Conn.
F. H. R.

## Simple Experiments for Young Chemists.

1. An easy way to prepare an invisible gas, that will burn with an intense heat, is to put some nails or strips of sheet zinc in an old bottle with a good, tight cork. The cork has a hole bored in it, and a clay pipe stem, or better, a piece of glass tubing with a fine opening at one end, is fitted into the cork. The zinc is covered with water and a little sulphuric or other acid added. The effervescence is violent; and if the cork is put in, the gas will escape through the tube. After waiting several minutes, wrap the bottle in a cloth and apply a match to the end of the tube, when the gas will take fire and burn with a colorless flame. If any airstill remains in the bottle, an explosion will take place. Hold a cold white saucer in the flame, and it will soon be moistened but not blackened. This gas is called hydrogen, because, when it burns, it forms water.
2. To imitate the delightful odor of rotten eggs, it is only necessary to place some pieces of the sulphuret of iron in an old bottle and pour on water and oil of vitriol. The sulphu. ret of iron is made when iron filings and sulphur are heated together. If the bottle in which this vilely smelling gas is prepared has fitted to it a tight cork and a glass tube bent so as to conduct the gas under the water in a second bottle, much of it will be dissolved and can be bottled up and preserved for several days. This gas is called sulphydric acid, and must always be prepared out of doors.
3. To produce light, flaky clouds in a clear liquid, dissolve a piece of alum in water and to the clear solution add ammo nia (spirits hartshorn) and stir or shake it. The clouds will be colorless and almost invisible. To another solution of alum, add just enough carmine or indigo to color it distinctly, then pour in some ammonia. The clouds will now be red, or blue, and as they gradually sink to the bottom will leave the solution colorless. This illustrates the method of preparing what are known as "lakes." The clouds thus formed are the hydrated oxide of alumina.
4. To convert a colorless liquid to an orange red, dissolve some tartar emetic in water and drop in some of the solutio of the vilely smelling sulphydricacid. (See No. 2.) Nextput
some tartar emetic into a bottle with zinc and sulphuric acid as described above (No. 1) for making hydrogen. After waiting long enough for all the air to be expelled, ignite the gas and place a cold saucer in the flame, when it will be
blackened; and the spot thus formed, which is metallic antimony, will not dissolve in a solution of bleaching powder.
5. Analogeus experiments could be performed with acid solutions of arsenic, but, owing to its poisonous nature, we would advise our young friends to avoid its use. The sul phydric acid would form a yellow precipitate instead of a red one, and the black stain on the saucer would be readily dissolved by chloride of lime, or bleaching powder.
6. To produce a strong smell by mixing two dry powders, each without smell, take pulverized sal ammoniac and stir in a little dry whitewash lime. A pungent ammoniacal odor is evolved.
7. In one tumbler or wine glass of water, place a single drop of oil of vitriol, in a second place some carbonate of ammonia, in a third some hydro-fluo-silicic acid and alcohol, hese glasses some barium chloride. In three of the these glasses some barium chloride. In three of them a
white precipitate is formed, in the fourth a yellow one. Dip a clean platinum wire in the barium chloride; then hold it in a colorless gas or alcohol flame, and a green color is produced. The green fires in theaters are made with this substance.
8. To convert a fair complexion into one of African hue, persuade some fair lady to improve her complexion with bismuth pearl powder (many do it voluntarily); then let her enjoy the perfume of the sulphydric acid, and she will gradu an acid solution is noticed by dissolving subnitrate of bismuth n muriatic acid, and then pouring it into a glass of water when it gives the latter the appearance of milk.
9. To prepare a gas heavier than air, place some pieces of
chalk or marble in a deep jar, or in a bottle like that used for hydrogen, and pour some muriatic acid on them. Effervescence takes place, and a taper lowered into the jar is excolloished; or if the gas, which is called carbonic acid, be collected in another vessel, it may be poured from one vesse to another like water. The substance formed when marble is dissolved in muriatic acid is called calcium chloride, and may be used for some interesting experiments: Fill three glasses with water, and to the first add a little sulphuric acid, to the second some carbonate of ammonia, to the third some oxalic acid and ammonia. On pouring the solution of calcium chloride into these glasses it will in every case form, unless too dilute, a milky liquid.
10. To produce an intensely blue liquid, make a solution of blue vitriol, so dilute as to have but a faint color, then add ammonia, and it becomes intensely blue. To another portion add yellow prussiate of potash and it turns a reddish brown. 11. To make blue glass, bend a piece of platinum wire to a hook at the end and heat red, then touch it on a bit of borax and heat until the latter melts to a little bead. Now dip it into some nitrate of cobalt and heat, when a fine blue glass bead will be formed.
11. To form a yellow precipitate, in a yellow solution, take a weak solution of bichromate of potassium and add sugar of lead; the effect is very pretty.
12. To produce a beautiful purple, take a dilute solution of chloride of gold and add a little chloride of tin; the color formed is known as purple of Cassius.
13. To pour red, blue, and black ink from one bottle, fill three glasses with water, and into one put a little sulphocyanide of potassium, in another some yellow prussiate of potash, in a third a solution of gallic acid, or nut galls. Dis solve a small nail in muriatic acid and dilute the solution On putting a drop of this chloride of iron into each of the glasses, the three colors will be produced.
14. Yellow and white can be formed similarly by pouring acetate of lead into glasses containing bichromate of potash and sulphuric or hydrochloric acid, respectively. The white chloride of lead dissolves in boiling water and crystalizes on cooling. Sulphydric acid blackens lead.
15. Red, yellow and black are produced as follows: put ome potassium iodide in one glass, bichromate of potash in a econd, and sulphydric acid in a third. Pour corrosive subli fate slowly into each, and the three colors will appear Into a clean glass put a little corrosive sublimate and açd potassium iodide, carefully; the color becomes intensely red but on adding more it disappears entirely, and can be restored by the addition of more of the sublimate.
16. One other way to make a milk-like liquid is to pour phosphate of soda into a solution of magnesium sulphate.
17. When a piece of silver is dissolved in nitric acid and ome muriatic acid added, all the silver is precipitated, and the precipitate may be dissolved in ammonia, or a piece of zinc may be placed in it and acidified, when the silver will all be restored to the metallic state as a fine black powder.
We hope the above experiments will prove an amusement for many of our young readers; and when they become experts in exhibiting these "tricks of magic," as we might have called them, they will have alsc gained some knowl edge of the methods employed by analytical chemists in test ng for the common metals. Even practical men, who need ometimes to handle chemicals, will find that the above are reliable tests.

Another Trial of the Gatling Gun-one Hundred Thousand Rounds Fired.
The Navy Department, in order to determine the quality of the solid head metallic cartridges made by the United States Cartridge Company, Lowell, Mass., and to test the working powers and durability of the Gatling gun of $\frac{50}{100}$ inch caliber, ordered that one hundred thousand cartridges of $\frac{50}{100}$ caliber (containing United States service charge) be fired in the gun at Fort Madison, near Annapolis, Md. The rials commenced on October 23, and lasted parts of two days. On the first day (the 23d) over 30,000 rounds were fired ; and on the 24 th, 64,000 cartridges were fired, without stopping to clean the barrels; and after this unprecedented test, the gun (without the barrels being cleaned) was fired for accuracy at a target $12 \times 12$ feet, placed 300 yards from the gun; and out of 30 shots fired, 29 of the ba ls hit the central part of the target, striking point on and giving good penetration. If may be safely said that this number of discharges was never before made from any arm in the world.
Singular as it may appear, the fouling of the barrels did ot increase after 4,000 or 5,000 rounds had been fired. The trials were made under the supervision of Lieutenant Com mander J. D. Marvin, United States Navy, commandant of Fort Madison. Many distinguished navy and army olficers were present at the trials. During a part of the trials, the gun was fired at the rate of over 400 shots, per minute. A drum which supplied the cartridges to the gun, and which 50 to 55 seconds
Of the cartridges used, none of the heads burst, none of he shells failed to extract, and there was only one missfire in about five thousand cartridges discharged. The cartridges are headed by a new process, which prevents injury to the fiber of the metal from compression.

AT THE recent meeting of the British Association, one: of the ruled speculum plates of Professor Rutherford, of this city, 2,300 lines to the inch, was exhibited by Mr.. Norman Lockyer, who stated that in the spectroscope it gave the ame amount of dispersion as a train of twenty or thirty glass prisms. Byits aid, movements of the sun's atm

## AMERICAN ACADEMY OF SCIENCES

This select body met at Columbia College, New York city on October 28, when Professor Joseph Henry read an interesting paper upon sound, with especial reference to its employment for

## FOG signals

The principal part of the paper related to abnormal phenomena of sound, of which a number of instances were given. In many instances the sound from a fog signal is heard at a great dis'ance, while it is inaudible at a much smaller distance. This was attiibuted to the effect of the wind on the sound. As a general rule the sound is heard at a less distance in opp sition to the wind, but in one case the souvd is always heard at a distance of nine miles against the wind during a northeast snow storm. This anomalous case is accounted for by an upper stratum of wind in an opposite direction to the one at the surface. Another principle which is applicable to the explanation of several of the abnormal phenomena of sound is that it diverges much more rapidly than light, so that a beam of sound produced by a powerful instrument swells out into a cone of sound, and it is on this account that reflectors have not been found to be of much use in enforcing the sound of fog signals.
Our sea coast is the largest in the world, extending over more than 10,000 miles, and a considerable portion of this distance is beset with dense fogs. On the northwestern portion of the Atlantic coast, whenever the wind blows from a southerly direction, it wafts the warm, moist air from over the Gulf Stream to the cold current coming from the arctic region, and passing along our coast between the Gulf Stream and the land; and thus, in the intermingling of the warm and cold air,the vapor of the former is condensed into fog. On the western coast, when the wind blows directly from the Pacific across the colder current from the north. a fog is similarly produced. Fog signals, therefore, are almost as important as lighthouses. Accordingly the I ighthouse Board has devoted much attention to this subject; and however our lights may compare with those of other nations, our fog signals are superior to any elsewhere adopted. They consist principally of three instruments, all founded on the principle of resounding cavities, in which the air itself is the sounding body as well as the conductor of sound. The instruments are: (1). The fog trumpet, furnished with a reed and blown by air condensed by an Ericsson caloric engine. (2). The siren trumpet, blown by steam from a high pressure tubular boiler. (3). The ordinary locomotive whistle of large size, blown also by a high pressure engine. These instruments can be heard in perfectly still air at a distance of from fifteen to twenty-five miles.

ON THE CONSTITUTION OF THE SUN'S SURFACE—BY PROFESSOR C. A. YOUNG.
Professor Young, in a brief extemporaneous address, placed before the Acaderay his latest views on that subject. Every one is aware, he thought, of the fact that, in the present state of science, it is impossible to regard the sun as anything but a gaseous body : the law of density, it seemed to him, could not be reconciled with the solid constitution of that body; and it is difficult to see how it could be liquid, as the liquids of which we know it must be composed are largely metallic liquids. It is safe to say we know that it is mainly gaseous. Another thing might be said. The luminous surface from its appearance has something of the uature of cloud. We find rapid changes in the appearance and constitution of the surface. It is impossible to consider it anything but flocculi floating in gas. But when we come to examine the overlying chromosphere with the telescope, we find evidence of violent outbursts from beneath, of extreme intensity. At first sight, it was thought that it might be only an apparent motion, or the same kind of motion that we see when a flame jumps up from a coal fire, and simply is communicated among particles already in position. But that would not account for the disturbance of the spectrum lines. It is not uncommon to find displacements of the spectrum lines indicating motion (in a line that joins the mass with the observer) of one hundred, and sometimes two or three hundred, miles per second. There is every reason to suppose that these masses, which we see-masses thrown vertically from the sun, 一have really velocities of a corresponding magnitude. The question that pressed upon his mind ing magnitude. The question that pressed upon his mind
was to reconcile that with the cloudy character of the photowas to reconcile that with the cloudy character of the photo-
sphere. If anywhere, the explanation, he thought, was to be found in the condensation that goes on the photosphere. If the heat of sun is anything very great (it would melt about 40 feet of ice a minute over the whole surface), the amount that is turned from vapor into liquid, that is, the amount of condensation over the surface of the sun, is something very enormous. On the surface of the earth a shower that gives us two inches in an hour is sonething tremendous. The rain descends in buckets. But the rate is exceedingly small compared with the rate of condensation on the ingly small compar
surface of the sun.
Now these droplets so produced would at first descend in fillets, with an accelerated velocity, and therefore growing slenderer as they fall. But soon they would come down to a place where the atmosphere and gases are denser. The materials they would encounter in the̊ first 300 or 400 ,and still more in the first 3,000 or 4,000 , miles would become denser, and the motion would be retarded. They would thicken in it. Besides whatever weight of liquid drops down from the clouds in a minute, that amount of gas must travel upward in order to maintain an equilibrium. That would cause the currents passing upward to be extreme in their rapidity, and the retarding effect would be still greater. It is probable that a good deal of the descending liquid would be evapora-
ted at that point. But it seemed to him likely that the
fillets would thicken and begin to coalesce, in which case they would form sheets. In that case we might get a surface something like a sheet, of water at Niagara The mass of the whole sheet would be vertical, and desc snd until a portion of the sun would be reached where the rapidity of the evaporation would equal the rapidity of the descent. Then it would be something like a series of descending ponds without any bottom to them. If their velocity were retarded entirely, their whole weight would be supported by the underlying atmosphere. The pressure would be something enormous. The gases would be forced up through them, the whole being in the condition of a liquid breaking up, the gas probably taking portions of the liquid and throwing them up. This theory is compatible with that of the gaseous constitution of the sun. But we do not know what to do with the sun spots on this theory any better than on any other thenry. Possibly they may be partly solid matter, as has been asserted. In that case, you might get a mass floating on the top of a more liquid portion. One element which we are much at a loss about at present, is to determine what amount of the sun's mass is to be referred to condensation, and what to dissociation.
Among other papers presented and discussed was one upon

RECENT FISH COMMISSION EXPLORATIONS,
by Professor A. S. Packard Jr., in which some results of the late cruise of the United States Coast Survey steamer Bache, in the shape of rare marine animals, were described. Near Portsmouth the dredge brought up a sea cucumber, nolpodia borealis, new to the American coast, and tubes of a worm which occurs at the greatest depths off Norway The latter came from the coldest abyss found during the ex pedition. The same author also read a paper on the " spira cles of insects." in which the conclusion he has arrived at is that, no known hymenopterous larvæ-that is, the bees and wasps-have more than two pairs of spirac'es on the thorax. Certainly at least, on evolution principles, it is considered, we are perhaps warranted, from the indications in existing cater pillars, in concluding that the ancestral type of lepidopter us larvæ was provided with two pairs of thoracic spiracles. Professsor Hilgard, on the subject of

## measurement of volume,

said that the kilogramme which was originally determined to be the weight of a cubic decimeter ( 61.027 cubic inches) of water, was not an accurate standard, and that there was an uncertainty of $10 \%$ milligrammes in its theoretic value. It is proposed to use a cylinder having a hight of a quarter meter and a circumference of one meter. The weight of water displaced by it will be nearly 20 kilogrammes, which can be weighed to 10 milligrammes-equivalent to half a milligramme in a kilogramme or to a fraction of one two-millionth. The circumference is to be measured by developing it upon a railway and comparing with a meter. The two rails a a little further apart than half the length of the cylinder.
A communication was also received from Rear Admiral Sands, stating that the preparation of instruments, etc., for the observation of the approaching transit of Venus was in satisfactory progress, and that everything will be in readi ness at an early day.

