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THE SAXBY AND FARMER SAFETY SWITCHES AND SIGNALS.
We have heretofore had occasion to notice, in the SoIEN tific American, the merits of the Saxby and Farmer interlocking system, as applied to railway points and signals, which, for nearly ten years past, has been in operation upon the principal English railroads. It has pro. ved successful to such a degree that, by act of Parliament, its use has been rendered obligatory on all new ligatory on all lines in England. The remarkable ca pabilities of the invention, in controlling the most intricate sets of switches, is practically exemplified at the Waterloo junction station, London. We have before us a photograph of the operating works at this station, at which no less than 108 switch and signal levers, all connected with the many tracks at this junction. tracks at this junction, are contiguously em-
ployed. It is gratifying to know that this valuable improvement, which is certainly one of the most important of all safeguards against switch accidents, is now being ex. tensirely introduced in this country. The Pennsylvania Railway Company, animated by the highly creditable desire to provide ble desire to provide their road with the best safety appliances, have lately put up, at the East Newark juncton, on the suggestion
of Mr. G. O. Howell, of Mr. G. O. Howell,
principal assistant enprincipal assistant en-
gineer of the New Jersey Division, a splendid example of the Saxby and Farmer system The engravings herewith presented are taken from these works. We understand that plans, for the employment of the sys tem at the grand depot of the same company at Jersey City, are now in progress. We hearthat the invention will also be employed at the railway junctions on the Centennial Exhibition grounds, Philadelphia, Pa., next year. Unless an engine driver deliberately shuts his eyes to prominent danger signals and intentionally dashes his train to destruction, it would seem that with the Saxby and Farmer mechanism an accident is hardly possible. The switch tender is utterly precluded from making a blunder either in signals or in locking or setting his points. The very worst he can do is to neglect his duty altogether, and the only result arising therefrom would be a temporary stoppare of the trains. He cannot shift points during the passage fannot shin a the track, nor can he easily signal a the track, nor can he easily signal a ine clear until such is the case. The characteristic feature of the Saxby and Farmer system is its absolute positiveness.
Our artist contributes in Fig. 2 a sketch of the locality at East Newark, N. J., showing the converging tracks eading from different portions of New


Fig. 1.-SAXBY AND FARMER'S SYSTEM OF RAILWAY sWITCHES AND SIGNALS.
ark to the junction, and on the left the Saxby and Farmer clear. 'I'he distant signals are cautionary, and placed 2,100 signal cabin, within which all the levers which control the feet from the switches, and the engine driver, if the signal ignals and switches are located. Beside the tracks are the arm denotes danger, slows down at once and runs to the ome and distant signal posts, the arms of which are always home post near the switches, and there stops and awaits the extended, indicating danger, except when lowered by the giving of another signal before proceeding.
operator for a few seconds, to signify that the passage is The large illustration, Fig. 1, represents the interior of the signal cahin, the upper story of which is surrounded by windows, affording a clear view in all directions. Here is located the row of levers and the governing mechanism, while beveath the flooring are the counterweights, together with the heavy rods and wire cords which lead to the various points which are to be controlled. The rods and cords extend from the cabin underground, in tubes, to the signals that are to be operated, the mos distant of which is nearly half a mile away fiom the cabin A sectional view of the lever 'mechanism is shown in Fig. 3. Just in the rear of the bank of levers is a frame containing two sets of rods, which fit in slots in the extremities of the frame, and have a free longitudinal motion. Connected with each lever arm is a locking bar, which beside sern ich latch to hold the as ither upright leve clined, also tilts or in which in turts a link larn oscil a slotted piece of metal attached to the lever, and arranged at right angles to the liding bars, and be tween them. As the slotted piece is turned certain dogs or projec tions on the sliding bars engage in the


Fig 2.-SIGNAL HOUSE, SWITCHES, AND SIGNALS slots, so that by this means certain levers other than the one or levers other than the one or one move ble, through the bars being thus firm ly held. It will be seen at once that, if these hooked projections on the bars be made adjustable, they may be so set and fastened that several of the levers may be locked by the motion of one and, conversely, that it may be neces sary to change the position of severa levers before one can be operated. Now in this latter case, if it be sup posed that the levers which must be operated first serve to lock facing points, or to cut off connection to a line to be kept clear, then it will be seen that, until this is done, the last lever which sets the signal right can not be moved. And this is the governing principle of the entire system. The levers, in order to be readily distinguished, are numbered, and painted in different colors. A black lever moves the switch points, and this $i$ does by the positive connection of bell cranks and rods, leading to a bar between the points. A blue lever gov erns the locking mechanism which holds the latter in place. The sume mode of communication leads to a long pivoted plate lying beside one rail, which, when the lever is changed.
rises up like one side of a parallel ruler, a little above and to one side of the rail, and swings over to a new position. The plate connects with a three-way crank, and the latter with bolts which shoot into the cross piece between the points. It is obviously impossible for the plate to swing over during the passage of a train, for the wheels prevent. Red and green levers manage the home and distant signals, and by suitable wire cords either turn the lights or lower the arms, arms being exhibited by day and lights at night. In rear also of the levers is a plate, showing their uses; and numiers on each serve to individualize them in accordance with a plan of the switches, etc. On each signal lever, besides its number, are marked the numbers of the otlrer levers which must be moved before it can be, so that the operator is provided with every means for showing him instantly what he has to do. It is impossible for him to move No. 2 signal, for example, until he has moved point lever 7 and locked it by lever 8 ; and then after he has pulled No. 2, that very operation prevents his stirring Nos. 11 and 15, which govern points crossing to the line shown clear by the signal; nor can he move No. 14, which might enable him to give a safety signal to lines which the open road crosses. A point lever cannot be stirred when a signal which should be at danger stands at safety. In brief, the device resembles a kind of vermutation lock, each portion of which is both latch and key; sometimes the projections on the bars which serve as the tumblers cause said bars to be shoved to one side, throwing other bars into or out of engagement-and thus all parts are inter-related in an ingenious manner.


The levers are all worked by one man, and he is instructed by the telegraph, the operator and instruments being located in the same apartment with him. The instant the wires deliver the message the levers are quickly moved, and in a few seconds the smoke of the approaching locomotive is seen far down the line. Should any part of the mechanism break, even at the last minute, there is no peril incurred. If any portion of the locking or switch gear give way or get out of adjustment, the signal lever cannot be stirred, and the semaphore arm remains at danger-its normal condition; so, also, if the signal mechanism itself rupture, the result will be negative, for the arm, being counterweighted, will not fall of itself, and, from the break, cannot be pulled down. The levers are moved in an instant; twenty seconds suffices at the Cannon street station in London to move ten pairs of points and all the signals belonging to them. We need not suggest the number of hands and 'the length of time which would be required to do the same under the old systems, nor the economy in expense and freedom from risk involved in the substitution of the new method.

Mr. Joseph Dixon, Secretary of the Broadway Underground Railway Company, is the agent for Messrs. Saxby \& Farmer in this country, and from him, at the office of the above named corporation, 263 Broadway in this city, further and more minute particulars may be obtained. The mechanism in the locality above described was manufactured in the factory of the inventors, an immense establishment in London, N . W., employing some $1,800 \mathrm{men}$, and imported hither. Certainly, the invention is one of surpassing importance and value; and with that conviction we can confidently direct to value; and with that conviction we can confidently direct to it the attention of the
the public in general.

A kind of tracing paper, which is transparent only temporarily, is made by dissolving castor oil in absolute alcohol and applying the liquid to the paper with a sponge. The alcohol speedily evaporates, leaving the paper dry. After the tracing is made, the paper is immersed in absolute alcohol which removes the oil, restoring the sheet to its original spacity.

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## SCIENCE IN COMMON SCHOOLING.

If it were possible to dispossess an average school boy of all the mental development and discipline, with all the knowledge, general and special, which he did not get in school, there would, we fear, be precious little left for the schoolmaster to take pride in. Still more, were it possible to set off,against the certain benefits of schooling of the usual sort, the advantages which a better ordered system of primary culture would afford, the popular appreciation of the schools would, we are certain, be seriously disturbed.
There are few places that can boast a more liberal scheme of public schooling-liberal, that is, in time and materialthan this city of New York. Her children may begin with the alphabet and end with a college diploma without other aid than that which the free schools afford. Yet the records of the schools show that, of the hundreds of thousands of children who have begun their schooling in them, more than half have gone out unable to read intelligently an easy page of print. Of those that are able to stay longer-that is,more than three or four years-it is but the fortunate few who with understanding the foreign telegrams in the morning paper; probably to not one in a hundred is the daily report of prices current any more intelligible than a page of integral calculus.
The fault lies less with the brevity of their school life than with the misuse of it which the school system entails-a system which makes a fetich of alphabet and multiplication table, and wastes on these tools of culture the children's best opportunities for gaining power to use them.
To insist that Science teaching be grafted on a system whose practical results are so meager is only to make mat ters worse. The sciences belong to a higher level of educa tion, and should be left for riper years. At this stage of the child's development, the Sciences, as oystematized group
ings of related facts and principles, have no existence, only objects and sensations, palpable facts and tangible relations have being in the child world ; and the child is merely the ob serving traveler and explorer. The scientific geographer, geolo gist, and the rest come later. Could we control the work of the common school, therefore, we should rigorously exclude all Science teaching, real or pretended, and all teaching not scientific.
Schoolmasters who imagine that teaching scientifically means cramming children with facts, principles, and theo ries in geography, grammar, physiology, physics, and what not may accuse us of making a distinction where there is $n$ difference; but the difference is as wide as between right and wrong. The most unscientific teaching which the common schools-and not a few of our higher schools,also-are guilty of appears in their teaching of the sciences. We would have none of it. Nevertheless, we say, as we have said before that to educate truly, the work of the primary school, in matter and spirit and method, should be, from first to last, purely scientific. In other words, the work of the primary schools should be shaped to accomplish these three ends (1) The systematic development and training in quickness keenness, and accuracy of all the child's faculties of sense through the pleasurable exercise of the senses; for in pri mary culture joy is the great quickener and inspirer of ef mary
fort.
(2) The systematic development of the child's mental fac ulties by varied acts of discrimination, judgment, and mem ory, dealing primarily, if not exclusively, with sensations (3) The formation of right habits in knowledge-getting, and in applying knowledge, through the personal observa tion, handling, investigation, and using of common things. As the young surgeon is set to study the human body; as the student of mining engineering is made sensibly acquaint ed with the ores he expects to deal with, their mineral as sociates, and the conditions of their existence ; as the practi cal machinist studies mechanics, so the child should be taught to study the world he has come to live in; not as a specialist in Science, but as a practical man, determined to master his environment. In this way only can his powers of sense and intellect be rightly developed and trained, and he sense and intellect be rightly developed and trained,
be fitted to play well his part in the great game of life
To this end letters are useful as auxiliaries, and for the cultivation of the wide fields of thought that lie without the cultivation of the wide fields of thought that lie without the
pale of Science; . but they should not be made the beginning pale of Science; but they should not be made the beginning
nor the end of instruction. If one part in ten of a child's nor the end of instruction. If one part in ten of a child's school life be devoted to letters, and the rest employed as we have indicated, he will not make less progress in reading than if the whole time be given to them; and he will be immensely better fitted to turn the art to advantage in after years. Besides, if the child's schooling be untimely cut short, as now happens in the majority of cases, his scientific training would fit him to make something, nay, to make the most, of his out-of-school opportunities. Far better absolute ignorance of letters, with the inquiring habits of mind and educated senses to be got by scientific traising for a year or two, than the half-acquired art of reading, which the majority of children carry from the sehools, weighted with the unawakened faculties and apathy of knowledge which they too commonly exhibit.