## Cyrus. Wakefield.

Probably few men have ever contr:buted more largely to he material prosperity of those around them than Mr. Cyrus Wakefield, the annourcement of whose sudden death we notice in recent New England jourcals. As is well known he was an extensive dealer in rattan furniture, with head quarters in New York and Boston, and a large manufactory in Wakefield, Mass., a town named after him and to which he presented a fine public hall. He was preëminently a selfmade man, clear headed, active and tireless in business, and apparently capable of performing labors far in advance of the capabilities of ordinary individuals. Always charitable toward others, his relations with the large number of his employees was constantly friendly and cordiel, while, throughout his life, his efforts in the cause of education were un tiring. About two years ago he gave $\$ 100,000$ to Harvard College, to erect the building which now bears his name. He was also one of the projectors of the Boston Globe, and a large operator in real estate in the last mentioned city.
Mr. Wakefield was born in Roxbury, N. H., in 1811, and was consequently sixty-two years of age at the time of his of patents of no mean value in relation to his own business

## Inter-Planetary Communication

Mr. Charles Cros, in a communication to the French Acad emy of Sciences, thinks that the approaching transit of Venus will afford an excellent opportunity for establishing communication with the inhabitants of that planet-if any exist. He says: "It is possible that among the dwellers on the surface of Venus there may be some who are astrono mers, to whom it may occur that the passage of their world
across the sun's disk will attract our curiosity. Hence it is reasonable to suppose that these savants will perfect means to transmit signals to us precisely at the instant when they determine that multitudes of earthly telescopes are turned in their direction."
A writer in La Nature, commenting on this novelidea, sug gests that it would be better to reverse relative positions, and for Venus substitute Mars. That is to say, when to the Martial inhabitants our globe appears to be crossing the sun's face, we should do something to attract their notice. As Mars is an older planet than the earth, it is supposed that
ful Venus.
It would be more satisfying to the inq uisitive mind if $M$ Charles Cros or the correspondent of our contemporary would kindly ventilate their plans somewhat more in detail. We have heard somewhere of a scheme for signaling to the moon by means of long black platforms, arranged on wheels and placed on the extended snowfields of Siberia; and, if we remember rightly, it was proposed to roll these about to make the letters of the Morse telegraphic alphabet. How the assumed lunar inhabitants were to interpret the symbols was not explained. Somebody has also suggested huge mir ors arranged to send flashes of light to our satellite.
These ideas are all very nonsensical, but rather pale in ab surdity before that of M . Cros. The moon, to be sure, is only about 240,000 miles away, and our big telescopes carry us to within a bundred miles of its surface; if that million dollar instrument is ever made, probably we shall be able to see with reasonable distinctness whether clusters of habitations exist thereon. But Venus and Mars are renpectively thirty and forty-nine millions of miles distant from our planet, and it is only by careful observation that the movements of vast glaciers on Mars are estimated, or spaces near the poles, of forty thousand square miles extent, detected; and even the phenomena noted are merely supposed to be due to even the phenomena
the causes ascribed.

Engine Turning with the American Chuck,
Looking at the American chuck, we see that the three eeth are worked to and from the center by a spiral coil, and that, when in correct working order, these teeth are drawn in regularly by winding up the screw, so that at any one time they are all exactly the same distance from the center Now, by unwinding the screw, these teeth can be removed from the body of the chuck. I removed the teeth, aud, putting two of them back into their proper places, I gave the screw one or two complete turns round; then I replaced the third tooth, and the position of the teeth was as shown in Fig. 2. Fig. 1 being the usual position.


The wood is first turned on the true center (Fig. 1), each end being turned down so that the block assumes the form of a right cylinder. The chuck is now altered as shown, and the wood put in and made fast. It is evident that, when the lathe is put in motion, the wood will revolve on a néw center; and, by moving the wood round regularly in the chuck, a series of circles can be described as with the tric chuck.
In order to keep these circles at a regular distance from ach other, I filed a line, $a$, on the face of the chuck, and drew lines across the base of my wood, passing through the center, as shown in Fig. 3. Putcing each of these marksA, B, C, D, E, etc -in turn against the line, $a$, a regular distance was maintained; and by alternating the tooth which I took out, I was enabled to describe a variety of patterns.W. E. P. , in the English Mochanic.

## The Water Supply of Paris.

Two new artesian wells have been in course of construction for some years in Paris, one at the Butte-des-Cailles, the ther on the Place Hébert. The former has been sunk to depth of 1,725 feet, and it is expected that water will be obtained at 1,890 ; its cost will be about $\$ 125,000$. The other well, like that completed after so many years' labor at Passy, presents great difficulties; and although the work is pushed n with activity, the progress is not more than 16 feet per month; and it is believed that 18 months' time will be re quired to finish the work. The boring tools now in use are worked by means of a steam engine of 40 horse power; a oad of excavated soil takes from seven to eight hours to raise it to the surface. The object of this well is not so much the increase of the water supply of the city as the establishment of public baths and wash houses at a cheap rate, as the water, as it issues from the well, will be of about the temperature of $95^{\circ}$ Fah.

Professor Hitchcock, of Amherst College, recently exlored Miles' Cave, in Salisbury, Mass, with a guide. Hun dreds of feet below the surface their torches were suddenly extinguished, and as there was no means of relighting them they remained below for hours. The professor fainted on emerging.

At the late fair of the St. Louis Agricultural and Mechanical Association, there was a large display of flour samples. The flour was arranged in open barrels without brand or mark by which it could be identified as the product of any particular mill. Thus prepared, a committee, consisting of practical millers, subjected the samples to the severest tests, and made their award. The Anchor Mills, of St. Louis, re ceived the highest award.

Speaking of the scheme to warm the Erie canal, the Boson Post thinks the invention might be applied to agriculture. "There is no reason," it says, "why the farmers hould lose six months in the year just to whim the sea son." Why not go forther and melt the barriers to the open
polar sea?

## IMPROVED FROST LOG DOG.

The engraving shown herewith is a side view of Brown's frost dog, a new and useful device for holding frozen, knotty, or crooked logs while the same are being sawn. The object is to clutch the logg instantaneously and hold it firmly while sawing the first half, or until the $\log$ is cut through and through. It is the inveztion of a practical mechanic and sawyer, who, finding it impossible to hold frozen logs as firmly as desired, with any available means, went to work and, with his jack knife, whittled out the patterns for his device. It has now been in use in circular saw mills in nearly all sections of the country for over tbree years.
The apparatus is bolted down from three to six feet from the head end of the set beam, where the sawyer bas it under his immediate control, and the $\log$ is rolled on the set works in the ordi nary way and left or held in the position desired. By means of the handle, A, on the back side, the whole dog is drawn to ward the log until it comes to a bearing, working in long slides, B, bolted to the set beam. As the operator lets go this handle, it drops down, and is held firmly whereever left by the half circle gear, C. The bottom dog, $D$, is next drawn up by the handle, $E$, at the lift until it touches the $\log$ and is held up by the little crank, $F$, which works in a movable nut By pressing together, with the thumb and fore finger, the two catches, $G$, the other dog is instantly placed in position on the top of the log. These catches work in the notched slide, to which they are attached, and to which is secured another movable nut, so that it is impossible for the cog to slip up or down while the catches are in action. The sawyer now turns the top crank, H on the shaft of which there is a right and left hand thread; thus imbedding both dogs in the log and holding the same immovable until it is entirely sawn, leaving only a thin slab in the clutch of the dogs. If it be desirable to turn the log when partly sawn, the crank is simply revolved back a half turn, loosening both dogs; then the knee is thrown clear back in the slides by the handle at the back of it, letting the log have a bearing against the knze at the right, as it is turned over with the sawn side against :t. The op ration, as before described, is repeated, and the dogs will hold up the last board firm and solid. It is claimed that the deviceis so arranged that it is simply impossible to run the saw on the ends of the dogs, as the latter are always half an inch inside and clear of the blade.
It is stated that the apparatus can be readily attached by the sawyer to any set works in the country having a beam run lengthwise, and it is now in use in at least one hundred and fifty of the principal mills in New England. The opera. tion of dogging a log, as described, is very rapid, and we learn that the whole sime it takes for the sawyer to fasten securely a knotty, frozen, hemlock log does not exceed a few seconds.
Patented August 23, 1870, by John S. Brown, of Windham N. H. For further infornation address the sole manufac turors, S. C. Forraith \& Co., Manoliester, N. H.

COMBINATION CORN SHELLER, BOOTJACK, ETC.
A hand corn sheller, a bootjack, a hammer, a hook claw
a tack drawer, a pot lifter, and a wrench, are all combined

in the single instrument represented in our engraving, the construction of which amounts to simply three pieces of metal fastened together by a single rivet. Mr. Anthony Iske, of Lancaster, Pa , is the inventor, and he clearly deserves credit for no small amount of mechanical ingenuity.
The portion, A, is provided with a hammer at one end, a fulcrum or rest near the middle, and a curved stem, having teeth on one side. The part, $B$, is $S$ shaped, and its upper
curve is provided with teeth facing those on portion, A. Its lower extremity, C , is formed for drawing out tacks or lift. ing off stove lids. The third section, D, is terminated with a hook which adapts it to various purposes. The position of the pivot is clearly indicated. Fig. 1 shows how the implement is used for shelling corn, the ear being introduced vertically between the toothed portions and the hammer edge placed upon the table. The shelling is accomplished by a downward motion and a quick turn of the wrist. When laid upon the floor, as in Fig. 2, on the hammer end being


## BROWITS FROST LOG DOG.

pressed down by the foot of ihe operator, the leg or fulcrum aises the handles, which, together, form an excellent boot jack.
Not content with all the applications of his device, as above noted, the inventor also suggests that a recess might be arranged in some portion so as to adapt it to cracking nuts.
Patents on combined implements of this kind and simple household contrivances of easy manufacture, without involv ing large capital, are the class of inventions most in demand and meet ${ }^{\circ}$ with ready sale.

## Hydraulic Mining in California.

Five years ago, fifty inches of water was considered an un usually large quantity for a compony to purchase, says the Calaveras Chronicle. It was conducted to the claim through a small canvas hose, with necessarily little pressure, and precipitated against the bank from an inch nozzle. The been produced by the discharge of a six inch syringe. Miners were forced to "coyote" under the bank and "cave it down" to get gravel to wash-a slow, labarious and expensive to get gra method of procedure. The sluices attached to these primior high, and yet the capacity was ample for the requirements of mining as then conducted. That whole system of operations has been revolutionized. At present three hundred inches of water is the minimum employed in any claim that aspires to the dignity of a hydraulic. Iron has taken the place of canvas for hose, and the greater the pressure to be obtained the better. Patent nozzles direct the streams that cut down the bank like grass before the scythe, and the mingled gravel and water find passage from tho mine through a three foot flume. Really, more dirt is put through the sluices of a modern hydraulic in a week that was formerly washed during an entire season. And yet the cost of unning one of the mammoth hydraulics of today is but a trifle, if any, more than the expense of conducting one of the piddling con. cerns that disgraced the name ten years ago. Water works cheaper than hands, and the employment of that element, to the almost entire seclusion of manual labor, is the principal reason why it costs no more to wash a tun of gravel now than it formerly cid to move a single pound.
Hydraulic mining in this country, notwithstanding the fancy A beduring the past two years, is yet in its in of the abandoned ground, from one end of the country to the other, will pay for re-working, and new mines are constantly being discovered and opened. As an illustration we will cite one instance: Near Murphys in this county, a gravel mine, one hundred and sixty acres in extent, has
lataly been located and patented. Beyond a little superficial prospecting no woik has been done upon it, aud yet a tenth interest in the ground was sold for $\$ 10,000$, the other day. Some curious individual has made an estimate of the probable yield of the entire mine, basing his calculations apon the "prospects" obtained. The result of his figuring is that the whole one hundred and sixty acres will yield an average of ninety cents per square yard.

## New Mode of Liquefing Gases

By the application of cold and pressure i suitably contrived machines, all of the gases with the exception of six, nitrogen, hydrogen oxygen, marsh gas, carbonic oxide and nitric ox ide: have been reduced to a linuid condition This liquefaction was first performed by Faraday and served to prove the fact that gases and vapors are not distinct in their natuve. It may be re membered that the simple apparatus used during these initial experiments consisted of a bent glass tube, having a long and a short leg at right an gles. Into the open end of the longer portion was placed a substance from which gas could be obtained by heat, after which the tube was her metically sealed. The shorter 1 i nb was then plunged into a freezing mixture, and heat applied to the larger portion, ge cerating large quantities of gas, upon which, being confined in a emall compass, the pressure gradually increased, finally condensing the same into liquid form in the smaller receptacle. The facts thus recalled will indicate the importance of a recsnt experiment made by M. Melsens, a celebrated chemist of Brussels, who, it is stated, has lately succeded in obtaining wood charcoal in an absolutely pure state. So great is the absorbent power of this substance that it wiil concentrate in its pores a quantity of gas equal to its own weight. This has been used by Melsens in an apoaratus similar to that of Faraday above described; and through its agency, ho has succerded in l quefying gases with great readiness. The charcoal, it scems, is placed in the long leg and allowed to absorb as much gas as possible. The tube is then sealed and enclosed in a tin pipe heated to $212^{\circ}$ by a current of steam. The cas in the charcoal is thus dis of engaged and caused to compress itself into the short limb, passing almost immediutely into a
liquid state. It is stated that from one to one nd a half cubicinches of liquefied gas can be quickly ob. tained.

## Taxes on Knowledge

O. M. says: Please ask our next Congress to remove ail axes on means of education, such as tha impet duty of 40 per cent on philosophical apparatus. "I know of several parties who propose, to import telescopes and other scientific mplements for their own use; but on ascertaining the fact of that enormous duty, they at once gave it up. I cannot see that it would lessen the profits of. those in this country who sell such instruments if the duty were removed, ss the goods are mostly imported; nor wonld it materially interere with such men as Alvan Clark, Ritchie, Zeutmayer, Spencer, and others, whose business depends mostly on their well known skill and integrity. Please lend your influrnce to assist those whose purses are scant, yet who are trying to educate themselves and others."

## Fast Trains in England.

There has been a dispute as to which is the fastest train in England. Precedence has been claimed for the 10 A . M. express from King's Cross. It also asserted that the Great Western express between Paddington and Exeter is faster Between Puädington and Swindon the distance is $777_{4}$ miles, and both the up and down trains travel it in 87 minutes, ncluding the starting and stopping, or at the rate of 53.62 miles per hour. At full pace, the speed is as nearly as possi ble a mile a minute. The Great Western railway is built on a feet gage, but many parts of the line have a third rail, al owing narrow ( 4 feet $8 \frac{1}{2}$ inches) gage trains to run on it also.

## LIGHTNING SHEEP SHEARS

This ingenious apparatus, accordiag to the Ironmonger will sbear six sheep in the time that it now takes to denude one of his fleece. Anybody can operate it and do better

## THE GREAT BRIDGE AT ST. LOUIS

In former numbers of the Scientific Americain, we have given rarious interesting details pertaining to the remarkable work involved in building the granite piers of this great example of engineering. We have also given various illus trations thereof, and of the superstructure. We now pre sent an engraving which will intelligibly illustrate the inge-
in July, 1874. The following interesting particulars are derived from a letter in the New York Times:
The river is spanned by three arches springivg from east and west abutment towers to piers in the river. From the abutments to the piers, east and west, the arches have a span of 502 feet; the central arch from pier to pier has a span of 520 feet. These arches are of cast steel. The

op and battom row form what is technically called a chord and thesese united togetherby main braces in the form of the letter A. The two chords are united laterally by huge ie rods. That is the whole principle of the matter.
The modus operandi is as follows: The tubes are brought and ares underneath the place where the men are working ationary engine. The ends of the tubes are so nicely grooved that they fit in very tightly, They without the couplings Thtside to correspo on the outilde, to cord fith the groove When the couplings. When the latter have been applied, an enormous pin, with a diameter of fire inches and $\pi$ weight of 100 pounds, is screwed through the couplings, going, of course, also through the united ends of the two tubes. The bridge being double, there are tight rows of tubes, making, for the side arches 340 to the span, and 342 for the central one. The men are working now on the eastern balf of the bridge, the other being in such a forward state that it has to be neglected until the rest of the work ba lances it. In this gigantic work the utmost thought of little things is imperatively nteded The moment that one tube in place, the tube that bunce it on the other side of the pirr must be putinto position. The strain upon the iron cables tha support the tubes until they form a perfect arch is regula ted to a pound weight by means of bydraulic rams. When the temperature rises the cable stretcb, and the whole fabric of uncompleted arching sinks a litt'le. It has to be raised up and the ams do this by taking a little gentle pull upon the cables, or, as the mariners would say, "hauling taut." 'This is effected by pumping a little glycerin into the rams. If, on the contrary, the tem perature fails, the cables cun tract and tilt up the arching a trifle more than is required Then the watcher over the rams has to pump out a little glyce rin, and the pressure on the cables is relaxed. This little place where the rams are may be considered the great artery of the work. The perfect con trol that Captain Eads and his assistant have over their offspring is sometimes evinced in an amusing way. The me thod of construction to pre serve the just balance is satu rally to build the tubes half way from each side of a pier at the same time, so that one half balances the other half The engineers commenced in this manner with the pier near est the western bank, building up, at the same time, the tu bing from the western abut ment. When the latter me the western half of the pier, the extremely hot weathe had expanded the metal, and the tubes would not unite. Ba ron Fladd immediately bough hundreds of bales of gunny bage, and packed the recalci trant tubes in ice. All nigh the thermometer kept rising but the ice did its work, and they came togerhir so closely that you could not have seen daylight bctween th.m. The same result could have been obtained by biasts of cold air but the Keystone Bridge C'ompany, of Pittsburgh, who have the contract for the super structure, were in a hurry to close the western arch, so the
nious manner in which the placing of the superstructure is bridge being double, the arches are double but the principle ice was used.
being executed. This work is now proceeding at St. Louis, can be more easily shown with one part; for as it is built. it The workmen now thoroughly understand the bandling of and by its novelty attracts the attention of enginears from is really two bridges joined together, and it could be made the tubes, and are putting them together on the eastern half all parts of the world. The chief engineer of this great indefinitely broader or narrowor according to requirement. at.the rate of twenty-four a day. The fram $\rightarrow s$, from which work is Captain James B. Eads, of St. Louis, to whose fame as a man of science the sucaene of the structure will add joined tagedber by most admirable oouplings. There are called skewbacks, and are of wrought iron, forged in onc many laurels. It is expected that the bridge will be finished four sets of tubos, arrangod two above and two below. The piece of three tung-a rery creditable specimen of the handi
work of Pittsburgh. The first tube, which is very short and stout, is screwed to this with four steel bolts, five inches in diameter, which go back into the very bowels of the pier, plate. This fact will give a better idea of the huge masses of masonry serving as piers than any formal statements or measurements. The men engaged in the construction bemeasurements. The men engaged in the construction be-
long to a class which American enterprise has called into exlong to a class which American enterprise has called into ex-
istence. They are bridge builders, working at nothing else; ietence. They are bridge builders, working at nothing else;
and though not scientifically educated, have a rough and ready comprehension of the work they do, which tends to elevate their minds. They are trained to perfect exactitude in the smallest details. If a bolt does not fit perfectly, there is no thought of esssisting it promptly with a sledge hammer; but there is an instant conclusion that, by some accident, the bolts have become mixed, and that this is not the special bolt for that particular hole. For down to the mispecial bolt for that particular hole. For down to the mi-
nutest scrap of iron, everything has been fitted at Pittsnutest scrap of iron, everything has been fitted at Pitts-
burgh, and must fit here. To nearly fit will not do; it must absolutely fit. The consequence of such exact training is exemplied in the conduct and manner of the men who are, without exception, the most intelligent and orderly body of workmen I have ever seen. With such men rapid progress is certain, and there can be no doubt that the arches will be completed before the end of November. But the bridge will not be finished then, by any means. The roadways have to be built upon it. The upper one will be for omnibuses, foot passengers, etc., the lower for a double tracked railway. These two will be supported by struts, the longest of which near the piers, will be 56 feet, and then gradually diminished as they approach the center of the arch. These struts will rest upon the heads of the couplings where the tubes are strongest, and, as only a direct weight comes upon them, will be able to bear five times more than the bridge company will ever permit; for the transit of trains will be entirely in the hapds of the company's officers.

## Molecules.

/ Professor Clark Maxwell lately delivered an interesting lecture before the British Association upon molecules, | by which is meant the subdivision of matter into the greatest possible number of portions, similar to each other. Thus, if a number of molecules of water are combined, they form a mass of water. Molecules of some compound substances may be subdivided into their component substances. Thus the molecule of water se
gen and one of oxygen.
gen and one of axygen.
The ancient atomic theory, described more than two thousand years ago by Lucretius, was that the molecules of all bodies are in motion even when the body appears to be at rest, and this is the accepted theory of today. In the case of
solids, these motions are confined within such narrow limits solids, these motions are confined within such narrow limits
that we cannot, even with the microscope, detect any alteration in thei positions. But liquids and gases may be subjected to experiments which afford convincing proofs of molecular motion. If the gases of ammonia and hydrochloric acid, for example, be placed in a glass tube, with a stratum
of air between, the lighter gas, ammonia, above, the gases diffuse through the air and produce a white cloud when they diffuse
Air confined in a vessel presses, as we say, against the wall thereof. What we term pressure is simply the impact
of the moving molecules against the interior surfaces of the of the moving molecules against the interior surfaces of the vessel. The amount of the pressure depends upon the number of molecules of air or gas within the vessel. By the application of heat,the movement of the molecules is increased
in velocity, and such increase of course causes each molecule in velocity, and such increase of course causes each molecule
to strike harder against the walls of the vessel ; in other words, the pressure is increased; the law of such increase of pressure being as the square of the velocity of the molecules. Dr. Joule has calculated the velocity of hydrogen mole cules, at the temperature of melting ice, at a little over 6,000 feet per second. The molecules of ammonia move about 2,000 feet per second. The molecules of common air move with a velocity of seventeen miles per minute; and if they all moved in the same direction, nothing could stand such a
wind. But molecules constantly impinye against each other wind. But molecules constantly impinye against each other
and by this contact, their directions of motion are incessantly and by this
Professor Maxwell has calculated the size and weight o hydregen molecules, and finds that about two millions o them, placed side by side in a row, would occupy a length of about one twenty-fifth of an inch; and that a package of
them, containing a million, million, million, million of them, would weigh 62 grains, or not quite one eighth of an ounce.
Each molecule throughout the universe, says our author, tinctly as does the meter of the archives at Paris, or the double royal cubit of the Temple of Karnac.
No theory of evolution can be formed to account for the similarity of molecules, for evolution necessarily implies continuous change, and the molezule is incapable of growth or decay, of generation or destruction. None of the pro cesses of nature, since the time when Nature began. have
produced the slightest difference in the properties of any molecule. We are therefore unable to ascribe either the existence of the molecules or the identity of their properties to the operation of any of the causes which we call natural. On the other hand, the, exact equality of each molecule to all others of the same kind gives it, as Sir John Herschel has well said, the essential character of a manufactured article, and precludes the idea of its being eternal factured articlee.
and self-existent.
Thus we have been led, along a strictly scientific path, very near to the point at which science, must' stop. Not
that science is debarred from studying the internal mechan ism of a molecule which she cannot take to pieces any more than from investigating an organism which she cannot put together. But in tracing back the history of matter, science is arrested when she assures herself, on the one hand, that the molecule has been made, and on the other that it has not been made by any of the processes we call natural.
Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that, because matter cannot be eternal and self-existent, it must
have been created. It is only when we contemplate matter in itself but the form in which it actually exists that our mind finds something on which it can lay hold. That matter, as sucb, should have certain fundamental properties, that it should exist in space and be capable of motion, that its motion should be persistent, and so on, are traths which may, for anything we know, be of the kind which metaphysicians call necessary. We may use our
knowledge of such traths for purposes of deduction, but we have no data for speculating as to their origin. Butt cat there should be exactly so much matter and no more in every molecule of hydrogen is a fact of a very different order. We have here a particular distribution of matter, collocation, to use the expression of Dr. Chalmers-of things which we have no difficulty in imagining to have been arranged otherwise. The form and dimensions of the orbits of the planets, for instance, are not determined by any law of Nature, but depend upon a particular collocation of mater. The same is the case with respect to the size of th:e earth, from which the standard of what is called the metrical system has been derived. But these astronomical and errestrial magnitudes are far inferior in scientific impor tance to that most fundamental of all standards which forms the base of the molecular system. Natural causes, as we know, are at work, which tend to modify, if they do not at length destroy, all the arrangements and dimensions of the earth and the whole solar system. But though in the course of ages catastrophes have occurred and may yet occur in the
heavens, though ancient systems may be dissolved and new systems evolved out of their ruins, the molecules out of which these systems are built-the foundation stones of the material universe-remain unbroken and unworn. They continue this day as they were created, perfect in number and measure and weight; and from the ineffaceable characers impressed on them we may learn that those aspirations after accuracy in measurement, truth in statement, and ustice in action, which we reckon among our noblest attri butes as men, are ours because they are essential constituents of the image of Him who in the beginning creatud, not
only the heaven and the earth, but the materials of which only the heaven and the earth, but the materials of which
heaven and earth consist.