## GYRIAN SPONGES.

 The latest project before the Acclimatization Society ofParis is the cultivation of the celebrated Syrian sponge in Paris is the cultivation of the celebrated Syrian sponge in
the waters of Southern France, a valuable and most usefu) the waters of Southern France, a valuable and most usefu)
product, which, like many another gift of the sea, is in danger of extermination through excessive fishing.
The sponge-producing grounds of Syria occur along the coast, from Mount Carmel in the south to Alexandretta in the north, the centers of production being Tripoli, Ruad, Lattakia, and Bartroun, on the coast of Mount Lebanon. The best qualities are found in the neighborhood of Tripoli and Bartroun. According to a late report of the British vice consul at Beyrout, as many as three hundred boats are engaged in the fishery; the annual yield, though falling off hrough the exhaustion of the g. $\$ 100,000$ to $\$ 125,000$. The majority of the boats used are ordinary fishing boats, from eighteen to thirty feet in length, three parts decked over, and carrying one mast with an ordinary lug sail. They are manned by a crew of four or five men, one to haul and the rest to serve as divers.
In former years the coast was much frequented by Greek divers from the islands of the Archipelago; the number is now restricted to five or six boats a year, the skill of the Syrian combined with his better knowledge of the fishing grounds, enabling him to compete successfully with his foreign rival.
Diving is practised from a very early age up to forty years after which few are able to continue the pursuit profitably The depth to which the diver descends varies from five to thirty "brasses," or from twenty-five to one hundred and seventy-five feet. The time he is able to spend under water depends on natural capacity, age, and training; sixty seconds time is reckoned good work-in rare instances eighty seconda are spent under water. The Syrian diver uses a heavy stone are spent under water. The Syrian diver uses a heavy stone
to carry him quickly to the bottom, and is drawn up by a comrade. On the bottom, he holds the guide rope with one comrade. On the bottom, he holds the guide rope with one
hand and tears off the sponges with the other, placing them in a net which he carries. No knife, spear, or instrument of any kind is used in detaching the sponges; nor does he,like his Greek competitor, ever use the diving dress, having an antipathy to it on the score of its reputed tendency to produce paralysis of the limbs. Two or three fatal accidents oc cur annually, mainly among the skillful and daring, who sometimes drop the rope to secure a tempting prize, and
missing it on their return, attempt to rise to the surface un aided, and are drowned. At other times the diver will b wounded by jagged rocks, or his rope will become entagled
exposing him to great risks where the depth is great.
Though varying much in quality and size, the sponges are roughly divided into three classes: (1) The fine white bellshaped sponge, known as toilet sponge ; ( 2 ) the large reddish variety called bath sponge; (3) the coarse red sponge used for household purposes, carriage cleaning, etc. Two thirds of chants for exportation, while the remaining third is purchased on the spot by French agents. France takes the bulk chased on the spot by French agents. France takes the bulk
of the finest qualities. One tenth the price received by the of the finest qualities. One tenth the price
finders goes to the government for revenue.
It is possible that this high-priced and durable variety of sponge might be cultivated in our southern waters, as a subtitute for the beautiful but tender sponge they now yield The experiment would be worth trying.

## INSPECTION OF BOILERS

We have recently received the report of the Hartford Steam Boiler Inspection and Insurance Company for 1874. These annual reports always contain a great deal of information valuable to steam users, and we give a summary of the presont one.
The company report the total number of boiler explosions of which they have knowledge, occurring during the year in the United States and Canada, to be 105, killing 183 persons and injuring 199. They were only able to ascertain the causes of a few of these explosions, but venture the opinion that they might have been prevented in great part by a system of rareful inspection. As we have already explained to our readers, the ground in England is so well occupied by boiler insurance companies that the cause of every explosion in carefuly investigated; and the results of these investiga boiler explosions can be prevented.
During the year, the company inspected 29,200 boilers. Of this number, 9,451 inspections were internal and complete, and the hydraulic test was applied to 2,078 boilers. The number of defects discovered by these inspections was 14,256 , of which 3,486 were regarded as dangerous, or, in other words, the company declined to take any risks until the de fects were remedied. The report is mainly taken up with explanations of the nature of these defects and the proper remedies. It is not uncommon to find a furnace out of shape, or with a fractured sheet, as the result of overheating and sudden cooling. Blisters in plates are caused by imperfec tions in the iron. They should be trimmed off and a patch applied, if the thickness of the sheet is much reduced. External corrosion is caused by exposure to the weather, leaky fittings, and the like. Boilers should be set so that they can readily be examined externally. Internal corrosion is ordinarily caused by acids in the feed water, and the remedy is, narily caused by acids in the feed water, and the remedy is,
of course, to purify or change the feed. In cases of internai of course, to purify or change the feed. In cases of internai
corrosion, some plates of a boiler will be clean and bright, corrosion, some plates of a boiler will be clean and bright,
while others are corroded and pitted. This seems to be due while others are corroded and pitted. This seems to be due
to differences in the iron composing the sheets. Internal to differences in the iron composing the sheets. Internal
grooring is caused by change of shape, due to varying temperature and the action of acids in the feed water.
One of the most common difficulties is caused by the deposit of scale in boilers. The principal impurities in water are lime, sodium, and magnesia, with salts of iron and organic matter. The carbonate of lime is deposited in the form of a soft slush; but combined with other impurities, it forms a hard scale. If a boiler is blown out while the water is hot, this slush remains, and is baked into a hard mass; but by allowing the water to cool, and then letting it run out, the slush can readily be removed in a stream of water from a hose. The sulphate of lime, unlike the carbonate, forms a hard scale at once, and is, therefore, much more troublesome hard scale at once, and is, therefore, much more troublesome
than the carbonate. It becomes necessary in such a case to use some kind of scale preventive. The company hesitate to recommend any of the patent compounds in the market, since it is impossible to say that a preparation which is good for one boiler will be good for all. Frequent blowing will be found very beneficial, lowering the water level two or three
inches at a time. Potatoes act mechanically, enveloping the inches at a time. Potatoes act mechanically, enveloping the
deposits and preventing their adherence to the boiler. Pedeposits and preventing their adherence to the boiler. Pe-
troleum has been found useful in some cases, but its general application is not recommended. Astringents, containing tannic acid, decompose the carbonates, forming insoluble tannates; but the tannic acid in some cases attacks the iron of the boiler. Common soda appears to be one of the best solvents, being introduced with the feed, in ordinary cases in quantities of from 1 to 2 pounds a day. Whenever solvents of any kind are used, the boiler should be cleaned fre quently. The use of feed water heaters, to collect the im quently. The use of feed water heaters, to collect then recommended in former reports. These views are entitled to great respect, from the extensive expe rience of the company with deposits in boilers and th means of preventing and removing them. We can fally in dorse the recommendations given above.
While we have necessarily been brief in our review of this admirable report, we have endeavored to notice all th most important points.

## michigan's salt interests.

The first establishment for the production of salt in Michigan went into operation in the spring of 1860. Four thousand barrels were made the first year. In 1864, the yield was upwards of half a million barrels. The next five years
showed little progress; since then the gain has been steady showed little progress; since then the gain has been steady
until 1874 , when the total product was $1,026,979$ barrels. until 1874, when the total product was $1,026,979$ barrels.
Thus in fifteen years the Saginaw Salt Springs have become
as productive as the Kanawha (Va.) Springs, where the manufacture of salt has been carried on since 1804; and wo thirds as productive as our New York springs, where the manufacture was begun as early as 1797 . The manufactur-
ing capacity of the salt works of Michigan is now about ing capacity of the salt works of Michigan is now about
$1,800,000$ barrels a year: the total product since 1860 being nearly eight million barrels. Owing to the constant efforts of the State Inspector, and the intelligent care of the manufacturers, during the past two or three years the quality of the salt produced in Michigan has been much improved, so that it begins to compare favorably in the markets with the products of Onondaga.
The first satisfactory evidence of saline waters in the State, of a strength to make the manufacture of salt profitable, was published by the State Geologist, Dr. Haughton, in 1840. The untimely death of that gentleman deprived the State of its main reliance for giving intelligent direction to the development of the industry which promised so much advantage, and the interest languished for twenty years. Since 1860, as we have already seen, the correctness of D Houghton's opinions have been amply demonstrated.
The primary source of the brines of Michigan is not yet fully determined, though indications point strongly to a deposit of rock salt underlying a large portion of the northern part of the Lower Peninsula. No borings have yet demonstrated this theory; still such would seem to be the most probable source of the present supply of brine. 'The immediate sources of the saline waters appear to be areas of depression in the strata known as the Michigan salt group and the contiguous sandstones above and below. Along the Saginaw lalley,the depression seems to have the highest specific gravity. The rocks which furnish the brine lie a thousand feet or so below the which furnish the brine lie a thousand feet or so below the level of the lakes, and all wells carried to a sufficient depth
in this region are sure to yield rich and productive brines. in this region are sure to yield rich and productive brines.
The quantity of briue seems to be unlimited. Thestrength of The quantity of brine seems to be unlimited. The strength
the brine increases with the depth; in the first well sunk it marked 1 degree at the depth of 90 feet; $40^{\circ}$ at 516 feet; $60^{\circ}$ at 559 feet, and $90^{\circ}$ at 636 feet.
Borings have also been made in the Michigan representatives of the Onondaga salt group, which furnish the brines of New York, but thus far they have failed to afford more than a reasonable hope that these rocks may yield brines sufficiently strong to be worked with profit.
The salt-producing territory of the State is divided into twelve inspection districts, comprising sixty-eight salt companies, working forty kettle blocks, as many steam blocks, twenty-t
overs.
The
The first variety of salt block consists of fifty or sixty kettles and the stone or brickwork in which they are set, a protecting building from 75 to 100 feet long and about 20 feet high in the center, and sheds on each side containing drainage bins. The brine is pumped to vats, near each
block, whence it is carried in pump logs along the brickwork between the double rows of kettles, with a spout for each kettle.
The process of manufacture is very simple. The kettles are filled with brine and heated, and the scum which rises $1 s$ skimmed off. Then the brine is boiled, whereupon crystals of salt form on the top and fall to the bottom. When the brine is about half evaporated, the salt is dipped out and thrown into baskets to allow the mother liquor to drain away.
In the stean process, the brine, after settling in vats as in the kettle process, is drawn into the steam settlers, strong wooden cisterns, from 100 to 120 feet long, 8 feet wide, and 6 feet high. Here the brine is heated by steam pipes until brought to complete saturation; then after standing awhile to settle, the clear brine passes to the grainers, which are
wooden vats differing from the settlers only in being shallow, and heated in the same way. The saturated brine begins to deposit salt at once, and in the course of twenty-four hours is exhausted. During this time the hot brine is constantly stirred, making the crystals fine. The salt is then thrown out upon draining boards; thence it is taken to the packing house, where it remains a fo
drainage, before it is packed in barrels.
A pan block is a building large enough to cover the settler, the pans, and the packing room. From the settlers the saturated brine is drawn to the pans, set in flues so that the heat is applied at bottom. In this process-which is considered most economical-the evaporation is very rapid, and the salt makes continually, with great economy of heat.
The solar process is the simplest of all, the being effected by sun heat alone. Shallow wooden vats, 18 feet square, are employed, each provided with a movable roof or cover, so as to protect or expose the brine as the
weather may require. The evaporation begins in April, or as early as the weather becomes sunny, and continues unti November. The first crop of salt is gathered about the mid dle of July, the second in September, and a third in October The middle crop is the most valuable, owing to its greate coarseness. A bout a tenth of a crop is gathered in November which ends the season. The annual product of a is about fifty bushels.
Four grades of salt are recognized by the State Inspector to whose annual report, for 1874, we are indebted for the regoing information:
Fine salt: Suitable for general use for family purposes Made with artificial heat; of this grade the yield last year as barrels.
t: Suitable for packing and bulking meat and ish. Yield, 20,090 barrels.
Solar salt: Coarse and fine. Claimed to be equal to the
est Onondaga solar, Yield, 29,301 barrels.