The summer's work of the American Fish Commissio is of unusual interest from the fact that a large number of queer marine animals have bsen brought to the surface by the improved dredging apparatus employed; and, besides much valuable information has been added to our knowledge regarding the habitat of various fishes and mollusks. A cor espondent of Forest and Stream epitomizes, in an interest ing communication, the labors of the scientists who have con ducted the explorations, and we extract therefrom the fol lowing particulars regarding the progress and discoveries
made: A live calista convexa (a species of clam), brought up made: A live. calista convexa (a species of clam), brought up
in Casco Bay, has, it seems, upset the opinion that it was extinct so far north. Quohogs, which once existed in plenty and the shells of which are found in the Indian ehell mounds which cover Peak's Island on the coast of Maine are now obtained only in a little cove in Casco Bay; while yster shells, to which a saddle rock is but a pigmy, are hickly planted below the bottom of Portland Harbor, though s living organisms their species is now extinct.
Down in these ocean depths, the animal kingdom takes rom the floral tribe the duty of embellishment ${ }_{3}$ but these flowers wave their graceful petals but to entrance a victim, which, when seized, is pressed close to its mouth and then, even if larger than its captor, is swallowed whole. Holding tightly to its prey, the sea anemone gradually protrudes its stomach from its mouth; and turning it inside out,envelopes its dinner and then lies quietly waiting the death of its food nd subsequent digestion. Then such portions as are not suitable are rejected, and the stomach is again stowed away for future use. The sea cucumber (pentacta frondosa) is
another curious creature. First found, it is a small compact gherkin: but left to itself, it swells and developes into an immense cucumber. Two magnificent specimens of a star fish known as a gomaster phrygianus were found in deep water, where an almost icy temperature made for them a constant winter. They are four or five inches from point to point,and of a deep scarlet hue with a surface embossed like shagreen. Hundreds of a pale straw colored star fish (clenediscus crispatus), hitherto esteemed very rare, were brought p from these icy depths. Three large specimens of a rare and beautiful anemone (urticina digitata), the first perfect ones ever found, were also obtained, a discovery of interest
from the fact that none of the species have been recorded as from the fact that none of the species have been recorded as
existing nearer the coast than George's Bank and at a depth of 400 fathoms.
Worms predominate in the hauls of the dredge. Many orts and sizes were fonnd,from tiny creatures, the peculiarities of which are distinguishable only under the microscope, to the grand cerianthus borealis', one of the anemone family, a foot in length. All have the same style of house, and exude from their bodies a slime, which probally has chemital af-
adhere. One specimen caught had a tube around him, an inch in diameter and a foot in length. $\cdots$ He was thrown into a basin of water where he moved rapidly about, evidently ill at ease. The next day he was lying quiet; and about his neck was a ring of mud formed from the floating particles in his prison. During the evening, he was found stretched out at full length, trying to swallow an anemone that had been imprisoned with him.
The hermit crab is a common but curious creature, resembling a little lobster, armed with powerful claws and a very thick breast plate. He is a quarrelsome customer; bat unfortunately for him, the after part of his body is soft and defenceless. Left to his own resources, he is a great coward, but gets an accession of bravery when he discovers an empty univalve shell. This he evamines inside and out urning it over and over until satisfied that there is no wealk place in the rear, when he passes into it tail first, and then, calmly folding his strong claws across the entrance, is ready for the fray. When a larger crab finds a shell that suits him, in which a smaller one of his own species has already taken refuge, he unceremoniously inserts a claw and drags the little one out. The shell becomes the home also of a beautiful hydroid which appears likea velvet coat of waving fibers. These, seen through a nicroscope, resolve themselves into a triune creature, three bodies on one stem, each with its special function to perforra, making one little single life One body absorbs food, unother reproduces the young, while a third, armed with tiny jaws, defends the little community gainst other creatures still smaller.
Another odd specimen found was the goose fish or lophius Americanus. It is about two and a half feet long. a flat thick mud-colored, mis-shapen monster, whose small fins proclaim it not a rapid swimmer. Burrowing close to the mud, it elevates two little fishing rods, each about twelve nches in length, formed of a stiff elastic substance like the pine of a catfish. These spring from the upper part of the nose; and when not in use, lie back flat upon the head. When he first wants his dinner, however, the rods are raised at arious angles and moved slowly about; on the end of each dangles a red muscular fiber which dilates and contracts ike a worm. Attracted by this bait,the unsuspicious pollak attempts to appropriate it. Slowly the goose fish lowers its
lip, and then suddenly engulfs the unwary victim in its lip, and then suddenly engulfs the unwary victim in its mouth, which, set with great fangs, opens like an old fash wed carpet bag.
Another curious find was the egg of a skate, seemingly a ark colored case, of texture somewhat like a beetle's back, but tougher. It was shaped like a fisherman's creel, a rec tangle with the ends cut out, leaving a square center with
four projections on which to wind the line. The egg shell is not unusual and can be found on sandy beaches, thrown up by the t:de, dried and empty, looking like the huek of some nut. The specimen found was opened, and the little creature released and placed in a basin of water, where it swam around for several days. The yolk of the egg re mained attached and appeared quite as large as the fish.

## Regular Eating.

Half of all ordinary diseases, says Dr. Hall in his Journal of Health, would be banished from civilized life, and dys. pepsia beco e almost unknown, if everybody would eat but hrice a day at regular times, and not an atom between meals, the intervals being not less than five hours, that being the time required to digest a full meal and pass it out of the tomach.
If a person eats between meals, the process of digestion of the food already in the stomach is arrested, until the last which has been eaten is brought into the condition of the former meal; just as, if water is boiling and ice is put in the whole ceases to boil until the ice has been melted and brought to the boiling point, and then the whole boils to. ether.
But it is a law of nature that all food begins to decay, after exposure to heat and meisture for a certain time. If a meal
is eaten, and in two hours another, the whole remains undigested for seven hours, before which time the rottening process commences, and the man has his stomach full of carrion -the very idea of which is horribly disgusting.
As, then, all the food in the stomach is in a state of fermentive decay, it becomes unfit for the purposes of nutrition and for making good pure blood. Small wonder is it that dyspeptics have such a variety of symptoms, and aches, and complaints in every part of the system, for there is not one drop of pure blood in the whole body; hence, the nerves, which feed on this impure and imperfect blood, are not properly nourished and, as a consequence, become diseased. They " complain"; they are hungry-and like ahungry manno onevish, fretful, restless. We call it nervousness, and no one ever knew a dyspeptic who was not restess, fretin.
fidgety, and essentially disagreeable, fitful and uncertain.
The stomach is made up of a number of muscles, all of which are brought into requisition in the process of digestion. But no muscle can work always. The busy heart is in a state of perfect repose for one third of its time. The eye can work twice in a second, but this could not be continued five minutes. The hands and feet must have rest, and so with the muscles of the stomach; they only can rest when there is no work for them to do-no food in the stomach to digest. Even at five hours' interval,and eating. thrice a day, they are kept constantly at work from breaikast until the last meal is disposed of, usually ten oclock at night. But
multitudes eat heartily within an hour of bed time; thus, while the other portions of the body are at rest, the stomach is kept laboring until almost dayjlight, and maae to begin again at breakfast time. No wonder is it that the stomach
is worn out-has lost its power of action. Many girly be-
come dyspeptic before they are out of their teens, in conse quence of being about the house and nibbling at everything they lay their eyes on that is good to eat.
In the Chronique de la Société $d^{\prime}$ Acclimatation, M. Ruime states that, by feeding silkworms on vine leaves, he has ob tained silk of a fine red color; and that by giving the worm lettuce leaves, they have produced cocoons of an emerald green color. M. Delidon de St. Gilles, of Vendée, has also by feeding silkworms-during the last twenty days of th larva period-on vine, lettuce, and nettle leaves, obtained green, yellow, and violet cocoons.

The Ayrshire Cow.-The Ayrshire is bred, and has been bred, for milk; her inheritance is all in the line of milk pro ducing. Her form indicates it ; her records prove it. When aged and dry, the same functions which ordinarily fill the udder fill her muscles with fat; but while milking, inheri tance, intensified yearly by selection, turns the energies of her system towards extracting materials from her food, and secreting the larger and richer part in the udder. As the horthorn stands with the grazier, who has tried their qual ity, so does the Ayrshire stand with the dairyman. By seek ing improved breeds, the farmer is adding materially to the profits of his farm, for he is utilizing the great power and unerring certainty of inheritance.-Dr. Sturteoant.

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Improved Apparatus for Extracting Cane Juice.
Ican Moffat, New Orleans, Lan.-This invention conststs in the arrang Duncan Moffat, New Orleans, La.-This invention consists in the arrange-
ment of a holding device with the delivery rolls of the mill and the rotary cutting apparatus; also of a vat containing a secondary steaming compartment under the one into which the crushed and chopped cane is first re
celved, containing revolving chopping and beating blades; also, stationar ones to continue the disintegrating process until the cane is reduced to pulp. The bottom of said compartment is perforated to fliter the juice from the pulp as much as possible; and has a spout leading from it to con
duct the pulp to an endless carrier, by which it is delivered to pressing rollers to expel the remaining juice. The two compartments of the steam Ing vat are separated by a valve, which is turned from time to time to deliv ed to the steam in the upper compartment a sufficient length of time. Be ed the steam in the upper compartmer compartment there is a trough, which receives the jutce
the evaporator.

Improved Needle Threader for Sewing Machines. eedle threader is of thin sheet metal, and the instrument may be placed an upright position. At one end of the handle is a forward projecting bulde plece which passes up and down along the side of the needle, until
hook strikes the eye of the needle and enters through it. The hook has carved end of very small size, which takes up the thread and draws the sam
back through the eye of the needle. The rear part of the hook is bent in back through the eye of the needle. The rear part of the hook is bent in
shape, and held in a groove in handle by means of a plate and screw. small set screw regulates the distance of means of a plate and scrom gulde plece, to be adjusted to needles of different thicknesses. At the other end of handle a to the body of the handle, so that needles may be threaded from the sides, to the body of

Improved Propelling Mechanism for Vessels. Lindsay Murdoch, Marble Hill, Mo.-This invention consists in a horizon-
tally slding frame and a bar carrying at its lower end naddle floats sliding tally sliding frame and a bar carrying at its lower end paddle floats sliding
vertically theren and horizontally therewith. By this arrangement the paddles have parallel vertical and horizontal motions, so that they are pre-
sented to and leave the water edgewise and move against it directly in the sented to and leave the water
line of the motion of the boat.

Improved Saw Sharpening Device.
John B. Drake, Goshen, Ind. - The flle gulde has, at one end, Jaws to hold he flle, and is rounded at the other to slide in a hole through an adjustable gulde, by means of which it may be placed at any desired hight. This appa-
satus is applicable to vertical saws as well as to cireular saws. By means of it the flle is carried in a straight line across the saw.
Improved Automatic Fire Escape for Safes.
Ira Parke, Mineral Point, Mo.-It is proposed to have a safe resting on a
platform having wheels, and pivoted at one end. while the end nest to the platform having wheels, and pivoted at one end. While the end nest to the
wall of the building is suspended by an easily com'ustible rope or other contrivance, to be destroyed by a fuse or a gun discharged against it, of
burned off to let the platform fall. The platform, which is arranged front of a trap door in the wall opening into the street, is to unfasten the
door in its fall and force it open, and the door is to form a continuation door in its fall and force it open, and the door is to form a continuation of
a descending track, of which the platform is the other part, on which the safe will roll into the street, and thus be saved from the fire. Fuse may be connected with the suspending rope, and arrangee throughout all parts of the bullding, to ignite the rope or discharge the gun against it when the fire
breaks out in any part of the building; and the fuse will also be arranged breaks out in any part of the building; and the fuse will a
Improved Tap Holder Attachment for Beer Coolers. ment to beer coolers for packing the hole through which the faucet projects to prevent the escape of the cold air, which is composed of metal clamping rings, and a rubber packing ring, arranged in two parts, of which one is fastened to the box, and the other to the door, in connection with the tap nole.

Improved Boy's Sled.
Samuel D. Mott, Milford, Pa.-The rear ends of two springs are
secured to the frame work of the sled, to the secured to the frame work of the sled, to the forward ends of which is
attached a cross bar, in such a position that the rider, when sitting upon attached a cross bar, in such a position that the rider, when sitting upon
the sled, may rest his feet upon the said cross bar, elther upon the outer or inner sides of the side frames of the sled, as may be destred. To the center
of the cross bar is pivoted a small runner, which is made of a much less hight than the sled, and the springs are made of such a strength as to hold the sald runner away from the ground, except when pressed down by the
rider's feet, resting upon the cross bar. To the runner 1s attached a cross bar, to which are attached the ends of cords. By pressing the runner down to the ground with his feet, and pulling upon one of the cords, the rider can incline t
sired.

Improved Fountain Hand Stamp.
Francis J. Coutant, New York city.-This invention relates to the con struction of stamps for certifying checks and for similar purposes, having spectal reference to what is known as the "ribbon stamp;" and consists in
a fountain for the ink and in a movable pad. The shafts being immersed in ink, the ribbon is of course saturated with it. As the ribbon is drawn from the fountain it passes between two packing pieces, the object of which is to
strip off the surplus ink from the ribbon and to keep the forintain closed These packing pleces are made of elastic materlal, compressed by means of the metallic plates and screws. After leaving the packing pleces, the rib-
bon is drawn overithe rollert and beneath the type plate, and then upward and into the fountain. By this invention the trouble and expense of freof a lever, is thrown upward against the ribbon and type, instead of operating the stamp, in the usual manner, by a blow on the stem. With a pad constructed in tits manner the stamping may be done with the same hand that holds the \$paper, or with one hand.

Improved Metal Planing Machine John T. Kichner and wiliam H. Odenatu, Philadelphia,Pa.-This machine engines, it being secured to the engine by screwing its stand bolts into the oles of the steam chest bolts when the steam chest is removed, and $t$ dapt it for attaching it to different engines, in which the holes vary in the stance apart. The top frame or disk on which a revolving disk is arrange are adjustable radially and circumferentially. The feed screw is turned by star wheel, which is broug
ach time it makes a circult.
Improved Car Coupling.
August Schorg and Benjamin Van Valkenburgh, Cobleskill, N. Y.-A band Which slides on closes the drawhead, and is operated by a forked lever. The
drawhead is made in two parts, one of which is attached rigidly to the ruck by means of clips. The other part is hinged, and drops down by its he mouth and opening of the drawhead, and are held firmly together by the band when the latter is slipped forward. At the top and bottom of the fiange is a loop, which the forks of the lever enter. The lever is held in positon by means of a forked iron attached to the timber of the truck. The handle end of the lever is bent upward to make it conventent to handle a
well as to fasten. When the handle end of the lever is thrown up to the well as to fasten. When the handle end of the lever is thrown up to the
truck, the band is thrown outward, so as to keep the drawhead closed and he coupling link confined. In this position the lever is confined by a pin in the forked tron. When the lever is thrown outward, the band is thrown back, which allows the part of the
he link of the opposite coupling.

Improved Apparatus for Graining Wood, etc.
Charles Falke, New York city.-In using the extension roller, the requi-
site width of the article to be grained is first taken, and the apparatus it hen adjusted by loosening the handle frame, setting the female screws and shells to the desired width, fastening the handle frame again, Inserting the band rollers and fexible band itting that width. The roller is presse
over the color board, which leaves the imprint of its grain on the peripher of the cylinder. The grain marks are thence transferred to the surfaces to e grained.
Daniel Sawyer, Washington, Ind., Nut Lock. olts before the nuts are screwed on, to which is secured one ormore piece of stee ${ }^{1}$, which are made thin and fastened edgewise, and upon the upper ably upon the side next the nut to be locked. A plate is pivoted to the pieces near one end, and is slotted so that it may be turned down upon the washer or turned back. The inner edge of the slotted plate is turned up a ight angles, and the steel plece is placed at such a distance from the nu oo be locked that the turned up part of the plate may rest against the sid of the nut, and thus prevent the said nut from turning. By this construc ion, when the plate is turned down, the steel plece passes through the
lot in the plate and the spring springs out over the sald plate, preventing t from rising.
Improved Snow Plow.
William J. Roberts, Cold Spring, N. Y.-A revolving bucket wheel is rranged in front of the locomotive on a vertical shaft, and is revolved by
neans of a belt, or gearing maybe substituted, from a pullev on the axle of means of a belt, or gearing maybe substituted, from a pullev on the axle of
the locomotive to thepulley on the vertical wheel shaft. The wheel is the the locomotive to the pulley on the vertical wheel shaft. The wheel is the
frustum of a solid cone. The outer edges of the buckets are parallel with the side of the cone, the ends belng cut on the plane of the base and upper roped down by means of a screw clutch revolves with the shaft, and is polley clutch when it is desired to run the snow plow. As the locomotive moves forward, the wheel clears away the snow from the track and throw to one side.
lmproved Faucet Attachment.
James Church, St. Louis, Mo.-This invention CQnsists of a cup of in aita-
rubber or other elastic material, or partly of elastic material and partly metal, combined with the faucet in such a manner that, when the barrei is tapped, by driving the cork into the barrel with the end of the faucet, the
cup will prevent the escape of the liquid while the fancet is being adjusted nd before it is made sufficiently tight to stop tie leak.

## Improved Refrigerator.

Charles Camp, Mott Haven, N.Y.-This invention consists in a removable ice box, fitted into the upper part of the smaller of two compartments of
he main box, so that it may be conventently taken the main box, so that it may be conventently taken out and put in when
desired. The cold air from the ice chamber passes through a pipe and into a horizontal hollow shaft, and escapes through the holes in the $s^{\text {idees of sald shaft. To the end parts of the hollow perforated shaft are }}$ sder of sald shaft. To the end parts of the hollow perforated shaft are
attached two four-armed plates, to the ends of the arms of which are
pivoted the turned up ends of shelves, so that the said shelves will always pivoted the turned up ends of shelves, so that the sald shelves will always
hang downward and be right side up, however the shaft may be turned This construction enables any desired shelf to be turned toward the doo are secured in any desirable position by a long screw which passes in from the front of the box through the end wall of the said box, so that its for vent it from turning.
Improved Washing Machine
mbination of the binding frame with the suds box of a washimg machin to strengthen sald box against the pressure of the operating mechanism the U spring, in combination with the lever and the rigid arm attached apon the arm to adjust the presser board to the amount of clothes to be operated upon. By suitable construction, as the presser board moves for ward, the clothes are pressed between sald presser board and a stationary presser board, pressing out the water, which carries the dirt with it. As the presser board moves back, the back rush of the water sweeps the clothe back from the stationary board, and turns them over so that they are ope-
rated upon by the presser each time in a different place, and are thus leaned thoroughly in all their parts.

Improved Printing Press.
Jacob G. Peterson, Morgantown, N. C.-The rollers are arranged in a reclprocating carrlage, which is suspended on the type bed by the upper
ooller. The bearings of the lower roller are immovable in the carrige The bearings of the upper roller are capable of moving up or down in the carriage, and have an adjusting screw by which the pressure of the rollers
in the bed is regnlated. The carriage has two toothed bars, extending in the bed is regnlated. The carriage has two toothed bars, extending
from one side, between two wheels on the crank shaft and the presser from one shde, between two wheels on the crank shaft and the presser
rollers, which are mounted in stationary housings. The crank shaft being presser forward and backward by a half revolution each way will cause the makes the impression on thard beyond the type and back again, whic raised, the printed sheet is removed, and an unprinted sheet is applied, and

Improved Quilting Attachment for Sewing Machines.
William H. Null, Blandinsville, Ill.-This invention relates to an improve ment in the class of machines for supporting,stretching, and moving quilts peculiarly constructed carriage and a tilting roller frame, on which it is upported, and in devices for holding and adjusting the fabric.

## Improved Plow Carriage

Ists of independen axles for the truck wheels, baving a long upright arm atright angles to tances apart, and connected by a short axle, which can be shifted higher or lower by changing it in the holes. From the center of this arm the beam is hung by a crotchet hanger, and is connected by adjustable braces with
the lower ends of the arms to maintain them in the upright position depth of the furrow is governed by the position of the suspending axle in the arms, and the plow is supported entirely above the ground. for transporting ft from place to place, by adjusting the suspending axle in the top

William H. Collings, Raytown, Mo.-A Instrument.
Winiam H. Collings, Raytown, Mo.-A pole of any desired length is made
ollow to receive a wire, which passes through it longitudinally low to receive a wire, which passes through it longitudinally. Upon the
pper end of the wire is cut a thread to screw into the shank of the saw hich projects above the end of the pole, and fits into a dovetalled groove or socket in the side of a ferrule attached to the upper part of the pole,
Where it is secured by a set screw. By this construction, in using the inhere it is secured by a set screw. By this construction, in using the in
trument, the hook is passed over the twig to be cut, and the wire pulled trument, the hook is passed over the twig to be cut, and the wire pulled
down through the pole. The saw is operated by the reciprocating move other
Improved Selt-Closing Faucet Attachment.
Robert McConnell, whlliam Truesdell, and Fredrick Mertshemer, Omaha er rest for a spiral spring, which coils around a tubular valve, resting ith its other end against a shoulder of the same. Apertures at the end the valve allow the liquid to pass out through the tube when that end
 the end of the tube. The rubber disk is of the same ditmeteran the end, the strainer fitting elosely over the same. By the jofnt action of he spiral spring and nut, the disk is pressed firmly against the end of the ube, closing the same effectively, so that no itquid can escape. The faucet When it is desired to draw off the fuid, is turned in far enough to strike the alve, forcing the same back, so that the disk is carried toward the inside The hquid enters, therefore, through the strainer and apertures into the

## Improved Boring and Drilling Machine. eridan, New York city.-This invention thas for

John J. Sheridan, New York city.-This invention has for its object to furnish an improved device for driling, boring, cutting screw threads, etc. The machine may be adjusted by means of set screws, and its base is ysimply loosing the nuts of sald bolts. Screws, which pass down throug the base and rest against the table, enable the machine to be convententl adjusted horizontally or plumbed, and the bolts secure it firmly in plac
When adjusted. The upright frame of the machine is made in th When adjusted. The upright frame of the machine is made in th
orm of a segment of a hollow cone, in two parts, flanged and bolted toge her so that the upper and lower parts may be adjusted upon each other The tool holding shaft passes up through the hub of a bevel gear wheel, so hat the sald wheel may carry the sald tool holder with it in its revolution
while the sald tool holder may be free to movelongitudinally in said wheel While the sald tool holder may be free to move longitudinally in sald wheel The latter revolves in bearings in the frame, and engagen, by a gear whee
and also by pulleys and band, with the driving shaft. The shaft is provided with two sliding clutches, and is made to carry the band pulley or gear heel with it in its revolution, according as one or the other of the clutche which enter grooves in the clutches, so that one of them may be throw Into and the other out of gear by a single movemert of the lever. The
third arm of the lever serves as a handle. Power is applied directly to the third arm of the lever serves as a handle. Power is applied directly to the
shaft by means of another shaft meeting it at an angle and connected with shaft by means of another shaft meeting it at an angle and connected with
it by bevel gear wheels. To the upper side of the gear wheel, tr rough hich the tool holder passes, and upon the opposite sides of the center, ar middle part of the bar is swiveled a screw, which screws into the unper en of the tool holder, so that the tool can be fed down to its work or raised uitable mechanism, each revolution of the gear wheel feeds the tool shaf down the distance of one thread of the swiveled screw. By a svitable
device, when a female screw thread has been cut, the cutter may be with device, when a female screw thread has been cut, the cutter may be with
drawn from said thread, allowing the holder to be run out quickly, and ithout danger of injuring sald screw thread.

## Improved Bee Hive

George Miller, Battle Ground. Wash. Ter.-This invention consists in an mproved bee hive formed of a number of cells, provided with a roof, and
upported by a single shaft or post from a base. Around the foot of the supported by a single shaft or post from a base. Around the foot of the
ost is placed a vessel to recalve water to prevent ants and other insect rom crawling up. The main frames are formed of an upper and a lowe plate within the cells, connected at their side edges by two or more bar in the top and bottom plates of the main frames, and midaway between the
ide bars of sald main frames, are formed grooves to receive the top and ottom bars of the single frames so that the sald frames attached to them may be drawn out conveniently and without breaking or otherwise injuring he comb, or the comb in the main frames. The bottom plates of the main frames are slotted. to give free passage ways to the bees. The lower or open ends of the cells are closed with plates, which are secured in place by but Which enables them to be turned to release one plate without releasing the other.

Improved Propulsion of Vessels.
George Boucher de Boucherville, Quebec, Canada.-This invention con ists in an improved wave motor for turning the propeller screw of a ship. vessel, or boat. A heavy platform is suspended by plvoted rods so as to
vibrate freely with the pitching of the ship. The after rods are extended each some distance upward; and to their upward ends are pivoted ba Which are also pivoted to vibratory rods which carry reversed spring pawls These pawls move alternately ratchet wheels which are rigialy attachod to pur wheel. Between these wheels and engaging with both is a small beve inion on the propeller shaft,which, by the motion of the two large wheel is turned by either alternately in the same direction. The vibrations of the latform are thus utllized and transferred to the propeller. Patents on this
invention have also been obtained fn England and various countries on the invention haver
continent.
Dr. John Improved Incinometer or Grading Level.
Dr. John Thomley, Charlottesville, Va.-This invention has for its objec to furnish a simple and hexpensive but efccent hustrument for readil ists in applying a graduated extensible bar to the ordinary carpenter's o mason's level, and providing such means for adjustment and clamping the ame as will enable it to support the level at various incinnations and ind cate the grade.

Improved Bee Hive.
John H. Stockwell, Bronson, Mich.-This invention consists in making the honey frame of a bee hive in separate sections, so as to turn like the ections, locked detachably by suitable nrojections and recesses, to enable oo large a swarm of bees to be easily divided.
Albert A. Murray, Ealtimore, Md. Impris invention consists in a cock valve and seat,the former arranged to rotate about the stem in combination
with a spiral spring that ylelds sufficiently to allow readily the rotation of he valve and yet to hold it in any position desired.

## Improved Car Coupling.

mps Atwell, of sam place, and William Gates, Frankfort, New York.-The coupling pins are passed through the bumper bead. aper sides of the shoulders upon their ecured in place by pins passed through them at the lower side of the sald bumper head. Upon the upper ends of the pins are formed hooks, which point toward the car bodies. The coupling link couples the cars by being
dropped overthe hooksof: the pins. A short standard is convected with ropped overthe the coupling ink and receives an arm which is pivoted o sald standard by a pin passing through a longitudinal slot in the sald arm, to give the link the necessary play to accommodate itself to the vartous movements of the bumpers. The other or inner ex d of the arm is attached to a short shaft, which is plvo ${ }^{\text {e }}$ and to which is attached a short asses up through a keeper attached to the car body. To the rod is attached double stop to hold it in place. By this construction. by raising the rod thi rod is lowered, the link will be lowered upon the hook pins, coupling the cars.