Second quality salt: Includes all salt intended for No. 1 of foregoing grades, but not up to the standard. Good for salting stock, hay, hides, etc. Yield, 16,741 barrels.

## THE MISSION OF THE FLY.

The generally received opinion about flies is that, despite imitless ingenuity expended on patent traps and poisoned paper, they form one of those ills of life which, it not being possible entirely to cure, must perforce be endured with as good a grace as may he. ('onsequently when they ruin our
picture frames and ceilings, insinuate themselves into our picture frames and ceilings, insinuate themselves into our milk and molasses pitchers, or lull us to sleep with their drowsy buzzing, only to bite us during our slumbers and render the same uneasy, we thank fate that the cold weather will rid us of the pest. To be sure they are scavengers in their way; but after we have spent several minutes in picking a score or more out of the butter dish, we arrive at the conclusion that it is an open question whether they do not spoil more good material than they carry off bad.
Hestina lente, good reader, hasten slowly and do not anchor faith to such opinions until you are certain that the above sum up all of the fly's mission in this world. Musca domesica (Science uses six syllables in Latin to express that which good round Saxon epitomizes in two) is a maligned insect He fulfils a purpose of sufficient moment to cause you to bear his inroads into your morning nap with equanimity, o even complacently to view him congregated by the score within your hidden sweets.
Did you ever watch a fly who has just alighted after aring about the room for some little time? He groes through a series of operations which remind you of a cat lcking herself after a meal, or of a bird pluming its feathers. First, the hind feet are rubbed together, then each hind leg is passed over a wing, then the fore legs undergo a like treatment; and lastly, if you look sharp, you will see the insect carry his proboscis over lis legs and about his body as far as he can reach. The minute trunk is perfectly retractile, and it terminates in two large lobes, which you can see spread out when the insect begins a meal on a lump of sugar. Now the rubbing together of lejs and wings may be a smoothing operation; but for what purpose is this carefully going over the body with the trunk, especially when that organ is not fitted for licking, but simply for grasping and sucking up food. This query, which perhaps may hare suggested itself to housands, has recently for the first time been answered ly Mr. Emerson,an English chemist; and certainly in the light of the revelations of that gentleman's investigations, the Hly assumes the position of an important friend instead of a pest to mankind. Mr. Emerson states that he began his self-appointed task of finding out whether thehouse fly really serves any appreciable purpese in the scheme of creation, excepting as an indifferent scavenger, by capturing a fine specimen and gluing his wings down to a microscope slide. On placing the slide under the instrument, to the investigator's disgust
the fly appeared covered with lice, causing the offending insect to be promptly released and another substituted in hi place. Fly No. 2 was no better off than fly No. 1, and as the same might be predicated of flies $3,4,5$ (or of $n$ flies, as the algebras have it),Mr. Emerson concluded that here was some thing which at once required looking into. Why were the flies lousy? Meanwhile fly No. 2, on the slide, seemed to take his position very coolly, and, extending his proboscis began to sweep it over his body as if he had just alighted. A glance through the microscope, however, showed that the peration was not one of self-beautification; for wherever the ice were, there the trunk went. The lice were disappearing into the trunk; the fly was cating them. Up to this time, the investigator had treated his specimen as of the masculine gender; but now he changes hismind and concludes it to be a female, busily devouring not lice but her own progeny. The flies then carry their young about them; and when the family et too numerous or the mother too hungry, the offspring are eaten.
Awhile reasoning thus, Mr. Emerson picked up a scrap of white writing paper, from which two flies appeared to b busily eating somcthing, and put it under the instrument There were the progeny again on the paper, and easily rubbed off with a cloth. "This," he says, "set me thinking I took the paper into the kitchen again and waved it around, taking care that no flies touched it, went back to the microscope and thero found animalcules, the same as on flies. I had now arrived at something definite; they were not the progeny of the fly, but animalcules floating in the air; and the quick motions of the flies gathered them on their bodies, and he flies then went into some quiet corner to have their dainty meal."
The investigator goes on to describe how he continued the experiment in a variety of localities, and how, in dirty and bad smelling quarters, he found the myriads of flies which xisted there literally covered with animalcules, while other fies, captured in bed rooms or well ventilated, clean apart ments, were miserably lean and entirely free from their prey Wherever filth existed, evolving germs which might generat disease, there were the flies, covering themselves with the minute organisms and greedily devouring the same.
Mr. Emerson, while thus proving the utility of the fly, has added another and lower link to that curious and necessary chain of destruction which exists in animated nature. Thes nfinitesimal animalcules form food for the fires, the he spiders, the spiders for the birds, the birds for the quad rupeds, and so on up to the last of the series,serving the sam purpose to man. He certainly deserves credit for inte esting and novel investigation, and for an intelligent discern ment which might even attack the more difficult task of
teaching us the usen-for Nature makes nothing without teaching us the usen-for Nature makes nothing
some beneficial end-of the animalcules themselves.


Fig. 3.-THE HUDSON RIVER TUNNEL AT NRW YORK.-SECTIONAL ELEVATION OF SHAFT, TUNNEL, AND AIR LOCR.-Scale, 12 feet to 1 inck.

## THE HUDSON RIVER TUNNEL AT NEW YORK.

We have heretofore made reference to the commencement of the great work of tunneling the Hudson river, for the purpose of establishing direct railway connection between the city of New York and the many great railways that now have their termini at Jersey City, upon the opposite bank of the stream. The gigantic traffic of all these railways at present depends upon ferry boats, the maintenance of which is expensive, while they are subject to frequent interruption. In winter, especially, when fogs and ice obstruct navigation, the ferry passage often involves the public in disastrous risks ard inconveniences.
The project of tunneling the Hudson river at this point has been often proposed. Its importance as a promoter of the prosperity of New York city can hardly be overestimated. Every additional link in the chain of communications by which access to this metropolis is improved, rendered quicker, cheaper, or better, is a positive and permanent gain for the city. Every added facility for ingress and egress helps to swell its business, helps to increase both its resident and floating population, helps to build it up as the chief mart of commerce and finance of the New World. So obvious are the public benefits that must result from the building of great works like this that it seems hardly credible that it could have any real opponents. It is a serious fact, howev ing against it. But we are confident they will not prever ing against it. But we are confident they will not prevail The work has been actually commenced, the means, it is alleged, are provided, and we believe the day is close at hand
when railway cars will run under our Hudson with the same when railway cars will run under our Hudson with the same
frequency and regularity as they now run under the Thames, at London.
This work of tunneling the Hudson is being carried on under the auspicies of the Hudson Tunnel Company. Capital, $\$ 10,000,000$. Incorporated under the General Laws of the States of New York and New Jersey. The President of the corporation is DeWitt C. Haskin; Vice-President, George G. French; secretary,L. C. Fowler; ; Consulting Engineer, William H. Paine.
Fig. 1 is a plan sketch of New York and vicinity, showing the general position of the new Tunnel. The other engravings are taken from the Company's drawings and works. Fig. 2 is a cross section of the Hudson river, showing the Tunnel works in profile, the depths of soundings, borings, grades, and distances. The upper figures show the latter in hundreds of feet from the bulkhead lines. The intermedi ate figures indicate the depth of the water in feet. The low er figures give the depth of borings in feet. The extreme grade of the Tunnel is two in a hundred feet, descending from
Jersey City, then, ascending on the New York side, three in Jersey City, then, ascending on the New York side, three in
a hundred for 1,500 feet, then two in a hundred to the New a hundred

The greatest depth of water is a little over sixty feet. The borings show that the suil through which the Tunnel will pass is for the most part a tenacious silt, underlaid by hard sand. Near New York shore, a small extent of rock is encountered, and some gravel. The enacious character of thesoil is consid culty of any kind is anticipated by the Company
Fig. 3 shows a cross sectional elevation of the vertical shaft on the Jersey city side, lately begun, together with a portion of the intended horizontal Tunnel as it will appear when extended under the river.
Fig. 4 is a cross section of the Tunnel at the air lock.
Fig. 5, cross section of complete Tunnel and rail way tracks.
The Tunnel walls, C', will be constructed of the best hard brick and cement, three feet in thickness; circular in form, twenty-six feet in width and twenty-four feet in hight, painted white in the inside, and lighted with gas; with a double track rail way, with heavy steel rails, upon stone ballast five feet from the bottom. D, bottom drain.
The entrance to the tunnel on the Jersey side of the river is to be from Jersey avenue, on Fifteenth street; the work is to extend thence to Hudson street and the river, about 3,400 feet; thence under the river, curving five degrees northward, to the New York bulkhead line, at or near the foot of Morton street, about 5,400 feet ; thence curving slightly southward in New York, about 3,000 feet, to a point to be selected by commissioners.
The entire length of the tunnel and approaches will be about 12,000 feet (with the depot tracks to be added thereto), being about one mile under the river, and nearly three fourths of a mile upon each side.
The track will be of steel, ballasted with broken stone to five feet from the bottom of the tunnel, where can be located gas pipes, pneumatic tubes, and water pipes, if needed. Telegraph wires can be placed upon either side.
For the purpose of expedition, it is proposed to work, from each side of the river at the same time, as many men as can be successfully employed in excavating and laying brick, changing them each eight hours. Thus by constant work, doing three days' labor every twenty-four hours-by which it is believed the work can be advanced five feet from each end every day--the whole work can very easily be completed within two years. The Hudson Tunnel Railroad Company will then be able to convey passengers, without change of cars, from the South and West, as well as from Newark, Elizabeth, Paterson, and all local points, arriving at Jersey City, and within six minutes thereafter to Broadway, New York, where the Company hopes to make connection with the Broadway Underground Railway, which is to run north and south.
The company say that more than four hundred trains of cars could be passed through the tunnel each twenty-four hours. Freight trains would have transit at night. Marke trains in the early morning. All drawn by powerful engines,
made especially for this purpose, to be run by signals-with-
out bells or whistles-consuming their own steam and smoke, out bells or whistles-consuming their own steam and smoke, or run with compressed air.
All connecting railroads are to have an equal right to have their passengers and freight transported through the Tunnel upon the same equitable terms.
The construction of the Hudson Tunnel to a point near Broadway will soon involve the construction of anuther Tunnel under the East River to Brooklyn, from near the same point; then a perfect system of rapid transit railroads, run ning East, West, North. and South, would be in operation This, the Company believes, is in the near future, and their report adds:
" Rap d transit should not be considered.as useful in only one direction, but is equally useful to run East, West, South, and North-will be as well for New York, if extended to Brooklyn and Jersey, as to run into Westchester County. All will be benefited by the general prosperity of the main city itself. All are feeders to it. Thus all will derive their proportion of the benefits that their position entitles them to. This Tunnel the company justly regards as but the precursor to rapid transit in all directions, soon to follow