Improved Feather Renovator.
Riason B. Coper, Montitecllo, N. F.-TThe outer casing forms, togethe
with the semictrenlar botto with the semicircular bottom of sheet metal or other sultatle material, sceamtng chamber, the upper part of which is of hexagonal shape and ar-
ranged with hinged lida, and perforated screens below them. $A$ hollow
shaft passes centrally in longtudinal direction through the chamber, and shaft passes centrally in longitudninal diriection through the chamber, and
carries, $e$ nar the side walls of the same, drums, with perforations of the carries, near the side walls of the same, drums, with perforations of the
sides facing toward the interior. Longmitudnal strips conect the drums, and act as sitrrers on their rotation. The steam is admilted to the hollow
shaft from its opposite enc, and passes through the perforated drums to shaft from its opposite end, and passes throuph the perforated drums
the interior of the chaniber, being led out again by means of tubes at the top of the casing. The doors are toghtly closed during the steaming pro-
 drawn of through a dumping box. The drying chamber extends from the lowest ponint of the steam chamber along its sull length on the side oppo-
stite the dumplng oox. it is provided with the enirance and exit plpes Eite the dumplng box. It is provided with the enirance and exit pipes
through which the steam is admitted and let out for drying the feathers through which the steam is admitted and let out for drying the feathers
after the steaming process is completed. The outer doors or lids are opened during the drying and cooling process to allow the free passage of a current of cold air through the feathers.

Improved Manufacture of Steel.
Levallois, Paris. France. This in vention
Hulatre Andre Levallofs, Paris. France.-This invention relates to a com-
pound prepared from soft tron, tungsten, and nickel, which forms a cast pound prepared from soft tron, tungsten, and nickel, which forms a cast
steel of superior quality. The proportions used are: for the first qually, soft tron, ninety-three parts; tungsten, six and one half parts; nickel, one
half part. For the second quality, soft fron four and one half parts; nickel, one half part. For the third quality, soft fron, ninety-seven parts; tungsten, two and one half parts; ntccel., one half

 which is placed in the center of the charge, said charge being sprinkled
over with a quantily of the fux, varylng (in proportion to the quantity of the metal treated) betwecn one balf part and two parts of flux to one hun-
 the e sual way nto a sand or metal mold, the latter betng liied with a mix-
ture of clay and percarburet of fron. Before ayd during the process of running off the fused metal, a vacuum is produced in the mold by covering the
bottom of the funnel with a daphragm of parchment, which is destroyed mold, the ingot is removed as soon as it becomes solidififed. It is then onnealed in a a closed vessel, and allowed toc cool gradually. The steel pro-
duced as ahove deseribed may be hammered in the same way as ordinary steel. The fux is composed of biborate of soda, calcined silex and carbonate of lime, pulverized in a mortar, mixed together, placed in manal quant:tiee
futed cast tron pute. Finally, the fux thus obtatied is crushed into ema fiuted cast iron plate. Fina
particles beiore it is used.
 placed about half way between the deck and the bottora of the vessel, and placed about haif way between the deck and the bottorn of the vessel, and
are connecicd for the support of the sides. Stanchions are placed on each of the cross stays, supported at right angles with the deck, and have par-
tition boards upon each side, which divide the portion of the hold above the cross stass into three compartments. T:se partition boards on the in. to the stays. Those attached to the outer sides of the stanchions extend from the cross stays upward a short distance above the lower edges of the
inner partitlon boarcs, 50 that the two boards of each set of stanchions lap past each other. The compartments are connected by the spaces
betwren the stanchions, so that the grain mas pass over the outside part:tlons from the outside compartments, and under the inside partitions
into the central compar.ment. This is done as the vessel rolls and is ca into the centrarcompar.ment.
reened. The result 1 s, the central compartment is soon flled ater ater the ves.

 damage can occur, and the
with immovable cargo.

## Improved Folling Camp Baker.

Froderick Leenn n, Marauate, Mich.- The object of this invention is to provide (for the use of surveying parties, expeditions, and others, who are
obliged to encamp in the field at some distance from human habitations, an improved baker, which can te readily folded up after use. The tivention consists of a main part with two sude wings and a top hinged to tt, which
are arranged and connected by suitale rod for carrying the baking pan. are arranged and connected by suitable rods for carrying the baking pan.
The latter is placed in a horizontal position by elerating the main part by The latter is placed in a horizontal position by elevatiting the main part by
means of hinged supports. The main and hinged parts may be folded up so means of hinged supports. The main and hinged parts may be folded up so
as to incase the pan and lock all the parts safely together. Improved Combined Padlock.
Wm. C. Langenau, Clevelana, tion lock and consists in novel means by which the combination of num:
bers mav be conreniently changec. The peculiarity of this permutation locks consists in pivoting a plate on a stud that has projections which act
in conjunction with notches on a subjacent plate and thus allow the changes of combination to be easily effected.

## Improved Broom Hanger. Boston, Mass.-There is a metallic

Mary A. Clifford, Boston, Mass.-There is a metallic spring loop and an open spring band, the two being connected by yeses. This bandis made
large enough to rececte the emall end of a had large enough to recectve the small end of a hand le, so as to bold it
tion. The loop ts hung upon a nail, and thus suspends the broom.

## Improved Windmill.

George Stearns, Eldcrado Mills, Wis.-This invention consists of nove contrivances for causing a pumping windmill to start and stop self-act-
ingly by the influence of the water raised up into the tanks and by weights it also consists of an ingenious contrivance for adjusting the vanes to take the wind morc or less, by the influence of the wind; and it also consists of as extension of the frameto the front side of the wheel, to furnish a bearing for the front end of the shaft.
Improved Wheel for Vehicles and Mode of Detaching Horses. Rolla R. Jones, Pillar Poinc, N. Y.-The tire is semicircular in form, or serted in an open cavity in the felly, and a sheet metal cap is then applied over the felly at that point, and its flange covers the lateral opening of
said cavity. A screw having a head passes through nut and cap. The end said cavity. A screw having a head passes through nut and cap. The end
of the spoke tenon rests or abuts on the screw head. The sheet metal
socket is divided longitudinally to adapt it to be fitted over the screw head, and is tightly clamped around the nut and around the spoke tenon by rings.
Wren it is desired to disconnect the felly and spokes, the bands are slid off the socket, and the latter may then be sprung off the head of the screw. Another improvement in wheels by the same inventor cons 'sts in a meta
plate, let into the felly in the ax's of the spoke, and secures by a pin. The The cap bas flinges overlapping the sides of the felly to secure it agains splitting. The bearing pitcemay be cast together with the cap. The spoke
is sloted at the end suitably to be fitted on the plate aud key, and it is firmly secured thereon by a plate bent around the spoke ard secured by bands, which are driven on tight and secured by solder. An elastic washer
is placed between the band and cap to lessen the shocks. The same inven is placed between the band and cap to lessen the shocks. The same inven
tor has also patented an improved device for detaching horses from shalts: Near each end of the whiffetree is attached a short arm, in the outer side of which is formed a recess to receive a projection formed upon the inner side of a similar arm, which is pivoted to the end of the whifletree. With the pivoted arm is coniected a spring so as to draw back the arm whenever
it may be released. To the outer side of the short it may be released. To the outer side of the short arm is attached a loop
to receive the tug and prevent it fiom sticking upon the projection of the to receive the tug and prevent it fiom sticking upon the projection of th
other arm and being carried with eaid arm when itis drawu back. To two levers is connected an eye by means of which the levers are operated to Ftug. Tas eje m is be operated by hand, or hy a wire extending to the car riageand secared in such a position that it may be readily reached by a
persoz la said carriage to detich the horse when deeired.

Improved Mode of Operating Bellows of Furnaces. Hugh Crumlish, Buffalo, N. Y.-This invention consists in the means for while betng moved up and down.

Improved Machine for Shaving Shingles.
Thomas H. Carter, Bremen, Ky.-This invention cons'sts in combining with rotary radial drivers, cutting blades set in the direction of chords less relative arrangement of regularly intervaled drivers and blades, the sets of each differing in number; also in combining rotary drivers and stationar: knives with gutdes and springs to hold the shingle blank in operation. TLis machine is entirely without cog wheels, or any other mechanism so
liable to get out of order, reauire frequent repair, and create delay as well iable to get out of order, require frequent repair, and create delay as wel
as expense. The power required is very small indeed in proportion to the as expense. The power required is very small indeed in proportion to the ciple, a large or small machine may be constructed, the number of knives
and drivers. as well as other parts, being variable; but, with one horse wenty-two thousand shingles may be shaved in a satisfactory manner,

## Improved Horse Hay Rake.

Burton J. Downing, Mitchell, Iowa.-This invention has for its object to conveniently raised to dump the nay when desired by the the teeth can machine. By suitable censtruction, when a sufficient amount of has has been collected by the teeth, the driver with his foot pushes forward thc
end of a lever which throws the parts of a clutch into gear, and the movebe part of sall clutch is carried around with the into gear, and the move forward, the first effect being to raise a pawl from a rack. The second ef
fect is to draw the upper arm of a lever forward, which eeth and diecharges the collected hay

Improved Coal scuttle.
Amasa S. Thomp Vasaly, of same place. This invention relates to coal hods or scuttles and it consists in the cover,made in two parts, wh
site sides so as to be opened and closed by the bail.

Improved Machine for Manufacturing Carpet Lining.
d ward II. Bailey, Brooklyn, N. Y. This invention consists of apparat combined with the machinery used for arranging the bat and the paper sheets together, by which odoriferous substances are sprinkled upon an ing made and befure the bat is inclorm quantity while the lining is be ton also consists of apparatus for pasting the paper to cause it to unite with the bat, gaged to the paper rolls by rollers, and caused to rise up to the paper rolls as they decrease in size by cords and weights.

Improved Wagon Seat.
Michael Likes, Mansfield, Ohio, assignor to himself and J. H. Barr, of same place.-This invention consists in providing the wagon seat with
risers or supports, whichare of angularform in one direction, and pivoted risers or supports, which are of angularform in one direction, and pivoted
to the sides of the wagon box, and produced under a certain angle, so that to the sides of the wagon box, and produced under a certain angle, so that
the seat is not only thrown forward, but inclines at the same time beyond the seat is not on
the foot board.

Improved Children's Building Blocks.
blocks wherewith children msy be amused and their minds instructed by the combination of said blocks so as to present the semblance of well known objects. The invention consists in making these blocks of such
relative shape that,although comparatively few in number, houses,bridges, relative shape that,although comparatively few in number, houses, bridges,
arches, chairs, rockers, cupolas, tables, fences, windmills, the letters of the arches, charrs, rockers, cupolas, tables, fences, windmills, the letters of the
alphabet, chandeliers and other ar icles of furniture and of an architec-

Improved Hay Elevator and Carrier.
ette, ind.-This invention furnishes a devic ard raising hay irom the load, in a perpendicular line, to any required hight,
and then carrying it in a horizontalline to any part of the barn, after which the car is returned by a weighted cord and the empty fork lowered to the pitcher without any exertion on his part. It consists of an iron bumpe and latch pivoted together and held in a car which hangs on a track sus-
pended by hooks from the rafters of the barn. The latch has an elbow, extened on the rope; so that, when the trip block strikas the bumper placed on the rope; so that, when the trip block strikes the bumper and
unlatches the car. the forked rest is thrown under and supports the load
while traveling back into the barn. When tiee car returns over the load or while traveling back into the barn. When the car returns over the load or
fioor, it is latched fast, the forked rest fifes from under the trip block, and the fork is lowered for another load. The car slides on
and the track is spliceable and supportable at any point.

## Value of Patents,

 and how wo obrain reim. Practical Iints to Inventors.PROBABLY noinvestment of a small sum of money brings a greater return than the expense incurred in obtaining a patent
even when the invention ts buta small one. Larger 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 inven.
tions, are well known. And there are thousands of others who have realized large sums from their patents.
More than Fiftr Thousand inventois have availed themselves they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN They stand at the head in this class of bus'ness; and their large corps
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## HOW T0

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to this office. A positive anwer can only bs had by presenting a complete application for a patent to
the Commissioner of Patents. An application consists of a Model, Draw ing. Petition, Osth, and full Specification. Various cficial rules and for malities must clio be observed. The $\epsilon$ florts of the inventor to do all this
business himself aregenerally without success. After great perplexity and 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 safeiy confide his ideas to them, they will advise whether the improvement is probably patentable, and will give him all the directions

## How Can I Best Secure my Invention?

This is an Inquiry which one inventor naturally asks another, who has had one experi
Construct a neat model, not over a foot in any dimension-smallerif poz New Fork, together with a description of its operation and merits. On re celpt thereof, they will egamine the invention carefully, and advise youse
to its patentsbilty, free of charge. Or, if you, have not time, or the means
at hand, to construct a model, make as good a pen and tnk sketck of the
mprovement as possibie and send by mall. An answer as to the prospect
of a patent will bs received, unually, by return of mail. It is sometimes best to nave a searci made at the Patent office. Such a measure often save the cost of an app hication for a pitent.
Preliminary Examination.
In order to have such search, mare ouc a written description of the inven-
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to order. Towle \& Unger Mf'g Co.. 50 Cortlandt St., N.Y. Five different sizes of Gatling Guns are now
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tion, and new recelpts. of great value. Price $\$ 1.50$. Manled