Fig. 1.-THE HUDSON RIVER TUNNEL AT NEW YORK. PLAN OF THE CITY AND VICINITY, SHOWING THE LOCATION OF THE TUNNEL.

- The Tunnel was commenced in November last, after extensive borings, for a year previous, in the bottom of the Hudson river, down to the depth to be occupied by the tunnel. A circular working shaft, C , thirty feet in diameter and to be sixty-five feet in depth, was then commenced one hundred feet inland from the water, on Fifteenth street in Jersey City. After it had been sunk twenty feet, with perfected brick walls four feet in thickness, the further prosecution of the work was enjoined at the suit of the Delaware, Lackawanna, and Western Railroad Company. The litigation occasioned thereby, it is hoped, will be terminated soon, and the necessary legislation secured, when the work proposed will be resumed and forwarded as rapidly as possible.
The company further say "that the great expense of an under taking of this magnitude has hitherto prevented its construc tion. The Hudson Tunnel Railroad Company, however, by the aid of compressed air,as applied in the patent thereior obtained by its president, Mr. Haskin, in connection with other important appliances, will be able to complete this work at much less expense than any similar work has ever been constructed. It is believed that its present capital of ten million dollars will be abundant for that purpose. In its plan of construction no expensive coffer dam, caissons, or Brunel shields will be needed.'
The use of compressed air introduced into the face of the Tunnel, with sufficient pressure to hold in place,or keep back and prevent the interruption of silt,clay or water, will," it is believed by the company, "overcome the difficulties usually experienced in constructing tunnels, and also enable it by this agency, to remove the water and waste earth to the surface, through pipes, without the aid of hoisting apparatus.'
The intended method of operating will be understood by eference to Fig. 3
A is the foundation ring on which the masonry of the vertical shaft is built and allowed to settle as fast as the earth below the ring is excavated. At E, is an air lock, composed of an iron cylinder, with hinged doors at each end for access of men and materials. The cylind 3 r is of small dimensions and rests upon a bed of earth and a wall, F, which, with a canvas curtain, G, and other packing, makes a sealed partition and forms a tight air chamber heading in front of the lock. A small railway track will convey bricks and materials to the heading. Air pipe,I, conducts compressed air from the surface to the heading. This air pressure is expected to as-
sist in keeping out water and upholding the roof of earth during excavation in front of the masonry, also to supply air for the workmen, who will work in considerable numbers on platforms, $K$, as shown in our engraving.
The air pressure will also carry back up to the surface, through pipe, H , and discharge at L , into scows at the dock, all sand, mud, or water that may accumulate in the heading during the course of the excavation (H, Fig. 3).
We shall watch the progress of the work with great interest giving our readers from time to time such incidents in con nection therewith as may be desirable. We heartily wish success to the enterprise, and trust that it may be brought to the speedy completion that the company anticipates.


## Racking for Photo Transparenctes

The British Journal of Photography says. To plain and rather thick collodion add some finely sifted carbonate of lead (white lead), in the proportion of a teaspoonful to four ounces of the collodion. Incorporate well together by trituration or shaking, then add a few drops of castor oil and as much Canadian balsam as would fill the half of a walnut shell. Filter through muslin, if necessary. This emulsion when poured upon glass will give a very fine and even opal surface and glass thus prepared will, for the purpose under consid eration, answer just as well as the finest and most expensive eration, answer just as well as the finest
opal glass, whether flashed or pot metal.
Another opal mixture consists simply of a mixture of collodion and negative varnish. Although very pure and trans parent when in the bottle, no sooner has a film been formed upon a cold plate of glass and allowed to become dry than the transparence gives way to a pure translucent white, presenting a very beautiful appearance. The mixture by mean of which we made our finest specimens was composed in the proportion of an ounce of ordinary collodion to two drams o a retouching varnish, which we had made of sandarac dis solved in alcohol.
Let those of our readers who desire to examine and exhibit their transparencies under the most favorable circumstances at once remove the ground glass from them, sup plying its place with a plain piece of glass rendered opaline by one or other of the methods described, and they will have every reason to be satisfied

## The Oxy-Sulphur Light.

We had a small sheet iron retort of the usual conical form The delivery tube of this we loosely plugged to act as a safety valve, if necessary, and in the lid we drilled a hole and screwed four inches of quarter inch brass tube. Through a hole in the side of this was inserted a piece of much smalle tube, closed by hammering the end, and having the closing pierced by a fine hole. By this arrangement we had the pierced by a fine hole. By this arrangement we had the
larger tube in communication with the interior of the retort and in the center of that tube, and rising a little bigher than and in the center of that tube, and rising a little bigher than
the level of its mouth, a smaller tube coming out at the side the level of its mouth, a smaller tube coming out at the side and long enough to enable a rubber tube to be attached-an
arrangement, in fact, very much like the ordinary form of blow-through oxyhydrogen burner. A quantity of sulphur was placed in the retort, and sufficient heat applied to raise the temperature to about $725^{\circ}$ Fah. the point at which it va porises. The end of the smaller tube was attached to the oxygen bag-one containing four cubic feet-and a fourteen pound weight applied, which was found amply sufficient. When the vapor of sulphur made its appearance, the oxygen was turned on, and the result was a steady flame of about two inches in length, and of such intensity that, although we had not an opportunity then of trying it, we are sure a small statuette could have been photographed by it in a few seconds.
The product of combustion-sulphurous acid-may easily be got rid of if there be in the room a suitable chimney; but even without that, there is no difficulty in rendering it so harmless that the operation may be carried on in a drawing room.

Beet Cider.
M. Plouard, a lawyer of Andelys, France, has invented a new cider, said to be very cheap and of excellent flavor-the peculiarity of which is that a large proportion of sugar beets is mixed with the apples before pressing; 80 lbs . of beets are mixed with 700 quarts of apples, or about 11 lbs . to 100 quarts. The beets and apples are pressed together, then saturated with water, left quiet in a cellar for twenty-fou hours, and pressed anew. This is repeated seven times. The inventor says he makes 100 quarts of cider for 80 cents, which seems rather questionable.

## The Latest Novelty in Paper

Inasmuch as paper has been made available for the manu facture of almost every variety of furniture and articles of dress, it is passing strange that paper coffins should have been left till this late day unthought of. The undertaker is certainly not an enterprising party. Trink makers have long been credited with using all the unsalable printed books; bu at the present rate of production, were every traveler supplied with a van load of these troublesome impedimenta to travel ing, such a stock would remain that all the bookshelves in the world would not contain a tithe of them. To further reduce the stock, a manufacturer out West proposes to supply every journeyer, to that bourne whence no traveler returns, with last trank made of papier maché, waterproofed with asphal
M. Schretz states that borax enfeebles the spontaneous movements of all living vegetable tissues and kills micro scopic animalcule. In this country, the use of borax as a pre servative of weed has been patented.

## cartespradeuce.

## A Fossill Skeleton

To the Editor of the Scientiflc American:
About three weeks ago, there was a report circulated in this vicinity that some men, while digging for water, had come across the skeleton of a most gigantic beast, the like of which had never before been found.
On hearing that the skeleton was on exhibition in this town, I went to see it. There were not many of the bones to be seen, but there were
the beast must have been
The horn, which was the most conspicuous, I found to be eight feet nine inches in length and two feet one inch in cir cumference. It is slightly spiral and considerably curved
in form tapering almost to a point; it is hollow for about four feet from the large end, which bears traces of having partly wasted away. There are three pieces of the jaw, one of which is two feet long and contains the two back molar teeth, and is onc foot five inches from the joint to the first molar tooth. A similar piece of an ox jaw is about one half the whole length; so this, in the same proportion, would be about four feet long. This piece, which is of the lower jaw, is about six inches thick and eight deep. The largest of the teeth are seven inches long, and three and one half broad measured on the face. A joint of the back bone measured thirteen inches in breadth and twenty-one in hight; but it is broken on the upper end. The joint at the back of the head measured eighteen inches across. A bone, said to be the third short rib, is four feet five inches in length, and th bone from the knee to the ankle is seven inches across the top.
The horn in its present state weighs one hundred and five pounds,and one of the teeth weighs five and one half pounds. The bones are in a very good state of preservation, and also the horn; but the teeth (which aretubercular) are perfect, the enamel being as hard and intact as ever.
These remains were found in marshy land on the north shore of Lake Erie, eighteen inches underground; and ove them there stood an oak tree three feet in diameter. There is more of the skeleton still under the surface, which will be taken out as soon as the frost is out of the ground

## s this skeleton similar to that of a mastodon?

St. Catharine's, Ontario
A. R.

## Kaolin in the United States.

To the Editor of the Scientific American:
Thir y-five miles from Omaha. Neb., there is a deposit of kaolin, about 30 feet thick and underlying about 100 acres It crops along a bluff for over one half mile, with but a few inches of earth covering it. Beginning at the top, it is coarse and of a granulated nature; but as we descend, it grows finer, and is very fine and white near the bottom. It quar ries in lumps, like chalk, and very readily dissolves in water
Pure and free from foreign substances, it readily be comes pliable, and can be turned or molded into almost any form; and its shrinkage in drying is remarkably small. The difference of grades in fineness adapts it to the manufacture of a very large class of goods, such as are in demand throughout the West ; and as it lies near the Burlington and Missour Railroad, shipping facilities are convonient.