## HMust (4urise

J. K. asks: How can I obtain a a varnish or
ther 11quid, that would be perfectly onl proof, and not ther 1lquald, that would be perfectly oll proof, and not
crack when spread on a fexible surface? Soluble glass $G$ wiln do.
G. W. B. asks: What is the best preparaL. W. asks: How can brass be made of a G. W. C. asks: If two locomotives were Daced at the summit of an incline and alvowed to de.
cend of their own gravity (all things being equal except the size of wheels, which are four feet diameter on one
and six feet diameter on the other), which will reach he foot of the hill frst? If either, why? TThis is
cod problem for some of our younger readers, and we would be glad to hear from them on the matter.-EDs. H. M.H. asks: How can I prepare test lead frassayer's use? I want to get it free from sil er,
C. E. R. aslss: How can I make ink which,
used on blue writing paper, will take the color out,

C. C. says: I wish to make a small specu-
um for a reflect.ng telescope. 1 . Can I electroplate the surface of my mold with speculum wetal? 2. If so,
how can I polish the surface of my mirror? ny way tode detrmine the dip of the speculum that will be nect fsary to overcome aill aberation? Answers;
and 2 speculum metal, being a alloy of copper and tin, you cannot plate with it; but you can of course plate the
surface of your mold with silver, which, when polished, Jurface of your mold with silver, which, when polishea,
gives an excellent reflecting surface. Polish with cha5ives an excellent reflecting surface. Polish with cha
mois leather and Paris white. 3. A parabolic form given
C. A. C. asks: 1. How can I bleach or whiten Conge? 2. How can I make a silver.coatitng solution
Answers: in sponge can bet bleached by frrst soaking it n very dillte hydrochloric (murratic) acid to remov calcareous matter, and then in cold water, changing it
frequenty and squezing the sponge out each time to requeve all traces of the acti. It is next soaked in




 drams; rub them together to a fine powder, make into a
paste with wate: and rub on the surface of the copper brass. The silver pawder is made by precipitating it
$\underset{\text { Ineral substance does the grape vine absorb from the }}{\text { H. }}$ mineral substance does the grape vine absorb from the
earth in order to color the grape ekins purple? Is the chango due to the eaction of the e un? ? If so, what trans.
ormation does the grope go through? 2 , What is the
 els carpet? Oxalic acid appeared to take tit all out; buc When the carpet dried.the dark colno of the ing returned.
Answer 1. The change of color from the green unripe
And nswer: 1. The change of color from the green unis.
fruit to the purple grape ts due to a molecuar change, causer by the chemical action of Hight, or the natural
organic changes in the fruti, on coming to maturity. $A$ nolecular change doesnot indicate any chemical change in composition. The tnfluence of heat in effecting thit
hange mav ve seen in the case of ordinary yellow and
 withoutholtering the chemtical composition. 2. Collect
wry leaves and boil them for an hour or more in the for ry leaves and boil them for an hour or more in the forl
lowing mixture: Dissolve 4 ozs8. Washing sooda in 1 quart
等 of the leaves is soft. Put the leaves then into cold water, and rub the soft portion away. Then place them
cor about 15 minutes. in a solution of bleachisg powder (chloride of lime) with a little vinegar. Lastly wash in
lin
or cold water and dry. 3. Damp the spot with bolling water and rub auickly into
L. H. W. asks: What will be the difference
between the oo wer of a steam cyllnder three inches in
 hat of a rotary steam engine with the same amount of steam surface on the periphery of a seven inch drum,
making tour hundred revolutions per minute? Will the same proportion hold good in all IIzes of engines? An-
wer: You can readily calculate this for yourself in any same proportion holad good in alisizes of engines? An- An-
swer: You can readly calculat this for yourresf in any
case. The power exerted br the reciproctug engine case. The power exerted bv the reciprocatiug engine
area of piston in square inches $\times$ twice length of stroke $\times$ number of revolutions per minute $\times$ steam pressure
33,000 . The power of the rotary engine $=$ area of piston in ,, 000 . The power of the rotary engine $=$ area of piston
square inches $\times$ mean circumference of revolution $\times$ num J. N. N. says: When a common house fly rounded by a kind of opaque vapor, or substance resem. bling vapor, for about a sixtenth of an tnch in all direc
tions. Can you tell me the cause? Answer: It It a mold or fungus that springs from the decaying boay or the
dy. W. C. C. asks: Why do railroad men con-
tinuaily grumblea
out cast iron wheels, and yet cannot be prevailed upon to use any other? Answer:
Chilled cast iron wheels ere considered by many rall:

D. asks: If a patent is granted for an ar
ticle of product in the United States, ean a party put up the eame article in Canada, and export it across the
wateror ship 1 Into the United Siates for sale on pyyIng duty? Answer: In this country no person has the consent of the patentee.
 What soluble glass, and how is is manufactured? 3 . power capable of being exerted by a turbine wheel is Himited only the hight of fanl1, quantity of water and size
of wheel. 2 . Soluble soda, ora a donbe silicate of both. It can be made by
fusing together 1 aptrt silica and 2 prats cerbote fusing together 1 part sllica and 2 parts carbonate of
potash or soda, or 54 arts dry carbonite of soda, 7 ? parts of dry carbonate of potash and 192 parts silica. 3 . Com or mon salt 1 s chloride of sodum, a combtnation of the
two elements chlorine and sodium. It contains, when pure, 60 of chlorine and 40 of sodium in 100 parts.
A. R. asks: Is it true that a locomotive en A. R. asks: Is it true that a locomotive en (by suction) tull of afr, taking the supply through the
exhaust nozzes makin the botler a compressed a atre. ceiver, and by this means store up power safflicient to propel the engine? The engine is supposed to bein ful worrfing order, with the cylinder cocks closed. The
pressure (overa a certain amount) would, I maintain, be pressure (over a certain amount) would, $I$ mantain, be
relieved by the air escaping by the way it entered. An Helieved by he air escaping by the way it entered. An.
ower: Such an ocurrence might take place under cer
tain circumstances, depending upon the direction in tain cricumstances, ,eepending upan the dirrection in

which the engine was moving and the position of tin | $\begin{array}{c}\text { Which } \\ \text { Hink. } \\ \text { M. }\end{array}$ |
| :--- |

M. H. S. asks: What is used for bronzing rode or wear off? Answer : The method most common bronze prowder is put on with sizing.
D asks: What will destroy cutch brown nn silk or wool, ard not injure the goods,so that a good
black can be dyed on it? Answer: Wash the goods thoroughty and expose then 1.: a close chamber to the
fumes of burning gulphur. or plunge into water mod-
erately impregnated vith sulphuroxs acid gas. Afterwards wash thoroughly and dry
D. J. J. says: 1 . I hava a blue flannel shirt with a white flannel Dosom; ; he latter cannot be taken
oft, and I would like to know how to clean the white fiannel without injuring the blue flannel. Will ammo-
nia or ether do tit? What will clean the blue flannel ordinary manner but imme:se at once in warm water not in cold, and let the operation of washing be done as
quickly as possible. This will prevent. In some cases
G. H. asks: 1 . Is there any chemical com aid gray color? In other words, can you destroy the vital
it of the hair without injuring its growth? 2 . What the nature of the dye that some lad es use to give their
hair the appearance of age? 3. Is this dye permanent? 4. Has it ever been demonstrated that explosions of
builers, not manifestly
cue to low water, are caused
by generation of electricicty orby some power greater than
steam, inside ot ths booller? If not, what is the accepted theory on this point? Answers 1 1. We think not. 2, 3
They empley a powder. 4 . Our theory of botler explu They employ a powder. 4. Our theory of botiler explu sions is that they occur because the press
steam is greater than the boiler can sustain.
S. T. W. asks: What is the American stand tween the American and the English standards? An swer: : The English and American units for horse power
are the same, namely, the work performed in raising are the same, namely, the work performed in raising
33,00 lbs. one foot high in a minute.
S. P. asks: If a rope has a horse hitched
to each end, the horses $\begin{aligned} & \text { vulling in opposte directions }\end{aligned}$ with a force of 500 los. ea.
rope? $A$ nswer: 5001 bs .
J. S. asks: What ingradients are used to
render neutral to exch other two or any number of dif ferent colors of oil paint, so as to teep them from run-
ning together on water or witle wet, and the proceess of mixing in view the flisishing of water colors with paints, a method to prevent the different colors running to gether 1 to cover the water color, when perfectly dry
with a thin coat of size, carefully applied. J. G. D. T. asks: Does cor fined gunpowder
when ignited, expand gradual when ignted, expant gradualy yntio it breaks 118 en
closure, or does it create an explosion without any grad closure, or doesit create an explosion wishou any grad
ual expansion Answer Expansion in iecesary to
explosion. In the case of gunpowder, it takse place quiekly.
S. B. . L. asks: How can
tools?
Answer: You should heat the articleser to a small color, add plunge them into water which has the chil taken off. You may be sble to produce a better tempe straw color, place the articles in a pot of melted alallow,
over a fre. When the tallow is heated to such a degree that it just commences to smoke, withdraw the articles,
and plunge them into the water.
W. M. asks: What will take the stains of Wash the articles thoroughly in hot soap and water, and
then apply. with a rag or sponge, alittle aquac ammonta
C. N. asks: Does not the use of a bucket
pump, instead of a denble acting one, involve the loss of over $1 /$ of the power that would be avallable by the
use of the latter? Supose that the head be 102 feet Which gives a pressure of 45 los.; to this hedd add 1
feet, as the pump is set in the water, which will ad
 which $\times 49$ lbs. pressure gives a load on the bucket
1.758823 lbs. The diameter of the plunger (beng inches) gives an area of $1256 \cdot-64$ which $\times 45$ gives a water load of 56548.8 . Answer: The double acting pump ordi-
narily has a check valve at the bottom of the dellvery pipe, so that ihe head of waterin the pipe is not avalla-
ble in the down stroke. It would appear, then that the bie in the down stroke. It woolla appear, then, that the to the double acting one, arises from not utilizing the
walght of the bucket and pump rod in tie down stroke.
$\underset{\text { So or io ibs , the cerilicate allowing me to carry } 80 \text { ibs. }}{\text { W. . . }}$ The boler 185 years olda and in in good condotition. 2 , I Iam
greatily troubled about greatily troubled about Eeenping packing in around valve
roo and plpton. The engine runs very hot. It makcs
200 revolutions ard the packing burn 3. Is it easier to keep up steam with a little over one 3. 1si easier to beep up steam with a little over one
gageof water, or is it better to have the boiler full
afterit onceraised to the requiredpressare?

If fou are tn doubt about four totler, the best pla
 difference in either case
$\underset{\text { ble iron, or convert it into steal? }}{\text { W. Whamper: We mallea- }}$ our refer to the case-hardenting of tison. Heat the iron oredness, cover it with prussiate of potash, and plunge
into cold water. A becter process is to heat the tron In an artight box, contatining gntmal carbon, which may an artight box, contatinng n anmal carbon, which may
be prepared by slighty burning horns or hoofs, and reducing them to powder. Keep the box at a light red
heat. for an hour or more, and then empty tts contents heat. for an hour or more, and then empty tis contents
Intocold water. EIther process hardens the ron on the
surfece,