It makes a beautiful white brick, suitable for fronts and trimmings; and it seems well adopted for terra cotta, chim ney tops, drain pipes, and all classes of jugs, crocks, etc. and is very superior for fire bricks.
This immense deposit, located as it is with timber, water and all conveniences for manufacturing, offers, I think, a good opening for some capitalist to build up an immense business. I hope to see such a one take hold of and develop this material.

Omaha, Nel. J. M. Gondwin

## Setting Locomotive Valven

To the Editor of the Scientific American:
In your issue of February 20, W. S. W. asks whether lo comotive valves can be set without opening the valve chests If the face of the valves and their seats are in good order their adjustment may be determined with suffcient accurac water cocks in the bottom of the cylinders. This may be best done when there is but little pressure in the boiler, not quite enough to move the engine. Set the reverse lever to its extreme forward position, then open the water cocks and the throttle; then bar the engine forward, and, as the cranks approach their dead points, note carefully when the steam begins to issue from the water cocks. If the valves are correctly set, steam will begin to issue just before the cranks arrive at their dead points, owing to the lead of the valves. The amount of lead may be determined by placing a straight edge against the gland of the stuffing boxes of the valve stems, and marking (with a fine scratch awl) on the valve stem, just at the point wheresteam begins to issue, and then again just as the crank reaches its dead point; the distance between the scratches will of course indicate the amount of lead, and should not exceed one eighth of an inch for passenger engines, and less than one sixteenth of an inch for freight engines
One revolution of the drivers is sufficient to examine each of the four dead points and adjust the lead and range of the valves, the range being adjusted by varying the length of the rods, of course, and the lead by moving the eccentric on the shaft, forward or back, as the case may be.
In setting valves as above explained, it is well to repeat he observation at each of the four dead points by moving the engine back sufficiently to take up the slack of the valve
gear, and then bar it forward again and apply the straigh edge as before.
To set the valves for the backward movement of an engine he reverse lever must of course be placed at its extrem back position, and the engine must be moved backward in tead of forward,otherwise the adjustment is of course precise ly the same as for going ahead, except that all adjustment in the range of the valves must now be done by varying the length of the eccentric rods, because the least variation in the length of the valve stems would now upset the previous ad justment for going ahead.

## Worcester, Mass

F. G. WOODWARD.

## To the Editor of the Scientific American:

In your issue of February 27, a correspondent gives short method for squaring numbers ending with 5 . There
is an excellent rule for squaring any number; and by its aid is an excellent rule for squaring any number; and by its aid
the operation can be performed mentally on any number of not more than two figures. It is as follows:
Take the nearest number ending with a cipher to the numer to be squared; if such number be greater than the one to be squared, subtract the difference between the two from he number to be squared, and if it be less add the differ ence; then multiply the number thus obtained by the one ending with 0 , and to this product add the square of th foresaid difference. The result will be the square of the numbers.
For example: Take the number 64. The nearest number ending with 0 is 60 . The difference becween the two is 4 , which add to 64 , making 68 . Then $68 \times 60$, which can easily be performed mentally, is 4,080 , to which add the square of he difference, which is $4 \times 4$ or 16 . The result is 4,096 , th quare of 64 .
If the number to be squared were 68 , the operation woul hen be $(70 \times 66)+2^{2}=4,624$.
This rule is always correct, easily remembered, and will Newark, Ohio.

A New Rifle Projectile.
To the Editor of the Scientific American:
I enclose a sectional sketch of a projectile which I hav invented. It is principally adapted to rifles. I believe I may safely say that I have made the longest shooting with it that was ever accomplished, ceteris paribus. Out of ten shots which I fired at a barn, at a distance of 2,773 yards, five assed through two boards, each over an inch airst board in thickness, and the sixth passed through
I used a common riffe, an old one, without any of the mod n improvements; judging from the circumstance that it or ginally had a flint lock, it must have been made at leas orty years ago.

A is the projectile. B is a wooden cov er in which the shot is placed. It serves two purposes: 1. That of filling up a space. 2. That of preventing windage, which it effectually does. C $D$ is the waist. It comes, or was intended to come, in contact with the rifling of the cylinder Proportions: $C$ D=diameter, $\mathrm{E} G=1$ diameter, $F$ G $=2$ diameters. Were the projectile designed for a field piece the waist would be broader, and would be fluted for the purpose of receiving a band of softer metal. upon which studs would be placed.

Colonel Strange,R. A., Dominion (Cana a) Inspector of Artillery, whose opinions on such matter are worthy of consideration, and who was one of the officers selected by the British Government to report on the artillery and arms of Prussia and France during the recent war, write as follows:

## J. Mrucdonald, Esq., London, Ont. :

anuary 8 , 1875 , inclosing description the receipt of yours of y you, and asking my description of a projectile proposed having an extremely long range. The form is exceedingly fa varable not only to overcome resistance from air in front, but the projectile would be less retarded than those of the ordinary form (that is, with a flat base) by the vacuum formed be-
hind the projectile when it moves with a velocity greate hind the projectile when it moves with a velocity greate than the air can rush in
ation at high velocities.
2. The center of gravity of your projectile is in about th right place, if the rifle had a quick twist; otherwise it woul ight place, if the ritle had a quick twist; otherwise
have a tendency to drop in front at extreme ranges.
The causes which led to the good shooting are probably : $a$. The wood, having a lower specific gravity than the lead,
was forced forward by the discharge and filled up the groves was forced forward by the discharge and filled up the grooves
of the rifle, imparting a twist and preventing windage. If of the rifle, imparting a twist and preventing windage. If
you examine the bullets, you will find probably that not even you examine the bullets, you will f
the waist-was cut by the grooves.
$b$. In the service artillery projecti
$c$. The draw in contact with the gun. c. The drawback to your system would be the difficulty of must be narrow to preserve your form.
$d$. The effect of field artillery depe Solid rifled artillery projectiles are obsolete. The space for powder in a common shell, on which its destructive powe e. Also the space for bullets in the Shrapnel shell. I Also the space for bullets in the Shrapnel shell. you have hit on correct principles. Excuse haste and a candid reply.
T. B. Strange, Colonel,

Dominion Inspector of Artillery.
You are at liberty to make what use you like of this com
unication.
London, Ontario

Experiments with Honey
To the Editor of the Scientific American:
On page 132 of your current volume, I noticed that one o our correspondents has great difficulty in preserving straine honey. Perhaps it would be of interest to him, as well as ther readers of your valuable paper, to know that candied or crystalized honey can be permanently restored to transpar ency by the following method, which I have found success ful: Take a flat bottomed pan, as deep as the bottles con taining the honey, and fillit with cold water; place the bottles in it so as not to touch each other, put it on a slow fire, and heat it up to $212^{\circ}$ Fah., and keep it at that heat until th and heat it up to $212^{\circ}$ Fah., and keep it at that heat until the
honey is clear. Remove the pan from the fire, and you will honey is clear. Remove the pan from
have no further trouble with the honey
Pittsburgh, Pa
A. L. F.

## Tests of Vulcanized Rubber for Belts.

Chemical analysis, in the majority of cases, is powerless to determine the quality of vulcanized rubber, and the con sumer is usually left to mechanical tests of the article fur nished him, in comparison with other and similar products o known excellence, in order to find out whether the former i adapted to his purpose or attains a fixed standard of efficien cy. These trials consist in examining the comparative de grees of elasticity and tenacity. The manner in which they are conducted in the French navy appears to us practical and easily followed. The first test consists in cutting from the sheets samples, which are left in a steam boiler under pressure of 5 atmospheres for 48 hours. At the end of this time, the pieces should not have lost their elasticity. The specimens may then be placed on the grating of a valve box under a pressure from above of 85.5 lbs . per square inch, and should withstand 9,100 strokes at the rate of 100 per minute. Specimens not boiled should withstand 17,100 strokes. Thongs of rubber boiled, aud having a section 0.6 inch square and a length of 8 inches, fixed between supports and square and a length of 8 inches, fixed between support and elongated $3 \cdot 9$ inches, should resist without breaking a
further elongation of 8 inches, repeated 22 times a minute further elongation of 8 inches, repeated 22 times a minute
for 24 hours. Thongs not boiled, under the same conditions, should resist for 100 hours. These extra elongations may be easily made by a wheel, to the periphery of which one end of the thong is fastened, while the other extremity may be ttached to a support. By turning the wheel, any determined longation may be given at the rate of from 20 to 25 times per minute. Under the above conditions bands of first qua lity rubber, perfectly pure and well vulcanized, break after 180 or 200 elongations of 8 times the initial length. Bands cut from pure rubber, but of secondary quality, break after 50 or $\mathbf{6 0}$ elongations. Inferior caoutchouc, containing mine al matters or residue of old vulcanized rubber, gives no re ults at all.
M. Ogier (from whose valuable paper, recently read befor he Paris Society of Civil Engineers, we extract the main facts of this article) has investigated the properties of rub ber belts made of repeated layers of cloth covered with pre pared rubber. Through the adhesive nature of the caou chouc, the superposed tissues form, after vulcanization, homogeneous substance, comparable, in M. Ogier's opinion to the best curried leather. His experiments, in order to ol tain the coefficient of friction of these belts on cast iron pul leys, give us results varying from 0.42 to 0.84 , as agains the coefficient for leather, $0 \cdot 28$. The minimum value corres ponds to canvas and rubber belts without an exterior rub ber coating. On pulleys of various forms, the maximum value of the coefficient of friction was found on those slightly convex and presenting a roughly turned surface, this re sult being inverse to that obtained with leather belts. Si milarly the presence of fatty bodies has an opposite action milarly the presence of fatty bodies has an opposite action On covering the former with a light varnish of half olive oil and half tallow, the adhesion was found to be considera bly augmented. This fact M. Ogier, who does not counse he use of the varnish but for rubber-coated belts, attribute o a resinification resulting from an action on the mixture of he excess of sulphur, which the caoutchouc always reject fter a certain period.
Fxperiments were also instituted on leather and rubber belts, in order to determine their resistance to rupture, and the law of elastic and permanent elongations obtained unde increasing stress. These trials were made on belts 117 inches long, suspended from a crane by jaws, and carrying at their lower extremities other jaws which sustained the weight Both pairs of jaws grasped the leather for a sufficient distanc oreclude any possibility of slipping. The belts were al owed to remain under stress for an hour and a half befor he elongations were measured. The results obtained ma e summarized as follows: 1. The resistance to traction of ubber and canvas belts per square millimeter ( 0.0009 squar nch) of section is at least equal to that of leather belts. This resistance per square millimeter is independent of di mensions-length, breadth, or thickness. Such is not th case with leather belts, and therefore preference should b given to rubber belting whenever the conditions of the powe to be transmitted necessitate the employment of very long, very wide, and very thick belts. 3. From two trials it appear that the external covering of caoutchouc adds nothing to the esistance, and hence it is advantageous to use covered belt which, at equal weights and prices, give a superior resis ance. 4. Under the same weight the elastic elongation of eather belts is double that of rubber ones. The permanen longation, under a change of 0.55 pound per square millime er, reached 2 per cent in the former and nothing in the lat

This last fact is worthy of special note, since the lack of This last fact is worthy of special note, sess, may be traced
thereby to the fact that a workman, used to leather belting, reats rubber naturally in the same way. He tightens the latter when it slips, a proceeding which results in breakage
or rapid destruction through use at too high a tension. M. or rapid destruction through use at too high a tension. M.
Ogier concludes that, in the present state of the leather and Ogier concludes that, in the present state of the leather and rubber industries, the price of installation, useful effect be ing considered, of leather and rubber belts is about the same,
but the cost of maintenance of the latter is small when compared to that necessitated by the use of leather belts of large dimensions.

## Electric Lathe Chuck.

In order to obviate the iaconvenience and loss of time in olved in the ordinary mode of fixing upon a lathe chuck certain special kinds of work, such as thin steel disks or small circular saws, the chuck is converted into a temporary small circular saws, the chuck is converted into a temporary on the face of the chuck, are held there by the attraction of the magnet; and, when finished, can be readily detached by merely breaking the electric contact and demagnetizing the chuck. The face plate of the magnetic chuck is composed of a central core of soft iron, surrounded by an iron tube, the two being kept apart by an intermediate brass ring; and the tube and core are each surrounded by a coil of insulated copper wire, the ends of which are connected to two brass contact rings that encircle the case containing the entire electro-magnet thus formed. These rings are grooved, and ecteive the ends of a pair of metal springs connected with receive the ends of a pair of metal springs connected with the terminal wires of an electric battery, whereby the chuck is converted into an electro-magnet capable of holding firmly on its face the article to be turned or ground. For holding articles of larger diameter, it is found more convenient to use an ordinary face plate, simply divided into halves by a thin brass strip across the center; a horseshoe magnet, consisting of a bent bar of soft iron, with a coil of copper wire round each leg, is fixed behind the face plate, each half of which is thus $\tilde{\delta}$ onverted into one of the poles of the magnet. The whole is enclosed in a cylindrical brass casing, and two brass contact rings fixed round this casing are insulated by a ring of ebonite, and are connected with the two terminal wires of the magnet coils. A similar arrangement is also adapted for holding work upon the bed of a planing or drilling machine, in which case the brass contact rings are dis pensed with, and any desired number of pairs of the electro magnetic face plates are combined so as to form an extended surface large enough to carry large pieces of work. For exciting the electro-magnet, any ordinary battery that will produce a continuous current of electricity can be used; but in machine shops, where power can be obtained, it is more
convenient to employ a magneto-electric machine-such as convenient to employ a magneto-electric mach
Gramme's, for instance-rather than a battery.

## The Pyrophone.

At a recent meeting of the Society of Arts, London, a paper descriptive of M. Kastner's new musical instrument, the pyrophone, was referred to. One of the instruments was in the room, and was experimented upon in the course of the evening. It was composed of a frame enclosing glass tubes, arranged in the form of the pipes of a small organ. In each of the tubes were two jets of gas, which were made to unite and separate by the action of keys, and thereby produced musical sounds. The paper, after describing the sound of the pyrophone, proceeded to explain the principles on which the sounds were produced. A very simple mechanism caused each key to communicate with the supply pipes of the flames in the glass tubes. On pressing the keys the flames separated, and the sound was produced; as soon as the fingers were removed from the keys, the flames joined, and the sound ceased immediately. If two flames of suitable size were introduced into a glass tube, and they were so disposed that they reached one third of the tube's hight, measured from the base, the flames would vibrate in unison. This phenomenon continued as long as the flames remained apart, but the sounds ceased as soon as the flames were united. The chairman, Lieut.-Col Strange, said that this instrument was the invention of young man who did not claim merit for it as a musical instru
ment, but as a scientific experiment, which, he hoped, would ment, but as a scientific experiment, w
be of great value in the musical world.

The engraving of the pyrophone appeared in Vol. XXX Scientific American, page 279.

## The Morse Telegraph Alphabet.

At a recent meeting of the Scottish Society of Arts, Edin burgh, Dr. Russell, Demonstrator of Anatomy to the Uni versity, read a paper on "The Telegraphic Alphabet as branch of Technical Education in Primary Schools.'
In the course of his remarks, the lecturer explained the structure and uses of the Morse or telegraph alphabet, by means of a diagram, advocated its introduction into primary schools, and more especially into those situated along the coast. He then proceeded to mention some of the advan tanges possessed by the alphabet as a means of communication. Among these were its extreme simplicity and the ease with which it could be learned by very young children; that it helped to prepare for post office employment and a seafar ing life; that it was already known all over the world by ex perts; and that it could be used with or without any appara us-an advantage which the lecturer believed was not pos sessed by any other method of signaling; that it involved o expense; that it formed a good alphabet for the blind ; tha it developed the sense of time or rhythm; and was impor tant in relation to lighthouses. Dr. Russell further stated that the Morse alphabet had been introduced with marked success into Kilmodan Free Church School and South Hall Public School,

The following article translated from Des Ingenieurs Taschenbuch, seems to contain, in a small space, a great deal of valuable information which will probably be acceptable to many of our readers.
alues.

1. Common Glue.-The absolute strength of a well glued joint is:

Pounds per square inch


It is customary to use from one sixth to one tenth of the above values, to calculate the resistance which surfaces joined with glue can permanently sustain with safety.
2. Waterproof Glue.-Boil eight parts of common glue with about thirty parts of water, until a strong solution is obtained ; add four and a half parts of boiled linseed oil, and let the mixture boil two or three minutes, stirring it constantly. (In these directions, and in those that follow, parts by weight are to be taken).

## Cements.

1. Waterproof Cement for Cast Iron Pipes, etc.Take equal weights, in dry powder, of burnt lime, Roman cement, pipe clay, and loam,and knead the whole with about one sixth the weight of linseed oil. The addition of more Roman cement improves the quality.
2. Cement which Resists Moisture and Heat but not the Direct Application of Fire, for Gas and Steam Pipes and Similar Purposes.-Two parts of red lead, five parts of white lead, four parts of pipe clay; fine and dry,and work the whole into a stiff mass with boiled linseed oil
3. Rust Cement for Water and Steam Pipes, Steam Boilens, etc.-Make a stiff paste with two parts sal ammoniac, thirty-five parts iron borings, one part sulphur, and water, and drive it into the joint with a chisel ; or, to two parts of sal ammoniac and one part flowers of sulphur, add sixty parts of iron chips, and mix the whole with water to which one sixth part vinegar or a little sulphuric acid is added. Another cement is made by mixing one hundred parts of bright iron filings or fine chips or borings with one part powdered sal ammoniac, and moistening with urine; when thus prepared, force it into the joint. It will prove serviceable under the action of fire.
4. Stove Cement, hor the Joints of Iron Stoves.Mica, together with finely sifted wood ashes, an equal quan tity of finely powdered clay, and a little salt. When re quired for use,add enough water to make a stiff paste.
5. Iron Cement, which is Unaffected by Red Heat. Four parts iron filings, two parts clay, one part fragment of a Hessian crucible; reduce to the size of rape seed and mix together, working the whole into a stiff paste with a satur ated solution of salt. A piece of fire brick can be used in stead of the Hessian crucible.
6. Cement for Fastening Wood to Stone.-Melt to gether four parts pitch and one part wax, and add four parts brick dust or chalk. It is to be warmed, for use, and ap plied thinly to the surfaces to be joined.

## The Vicissitudes of the Sea.

The steamship Abbotsford recently arrived at New York, 108 days from Antwerp, during which the following mishaps occurred: On reaching one of the southern points of Eng land, the ship stopped for a few minutes to land her pilot and while so engaged was run into by another steamer, and so badly injured that the vessel had to go to London for re pairs. Delay one month. The Abbotsford then continued her voyage to New York, but in mid-ocean, during a heavy her voyage to New York, but in mid-ocean, during a heavy
gale, her propeller suddenly broke off. This converted her into a sailing vessel. The captain then put back to Queens town, Ireland. On approaching land, a heavy gale blowing, he signalled for help from another steamer, which, in the of fort to connect a hawser, dashed into the Abbotsford, knock-
ing a hole forty feet long, happily above the water line. Through this vessel rolled, until the fore compartment was filled. But a last they reached Queenstown harbor; temporary repairs were made, and tugs employed which took the vessel to Liverpool. Here another month was consumed in repairs, and then another start for New York was made. Heavy gale were encountered, and the passage was long but successful.

## Petroleum in algiers.

A petroleum well, capable of giving a large and paying yield, has recently been discovered in Algiers, near the plain of Cheliff. The substance looks like tar, is soft and very te aceous, melts in boiling water, and dissolves in turpentine t burns with a very bright flame, and yields a large variety of products and considerable carbonaceous residue on dis tillation. It is neither tar, naphtha, bitumen, nor asphalt but seems to possess the properties of all, in a measure. It
has most characteristics in common with naphtha, but, unlike that substance, is almost completely insoluble in alcohol.

## Honors to a Young American Lawyer.

The British Social Soience Association has lately awarded its first prize of $\$ 1,000$, for the best essay on international arbitration, to Mr. A. P. Sprague, of Troy, N. Y. Mr. Sprague is a young man of great promise and ability. The essay in question occupied 150 pages.

## gCIENTIFIC AND PRACTICAL INFORMATION. CURE FOR WARTS.

Lisfranc immerses the parts on which the warts are developed in a strong solution of black soap. This causes a slight cauterization of the surface of the wart. The loosened tissue is to be removed and the application repeated every day till the cure is complete. Oil of vitriol should never be used for this purpose; it is very irritating, and inflames the waits instead of curing them.

## NEOGENE.

The above name is given by M. Sauvage to a new white alloy composed of copper 57 parcs, zinc 27 parts, nickel 12 parts, tin 2 parts, aluminum $0 \cdot 5$ part, and bismuth 0.5 part. It has a silvery appearance, is sonerous, tenacious, malleable, and ductile, and is recommended for jewelry, as a substitute for silver in plate, and for low coinage. The new elementsin the combination are those of the bismuth and alu minum. The alloy is very homogeneous, and is susceptible of a high polish.

## A NEW sYstem of dredging.

M. Bazin, of Angiers,France, proposes to attach, to a steamer with an engine of 60 horse power, two pipes on each side at with an engine of 60 horse power, two pipes on each side at
some 12 feet below the water line. These pipes are to be 10 some 12 feet below the water line. These pipes are to be 10
inches in diameter, about 50 feet in length,and are to be coninches in diameter, about 50 feet in length, and are to be con-
nected to the ship, so as to swing up or down, and also so as nected to the ship, so as to swing up or down, and also so as
readily to yield to the movements of rolling, etc. The extremities of the couple on each side are united by tubes of like diameter, open at the forward end. In clearing out a quicksand,the vessel is got underway at the speed of 8 knots per hour; and on reaching the obstructicn, the tubes are low ered with the soft mass. The water pressure above the sand or mud, which of itself would force the material into and up the tubes, is aided by the onward motion of the vessel, and the result is that the mud is driven through the tubes and into the hold. When the vessel is full, the apparatus is raised, and her contents hoisted out or otherwise discharged in some suitable locality. M. Bazin says that, with tubes of the size and with the speed above mentioned, 43,200 cubic feet of mud per hour could be raised. He points out that, in case of their becoming obstructed, the tubes can easily be cleared by simply elevating them out of the mass and allow ing the water to rush through them.