 valve has very small lead, scarcely one thirty-second of
n inch. I want to know if more lead would not give $e$ more power, and aliso let the engine sun more easitroke, with but small lead : I rad occasion to change Che run of the engine ; and in doling so, I happened to
ive her nearly $\%$ inch lead, which made her run, Ithink, zive her nearly $1 /$ tinch lead, which made her run, I think,
one fourth faster, with the same amount of steam. An. swer: hhe proper amount of lead can best be deter. nined by experiment, and you can probably hit upon it
J. says: In riding in the bed of a creek, I
came across a spot that sounded hollow; no oullet could came across a apot that sounded hollow; no outlet conla
le scent the botiom was sand and gravel. and the creek as moderately full only. What would be the result
 should dig over the spot where the hollow sound was
perceived, you would probably tap a cave, or natural Ollow in the eartu. Such are produced, especialls in washed away the mineral substance which oi iginally filled them. 2. If you use any oll for your gun, ust some
sind that will not ox'dize or thicken, such as watchkind that will not ox'dize or thicken,
makers' oll; and use very little of tiat.
F. X. M. says: Our men in the shop use
oft soap to remuve tiec siease ard d tr rrom thelichands hen they quit work. This, they fino, causes cracks to
 mooth, and any cracks on the hands will immediately
eal up. Can you sive the chemstry of this? eal up. Can you give the chemistry of this? Answer:
in the ordinary careles s manuiacture of soft soap, there apt to be sumetimes an excess of alkali or lye, above austic action on the skin, making it rough, and otherwise injuring it. After using soap of this kind, washing
n vinegar removes the excess of alkali from the hand $s$. inegar, being an acid, combines with the alkali, formg a neutral and soluble salc.
D. F. asks: Will carbureted air burn in an
tmosphere of its own carbonic acin, under a pressure S. R. asks: What can be done to make gas-
ine gas burn steadlly when a drait of air or gusi of .ine gas burn steadily when a drait of air or gusc of
ind strikes the flame? Coal gas is not affected by peculiarty you speak of 18 due to chemical causes which
tis difflcult to obvlate. Coal gas or heavy casbureted ydrogen is a complete chemical compound with little no menation thatise the light being pioduced by incandescent particles of ydrocarbon taking place. In carbureted air, however, made by passing atmospheric air through naphtita, ctc.,
we have merely a mechanical mixture of a hydrocarbon vapor with an incombustible gas, nameiy, the atmoshere. The nitrogen, byfar the larger portion of the
ir, not being combustible, is rapidly diven off through he flame, giving rise to the filckering unstable flame M. asks: What should bo the form and
 the top (the smoke pipe connecting at one side), an the grate should be as large as the diameter of the flue.
The boiler will sustain with safely a pressure of about The boiler will sustain with safely a pressure of about
35 pounds per square inch, if, as we suppose, its diame-
E. E. H. asks for an explanation of our ecipe for preserving cider. Answer: Read $1 / 2$ pail of
ugar instead of $1 / 2$ part. We have since learned from
he manufacturer that the sugar may be om.ted with he manufacturer that the sugar may be om.tted, with
advantage, when the juice is goud. The sugar is apt to
cause too great a fermentation. If sugar be added, cause too great a fermentation. If sugar be added,
owever, experience would teach what quantity to use
J. R. asks: When an electric battery is ap-
ied to a person for some time, and he beeps shaking afterwards as if he still had hold of the havalles, is it ight to apply the battery to take it off him again, or to
lthe electricity remain in till it goes of itself? Anet the electricity remain in till it goes of itself? An-
swer: Any trembling or shaking of the muscles or limbs arer: Any trembling or shasing of the muscles or ham af ected the nerves too severely, and not that any free
lectricity still continues to circulate in the body. Another application of the battery would only make maters worse
J. T. asks: How is it that steam taken from tagannstitself? Answer: In the action of the Giffard njector, steam is condensed, and the power previously
xisting in it is expended in the propulsion of the water. G. W. asks: 1. What is Javelle water? 2.
What is the easiest and most economical way of pro curing oxygen gas? 3. How is soda water made? 4. Where can Iget Rloxam's "Cheristry ?" Answer: 1 . See,
p. 278 vol. 26. 2. Heat the binoxide of mangauese to a dull deatin an iron retort. 1lb. of good commercial binoxde of manganese will yield from 5 to 6 gallons of oxy-
en.
s. By charging water under pressure with caronic acid gas, procured bv the action of sulphric acid
n. marble dust or any carbonate. 4. See our advertisC. A. D. asks: When, where, and by whom use? Answer: Spectacles were trst invented in the spectacles, says that they were invented between the
yeart 1280 and is11 A. D., by a monk of Florence named yeart 1280 and 1311 A. D., by a monk of Florence named
Alexander de Spina. Muschenbroeck sass that it is inof Florence, who died in 1317, that he was the inventor died in 1292, hy others Roger Bacon, in England, who
T. B. W. asks: If a steam boat runs four mile current? Answer: The speed of the vesse resistance oreased by the speed of the current, if the
J. S. . . P. asks: 1 . How is carbolic soap
made? What proportion of the (pure) acld 18 used? In mid winter. when the thermometer th the room stands ments, we call 1 t only comfortably warm. But in sum mer at the same temperature, though clad in the thin. nest possinle garments, we loll in the shade and call it
Intolerably hot. Why is this? Answers: 1. Carbolic intolerably hot. Why is this? Answers: 1. . Carbolit
acid soap is made by adding from 5 to 20 per cent of car bolic acid, according to the use to which it is to be ap plied. 2. We do not always feel the same degree of tem
perature, for example, 85 perature, for example, $85^{\circ}$ Fah., to be invariably op
pressive or hot. This is owing to the fact that the atmoisture than at others. The drier the warm or hot at mosphere, the less the heat is felt, owing to the rapid evaporation of perspiration from the surface of the
body. During a cold clear winter's day the air contains much less moisture than in summer, so that, althoug above, it may not feel uncomfortable, the insensible
perspiration rapidly passing off and cooling the body.
$\underset{\text { C. Wagnet to be operated by an earth battery? }}{\text { W. Answer }}$ You can make an earth battery by sinking two large them by conducting insulated wires attached to each. Such a battery was constructed by Bain in 1841. You
can make an electro-magnet by winding stout coppe wire, covered with silk, around a piece of soft fron ben In the form of a horse shoe, care being taken that th er from or towards the axis of themagnet. Th more numerous the coils, and the greater the
W. S. B. asks: How can I anneal gold after C. R. asks: 1. What is the best and most sconomical constant battery? 2. I have heard of a
thermo-electric battery. Is there one of practical util y? Answers: 1 . Daniell's battery is recommended fo constant action. It is not expensive, and no gases es
cape from tit. It consiets of a cylinder of copper, in which is placed s cylindrical vessel made of unglazed vessel a rod of amalgamated zinc is placed. The copper vessel is filled with a saturated solution of sulphate of copper with a little sulphuric acid. The porous cell is
filled with dilute sulphuric acid, and on a perforated shelf filled with dilute sulphuric acid, and on a perforated shelf,
fixed to the upper part of the copper cylinder, are placed crystals of sulphate of copper (blue vitriol) to keep up eries have been made of considerable power, but we D. H. M. asks How can I separate iron rom copper and brass? Answer: If you heat the met als in a cruçble,
$b \rightarrow$ poured off.
S. asks: 1. How is aniline made from coal
tar? Fhat apparatus is necessary? 2. How are bronze powders made? 3. How are the various colors produced Worcestershire sauce? Answers: 1 and 3 . The basic portion of coal tar or coal tar naphtha, that is, the least
volatile products of the distliation of these substances, is strongly agitated with hydrochloric actd in excess. This is done on the large acale in vessels lined with lead. The clear portion of the liquid is then decanted and and neutralized with potash ormilk of lime and distilled ine. By the action of bichromate of potash on sulphate of aniline, rich shades of purple and violet are produced.
2. To make a bronze powder, mix perozide of tin and sulphur, of each 2 parts, sal ammontac 1 part. Expose phurous fumes cease to be given off. 4. The following ecipe gives a fine sauce: Port wine and mushroom ketchup, of each 1 quart; walnut pickle 1 pint; soy $1 / 2$ pint; pounded anchovies $1 / 2 \mathrm{lb}$.: fresh lemon peel,
minced shallots and scraped horseradish of each 2 ozs.; minced shallots and scraped horseradish of each 2 ozs.; enne pepper and bruised celery seed of each $3 / 4$ oz. (or
curry powder $3 \mathrm{O} . \mathrm{z}$. ; digest for 14 days, strain and bottle
W. W. B. says: In making gas from petro-
leum, there are several cifficulties of which the most serious is the deposit of carbon in the shape of dry powand the gas holder. Petroleum is the finest gas-making
material we have, taking into consideration its price ; it will yield from 6,000 to 8,000 feet per barrel and the ; ; it ply seems to be inexhaustible. It is a question of great imnortance to the oll producer to get a steady market
for his oll, and to the people to get a cheap and good for his oll, and to the people to get a cheap and good
light. Both of thess objects would be attained by a uality solution of this question: Can gas of good leum on a large scale? I I say that it can, and it can be
lone
lon any mechanical arrangement to inject air and done by any mechanical arrangement to inject air and
petroleum in graduated quantities into the retorts; and petroleum in graduated quantities into the retorts; and
I also say that it will convert all the petroleum into gas figh illuminating quality and leave no carbon in any shape, etther in retort or pipes. I have proposed
the question to many gas men, but nobody seems to know anything aboutit, except that petroleum is a dif ficult thing to handle in gas making. I write to you to
ask : 1 . Will not the injection of air and petroleum into ask : . Whe convert all the petroleum into pas? 2. Would
the retort
there be any deposit of carbon on the retorts or pipes? there be any deposit of carbon on the retorts or pipes?
3. Would it be a permanent gas or a mechanical mixture? . Would there be danger of explosion from injecting a graduated quantity of air into the retort
Petroleum Answer
being a mixture of various hydrocarbons that is, various chemical combinations of hydrogen and
carbon that are for the cost part liquid at ordinary tem. carbon thatare for the most part liquid at ordinary tem-
peratures, it is obvious that it cannot be changed into a permanent gas without decomposition, or a new inter pounds. It is found that, when petroleum is submitted to a high temperature without accees s of oxygen, de bon being deposited. It is evident, then, that the perma nent gas formed is a hydrocarbon with a less proportion
of carbon than the liquid petroleum. To convert all the petroleum submitted to heat into a gaseous body, some
thing must be supplied that will combine with the extr thing must be supplied that will combine with the extra or one that can be removed by subsequent purification.
When petroleum burns in the air, its elements combine with oxygen, forming carbonic acid gas and vapor o Whth oxygen, forming carbonic acid gas and vapor of
water. The injection of air or oxygen into the decom-
posing retorts would therefore defeat the object in view
that of making a permanent illuminating gas. It would
simply cause a combustion of the petroleum nore rapid than that which takes place in the open air, besides the o inject hydrogen with the petroleum into the retort bydrogen. This hydrogen could be readily formed by nthra contact with the decomposing petroleum might yield a ortion of its oxygen to the extra carbon, thus obviating Which could be removed by water. If free hydrogen
年 were liberated, it would increase the heating properties of the flame. We simply mean here to indicate the philosophical method of experiment, bearing in mind the onstitution and afinnities of chemical bodies. Nothing at practical trial in this way can solve the probiem ill minating gas.
J. M. asks: How can I make an induction angement, can I make an electric light? Answer: You n make an induction coll as follows: In the figure, the

round a glass tube. Outside of this is wound the second ary fine wire coll of about 1,400 feet. Battery contact h, which, mounted between two brass pillars, is placed mmediately over the axis of the coil, in which is placeda passes through the pillar $d$ and the axis carrying the on bar, and contact is broken and renewed by the
oint $i$ dipping as $h$ revolves into and out of mercury on brass cup $g$ on the pillar $a$, through which the in in brass cup $g$, on the pillar $a$, through which the cir
uit is completed. The binding screws in front connect with the ends of the coarse interior coll, and for connection with the battery. Two screws behind connect With the ends of the fine wire coll, from which the sec-
ondary current is derived, and fro n which shocks may taken, water decomposed, etc. You cannot make the electric light with this arrangement. That requires that the fine wire coil should be wound round a soft tron iorseshoe magnet, which is made to revolve rapidly in
front of a permanent or temporary electromagnet.
J. K. asks: Is there in existence a means minute only, a machine which uses 5 horse power? The power which runs the machlne is unable to set it in
motion, and cannot even assist in it. What may I emloy to start the machine? Answer: We hardly get ur idea; but as the question is stated, it would seem engine, to start the machine.
A. L. B. says: In your answer to I. E. E., lighted by electricity is incorrectly stated. The burn ers in the Synagogue are not lighted by the galvanic current heating a platinum wire, but by induced elec
tricity, produced by a new frictional apparatus and con enser, contained in one small case. The electricity, enerated bv turning a crank, is stored up in the con enser, which, when a sufflcient quantity and intensity arrived at (depending upon the number of burners to e lighted), is discharged, producing a spark at eac gas which has been turned on immediately before the discharge.
Minerals, etc.-Specimens have been reeived from the following correspondents, and xamined with the results stated:
J. E. H.-Siliceous earth, apparently infusorial. Infuame of electro-silicon.
J. R. E.-Blue clay, a silicate of alumina
W. W. B.-Galena (sulphide of lead)
T. F. H.-Galena (sulphide of lead)
J. W. C. - Micaceous iron ore

COMMUNICATIONS RECEIVED.
The Editor of the Scientific American cknowledges, with much pleasure, the re ceipt of original papers and contributions upon the following subjects :
On Crucibles. By L. T. C.
On Silicon Steel. By C. W. H.
On Heat. By H. C. F.
Gn Perfect Combustion. By C. R. On a White Blackbird. By J. S. B. On Using Heat Twice. J. A. H. E. On Transit on the Canals. By R. D. R On the Art of Inventing. By K. On Lunar Acceleration. By J. H.
Also enquiries from the following C. K. C.-P. W.-W. H.-W. H. S.-E. J.-E. H. K.S. E. J.

Con espondents who write to ask the address of certain anufacturers, or where specified articles are to be had so those having goods for sale, or who want to find mountsufflcient to cover the cost of publication unde the head of "Business and Personal." Which is specially devoted to such enquiries.

## Index of Inventions

## FOR WHICH

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## Ar compressing apparatus, R. S. Pardee. Alarm and circuit, electrical, J. H. Guest

 nnunciator, electric vote, T. B. Doolittle Barrel head, A. Hanvey.Baton, policeman's, Beer
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ar wheel, A. F. Cooper..
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Paper ruling striker, J. D. Connolly
Peat machine, Clayton \& Howl



## APPLICATIONS FOR EXTENSIONS.

Applications have been duly fled, and are now pending
cor the extension of the following Letters Patent. Hear'ngs upon the respective applicat
the days hereinafter mentioned:
26,860.-Making Tinware.-S. J. Olmsted. Dec. 31.
26,952.-LAAAP.-G. Neilson. Jan. 7.
30,467.-SINGEING PIGs.-A. Denny

## EXTENSIONS GRANTED.

25,799.--HARVESTER.-E. Ball.
25,807.-HER Folder.-L. Clark.
25,814--Slemping Car.-J. Danner.
25,843 .-Cultivator.-T. McQuiston
50,862.-Werding Hoz.-J. M. Adams.
25,867.-Covering SADDLe Tress.-J. Maclure.
DISCLAIMER.

## DESIGNS PATENTED

## 956.- Toor Knob.-J. O. Hollts, Boston, Mass

6,957.-Rubber Boot.-L.L. Hyatt, New Brunswick, N.
958.-Stove.-J. Martino, Philadelphia, Pa. 6,959.- Picture Frame, etc.-J.Nonnenbacher, N.Y.city 6,960.-STATUE.-J. Rogers, New York city.
6,961.-Kite.-S. M. Simonds, Philadelpha, P

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L994.-Clothes Wringers.-Queen City Wringer Co. Cincinnati, 0
1,495--Bakine Powder.-Royal Baking Powder Co.
New York city. New York city.
1,496.- SToves.-J. Spear \& Co., Philadelphia, Pa. 1,497.-Grinding MILLs.-Straub \& Ce., Cincinnati, o.
1,498.-RubBER Boots.-Candee \& Co.,New Haven, Ct. 1,498.-RUbber Boots.-Candee \& Co.,New Haven, Ct.
i,499.—Quicksil 1,499.-QUICRSILVER
New Almaden, Cal.
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