## Useful Recipes for the Shop, the Household, and the Farm.

Themain objection most people have to sending commu nications on postal cards is that the writing is, of course open to general perusal. A good way of avoiding this difticulty is to use sympathetic ink. A solution of 10 grains hyposulphite of soda in 16 teaspoonfuls water is the sim plest fluid for the purpose. Use a perfectly clean pen, and after writing go over the letters with a smooth paper cutte after writing go over the letters with a smooth paper cutter
to remove all traces of the salt. Exposure to the heat of a to remove all traces of the salt. Expos
bright coal fire turns the writing black.
Soluble glass can be made of pure
Soluble glass can be made of pure sand 15 parts, charcoal 1 part, and purified potash 10 parts. Mix and heat in a fire proof melting pot for five hours,or until the whole fuses uni-
formly. Take out the melted mass, and, when cold, powder it and dissolve it in boiling water.
To make pocket mucilage,boil one pound of the best white glue and strain very clear; boil also four ounces of isinglass, and mix the two together; place them in a water bath (glue kettle) with half a pound of white sugar, and evaporate till the liquid is quite thick, when it is to be poured into molds dried and cut into pieces of convenient size. This immediately dissolves in water and fastens paper very firmly.
A solution of chloride of lime, in water to which a little acetic acid has been added, is among the many receipts recommended to remove ink stains from linen.
Marble can be stained different colors by the following ubstances: Blue, solution of litmus; green, wax colored with verdigris; yellow, tincture of gamboge or turmeric ; red tincture of alkanet or dragon's blood; crimson, alkanet
in turpentine; flesh, was tinged with turpentine; brown, tincture of logwood; gold, equal parts of verdigris, sal am moniac, and sulphate of zinc in fine powder.
Mounting fluid for microscopic objects is made of gelatin oz., honey 5 ozs., distilled water 5 ozs., rectified spirit $\frac{1}{2} \mathrm{oz}$., and creosote 6 drops. Filter through fine flannel. Heat the honey before adding to the gelatin, which last must be dis solved in the boiling water. When cool, add the creosote. Copies of signatures, which may be printed from on a cop perplate press, can be made by writing the words and then sprinkling the wet ink with very finely pulverized gum araic. Make a rim of dough, putty, or similar material, abou the writing and pour in melted fusible alloy of 5 parts bi muth, 3 lead, and 2 tin. This alloy melts at $199^{\circ}$ Fah.
To bleach sponge, wash first in weak muriatic acid, then in cold water; soak in weak sulphuric acid, wash in water again, and finally rinse in rose water.
A very goodimitation of meerschaum, which may be carved like the genuine article, can be made by peeling common potatoes and macerating them, in water acidulated with right per cent sulphuric acid,for thirty-six hours. Dry on blotting hot sand. The potatoes should be strongly compressed while drying.

New subscribers to the Scientific American will hereafter receive the papers from the time of our receiving the order, unless they specify some other date for commencing. All the back numbers from the commencement of the volume (January 1) may be had if requested at the time of sending the order, or on request, after receipt of first number.
ning, whether it is throwing water or not. Friction soon renders a new plunger necessary, and frequent stuffing and constant attention occupy much valuable time. These are saved by the use of the injector.
Other forms of the appliance, adapted to portable and marine boilers, are also made by the proprietors of the inven tion, who report that their sales of these useful and eco nomical devices, in this country and in Europe, have reached 15,000 in number.
Patented April 6, 1860, by Alex. Friedmann. For further motive injectors, Fig. 1 showing a lifting injector, which is intendel to pump the water as well as to force it into the builer against a steam pressure, and Fig. 2 showing a form of apparatus to be used when the water flows from the tank at a higher level than the feed pipe of the boiler. Fig. 3 shows a non-lifting injector as applied to a stationary boiler. Fig. 4 shows Fig. 2 in section.
The new features in Mr. Friedmann's invention are the intermediate nozzle, shown in Fig. 4, which admits steam to the flow of water in two annular jets instead of one. This is claimed to prevent the recoil of the steam from contact with the water, as momentum in the water is continuous, owing to the jets being two in number. Another advantage in this arrangement is that the overflow from the first orifice fows the overtlow from the finsting the lows to the second, adjusting the water supply to the pressure of the steam. It is also claimed that this injector starts as
promptly and works as well with steam promptly and works as well with steam of a high pressure as with that of a low pressure, and delivers more water with the same consumption of steam than injectors with movable nozzles, or other contrivances liablê to get out of order, besides being more simple and easily manipulated intermediate nozzle of this injector being fixed and station ary, it is not liable to wear or need repairs.
The lifting injector, Fig. 1, will raise water 6 or 8 feet with ease, and can be applied where want of space prevents the use of the non-lifting form, which must be placed below the use of the non-liftio
the water line. The the water line. The
latter, Fig. 2, can be latter, Fig. 2, can be used as a heating cock for the tender or wa ter tank, by closing the overflow valve. The ordinary heating cocks are thus done away with, and the expense spared. The water in the tank can be heated by this means up to $120^{\circ}$, without any trouble in working or starting the injector. The the injector. The overflow valve, with which each of these injectors is supplied prevents air or dirt from entering the boil or. By simply transforring this valve from one side to the other, the injector may be used for either the right or left hand side of the engine.
The value of the injection system is very f.)rcibly shown by its us: on stationary boiler, , which can be kept full when the engine full when the engine is stopped for repairs. In a great many manufactories, hot water and steam are constantly needed for varions processes, and the stoppage of an engine on which a boiler is dependent for its feed hinders the whole business. This, however, is obviated by the attachment of the non-lifting injector, as shown in Fig. 3. The injector is placed a little lower than the bottom of the heater or water reservoir, so that the water will How to it by the action of gravity. The steam pipe should be attached to the top of the boiler, as shown so as to secure dryness in he steam. Thelifting form the stam. The liso form of injector is also adapte o stationary boilers.
On many locomotives, force pumps are altogether dispensed with, and two of these injectors are substituted on each engine. These are amply sufficient to keep the boiler supplied with


Ice houses are not difficult structures to build, and we pre sume that few farms are without them. There are cases, however, when it is desirable to stow away a larger quantity of ice than the receptacle will contain, and when the farmer is unwilling to go to the expense of a house which he might utilize only for a single season. In such instances, as well as those where the ice house is absent altogether, the following plan for storing ice without an ice house will prove useful. The present time, we may here remark, should betaken ad antage of at once to procure the ice, as the spring thaws now beginning will speedily cause the opening of the stream and ponds.
The first thing to be done in following the directions, which we find in the English Gardener's Magazine, is to select a shady spot, on the north side, if possible, of a clump of trees. Throw up a circular mound, some twelve inches in hight and at least fifteen feet in diameter, flatten ing the summit carefully, and leaving a trench around the eminence, two feet in width and eighteen inches in depth. In gathering the ice, there is no necessity of cuttinginto uniform shape or of seeking large pieces. Fill up the carts with any kind of fragments, transport them to the mound, and dump them on a platform made of a few planks. Ram the surfac $f$ the mound hard and firm, cover with fow and then place the first layer awhut, ice, which should previously be cracked into small pieces, for which purpose the men should be provided with wooden mal lets. As each layer is put on the stack, the ice should be thoroughly pounded particulars address Messrs. Nathan \& Dreyfus, 108 Liberty ${ }^{\text {both }}$ above and at the sides so as to form a huge block of ice, street, New York city. he shape of which will be slightly conical.

When the stack is completed, it will require two coverings of straw, one lying upon the ice and the other sup ported on a wooden framework about eighteen inches out | The Nashua (N. H.) Telegraph says: "There is an unoc- | $\begin{array}{l}\text { ported on a wooden fra } \\ \text { cupied house in Barnstead, Belknap county, having a chim- }\end{array}$ side the first covering. |
| :---: | :--- |

## FRIEDMANN'S NON-LIFTING WATER INJECTOR.

Fig. 3.
ney in the center. The house is 22 by 30 feet. The chimney is built so as to support the sills and beams. The frost has got into the cellar and frozen under the chimney and raised it up several inches, lifting the house free from the ground, except some nine feet where it touches the underpinning. In places it is two or three inches from the underpinning, and can be rocked by pushing against it with the hand. It has attracted a good deal of notice from the citizens of Barnstead."
We recommend the pattern of this house to dwellers in San Francisco and vicinity. A house that can be lifted by the chimney and rocked to and fro without danger would seem to be just the thing for all earthquake countries.

Paper as a Plant Protector.
A gentleman residing in Guernsey, Channel Islands, writes to say that he has saved his crop of early potatoes under glass by spreading newspapers over them, while his neighbors lost theirs by the severe frost. He suggests that a convenient number of newspapers be pasted together, and the edges folded over strings, thus making a screen which, suspended over the newspapers spread loosely over the plants, would give the young shoots an excellent protection in the severest cold weather, and from the sun's rays in summer.

AmONG recent curious inventions is the application of the camera obscura to a railroad car, imparting to the traveling and wondering beholder a moving diminutive picture of the country through which ho is passing.

The layer of straw nex the ice must be well beatn and flattened down up on it, and when this is done be twelve inches in hickness. The frame pork upon which a milar thickness of a sl placed of straw placed, may be formed y laserting stout larch or other poles of a suitable length round the base in a slanting direction, so that they can be readily rought together at the top, and securely fas ened with stout cord From six to eight of thes will, when joined togeth or by means of strips of rood fixed about twelve inches apart, afford am le support for the ond covering of the traw. This must of the on nicely, so as to pre vent the possibility of the rain's penetrating to the inner covering. By this rrangement there will be a body of air, which is one of the most effectua non-conductors known between the two cover ngs of straw. To effect a change of the enclosed air, when rendered needful by its becoming charged with the mois ture arising from the melted ice,a piece of iron or earth enware piping a few inches in diameter should be fixed near the apex, one end being just above the straw, and the other end reaching into the enclosed space. The pipe can be readily opened or stopped up, as may appear necessary, but as a rule it will suffice to open the pipe once a week, and allow it to remain open for about two hours. This should be done early in the morning, as the air is then much cooler than during the day or in the evening.
In removing ice from the stack, the early morning should be taken advantage of, because of the waste which must naturally ensue from a rush of warm air at midday. That removed can be placed in a cellar, or even an outhouse, and be enveloped in sawdust until required. The ice must be taken from the top; and when the first supply is obtained, a good quantity of dry sawdust should be placed over the crown. The principal points to avoid waste are to ventilate in the manner indicated, to avoid opening the stack more frequently than is really necessary, and to take the supply early in the day, before the air has been warmed by the sun.

AcCordnag to recent investigations by M. Cailletet, the esults of burning sulphide of carbon, alcohol, and carburet of hydrogen, under pressures reaching thirty-five atmospheres, are that the flame augments considerably in brillianc, while the combustibility of the substance burned is no tably diminished.

## Honing a Razor.

" The first requisite," sáys our correspondent G. W. D., "is to have a well shaped, well tempered and well (water) ground razor; unless very truly ground, it will be impossible to hone it properly. Take an Ilalian hone, of not too fine to hone it properly. Take an Ilalian hone, of not too fine grit, face it perfectly with fine emery paper glued on a boand
dust it off, and drop 6 or 8 drops of sperm oil on its face. dust it off, and drop 6 or 8 drops of sperm oil on its face.
Hold the razor perfectly flat on the stone, draw firmly but Hold the razor perfectly flat on the stone, draw firmly but
lightly from heel to point (from the further right hand corner to the lower left hand corner), against the edge; if a wire edge be produced, run the edge lightly across the thumbnail, and a few strokes on the hone will remove all trouble on that score. If you will examine the edge of the razor now, by aid of a magnifier, you will find that the fine grooves or teeth incline towards the heel.
I would here say that the hone must be kept perfectly clean, as, after using a few times and then neglecting it, the pores will get filled with steel, and in that case it will not be possible to get a keen edge on the razor. I have had a hono in use for forty years, for my own and friends' had a hono in use for forty years, for my own and friends
razors. I have kept it perfectly true, and yet there has razors. I have kept it $p$
been no perceptible wear.
I make my own straps as follows: I select a piece of satin. maple, or rose wood, 12 inches long, $1 \frac{8}{4}$ inches wide, and $\frac{8}{8}$ inch thick; I allow $3 \frac{1}{2}$ inches for length of handle. Half an inch from wh $r$ re the handle begins, I notch out the thickness of the leather so as to make it flush towards the end. I taper also the thickness of the leather; this precaution prevents the case from tearing up the leather in putting the strap in. I then round the wood very slightly, just enough (say $\frac{1}{12}$ of an inch) to keep from cutting by the razor in strapping and turning over the same. I now select a proper sized piece of fine French bookbinder's calfskin, cover with good wheat or rye paste, then lay the edge in the notch, and secure it in place with a small vise, proceed to rub it down firmly and as solid as possible with a tooth brush handle (always at hand or should be), and, after the whole is thoroughly dry, trim it neatly and make the case.
Use cold water for lather,as it softens beard and hardens the cuticle; hot water softens both and makes the face tender. Always dip the razor in hot water before using, and also after use, as it will dry it and prevent rusting.

## RED DEER.

The deer family, species of which are indigenous to all countries in the world except Australia, are every where renowned for their graceful and elegant form and their timi dity, their remarkable fleetness of foot enabling them, in open country, to keep away from the haunts of man. The race includes genera of all sizes from the little muntjac to the moose, and the chief peculiarities of the species, the horns, the hairy skin, the habit of rumination, and the feet,
each with two principal and two rudimentary toes, are to be found in all of them. The American deer (corous Virginia$n u s$ ) has a long head with a sharp muzzle, with large eyes; and the legs are long and slender. It is easily domesticated but requires a spacious range to keep it in health. The hind produces two or three young at a birth, but no accouchement takes place till she is two years old; she conceals her young carefully, visiting them only three times a day.
The subjects of our illustration are the red deer, formerly found in all parts of Great Britain, but now seen only in the mountains of Scotland and on one or two extensive moors. The red deer are so exclusive in their habits that they will not feed with inferior animals; they have an especial abhorrence for sheep, leaving the place at once if there are foot prints of sheep on the herbage.
The kind usually kept in parks in England is the fallow deer, a native of Africa originally; but it has been domesticated in England for some centuries. It is humbler in its tastes, and accommodates itself well to a small park or paddock. Like all its tribe, it sheds its horns annually, retir ing as if in shame till the new growth appears.

## Chemistry of Milk.

C. A. Cameron, M. D., states that the opacity and whiteness of milk are due, not to the liquid being an emulsion of fats, but to the reflection and refraction of light by solid caseous matter suspended in it
Cow's .Milk.-Forty analyses of pure milk from Dublin dairy cows gave the following average results: Water, $87 \cdot 00$, fats, $4 \cdot 00$, albumenoids, $4 \cdot 10$, sugar, $4 \cdot 28$, mineral matter 0.62 .

Mare's Milk.-The average of the fourteen specimens gave: Water, $90 \cdot 310$, fats, 1.055 , albumenoids 1.953 , sugar, 6.285, mineral matter, 0.397 . Mare's milk is bluish white specific gravity about 1.031 ; reaction neutral, or faintly alkaline.
Sow's Milk.-The sow parts with its milk (except to its young) with great reluctance. Its specific gravity is 1.041 its reaction faintly alkaline, and color yellowish white: 100 parts contain (mean of two analyses): Water $81 \% 60$, fats, $5 \cdot 830$, albumenoids, $6 \cdot 180$, sugar, $5 \cdot 335$, mineral matter 0895 . These results show this species of milk to be very rich. It is remarkable that in the lactometer it shows up no cream. Drying on the water bath, it exhales the odor of roast pork, and on putrefying that of putrid bacon.

## Salting, Packing, and Selling Buttor.

Blanchard's Butter Manual recommends one ounce of salt to a pound of butter as sufficient for keeping it; but the bet ter paying class of customers, who are a little more fastidious about the quality, prefer about one half as much; and this is found sufficient, if the casein has been properly removed Butter makers in the vicinity of large towns should seek out
regular customers for their produce, in which cases it may be put up in balls or any other form adapted to the demand "Philadelphia prints," which have acquired a worldwide re putation, are pound balls, with a small figure upon the top They are usually enclosed in a white linen napkin, and packed in a cedar, zinc-lined chest, with apartments at each end for ice, to keep it hard while being transported to mariet For the great mass of butter makers, the wooden tub, holding from fifteen to one hundred pounds, must ever be the mos economical form of package. In the vicinity of New York city, heavy return pails, of the best white oak, with thick covers, having the owner's name branded on them, are used and re-used year after year. In some parts of the West, mis erably poor oaken tubs are employed, which affect the butte very injuriously. In other localities, ashen tubs are favorites, while in Northern Vermont the most approved tubs are spruce Spruce is unquestionably the least liable of all timber to af fect the flavor of butter injuriously; while it is generally be lieved that, for long keeping and much exposure grod whit oak is preferale. Stone jers and but we do not recommend them. Much dopends upon the purity of the salt-it must be perfectly white, and completel purity of the salt-it must be perfectly white, and completely
soluble in water. The office of salt is, first, to remove the soluble in water. The office of salt is, first, to remove the
buttermilk from the pores of the butter, and,secondly, to ren der harmless what cannot be removed.

## New Utilization or Refuse Material

A very important discovery has recently been made by MM. Croissant and Bretonniere, of Mulhouse, France, which consists in producing dyes of a large variety of brown hue from substances not merely refuse but in themselves color less. The pigments are obtained by the reaction of alkaline sulphides upon ordinary wood sawdust, humus, horn, feathers linen, silk, cotton, and paper waste, gluten, blood, and a number of other materials. In certain cases, when treated with the sulphides or polysulphides, the sulphur directly combines with the organic body; in others sulphuretted hy drogen becomes substituted for the hydrogen atoms elimi nated.
The same body gives different shades, according to the degree of temperature, the duration of the operation, and the proportion of sulphide employed. The longer the heating and the higher the degree, the nearer the dye approaches to black. Humus gives a fine bistre shade, which does not fade and is unalterable by organic or mineral acids, caustic lyes, soap, oxalate of potassa, etc. With bran, a color is produced which subsequently, with bichromate, yields a fine brownish yellow or rosin color, which can be changed to gray by the addition of carbonate of soda. Sawdust, preferably of oak, chesnut, and other non-resinous woods, gives a soluble dye of a brownish black, which appears upon the fabric of a greenish hue. It is possessed of high coloring properties and is very permanent.


## Phosphoras Steel Making.

M. F. Gautier, engineer of mines, France, gives the follow ing useful sketch of the various methods for producing phosphorus steel, or, to use a more correct definition, phosphorus cast metal. This metal, says M. Gautier, cannot be employed in industry except on condition that it is nearly deprived of carbon, consequently every process which will
yield extra soft steel will, with inferior materials, produce yield extra soft steel win
phosphorus cast metal.
I. The Bessemer Process.- 1 . The ferro-manganese process practised at Terre Noire.-The silicious pig iron used contains but little manganese ; the first stage, that which pre cedes the appearance of the yellow ray in the spectroscope lasts about a quarter of an hour, according to the richness of the pig iron in silicon. There is no explosion, the flame is pure, without smoke; the completion of the operation is posi ively marked by the disappearance of all the rays of the spectroscope with the single exception of the yellow sodium
ray. For the production of extra soft metal, the refining is ray. For the production of extra soft metal, the refining is
prolonged for about twenty seconds, the blast is stopped, and the converter is laid on its side. Manganese iron, previously heated to redness, is then thrown in by means of shovels, taking care that the pieces pass through the scoria and enter the metal. The manganese iron used is an alloy containing a little carbon ; the manganese in it reduces the oxide of iron in the converter, and the greater part of the carbon is con verted into oxide of carbon in the form of brilliant flames. When the agitation ceases, the charge is drawn. The metal is even and quiet, without bubbles or other irregularities and, which is of essential importance, the product is always
equal and regular in practice. This is the method also which equal and regular in practice. This is the method also which
is adopted at the Seraing works, with the same manganese is ado
iron.
2. Swedish method, with highly manganiferous pig iron.The pig iron used is without silicon, but rich in manganese, the proportion running from 4 to 5 per cent. The character of the operation is such that there is not what is called a firs period; the yellow ray appears at once. There are abundant explosive projections, which would render the process ruinous if care were not taken to have enormous converters rela
tive to the quantity of metal treated. The flame is veiled by smoke and gases, the principal of which is oxide of manganese. It is difficult to control the operation; for if the temperature be reduced by additions of small quantities of steel and iron, the object is not attained, for the heat must be retained in order to keep the metal in such extreme fluidity as will permit the oxide of iron to separate itself and arrive at the surface, for no addition is made of spiegel. The work is carried on blindfolded, for the intermittent flashes of flame are blinding; the heat caused by the explosions is annoying, and the spectroscope is misleading. From time to time sam ples of the scoria have to be drawn to find how matters are
proceeding; after a certain amount of experienee, the state of proceeding; after a certain amount of experienee, the state of
the metal is ascertained by the behavior of metallic globules under the hammer, and from the color of the scoria. But the results are uncertain, and have to be classified. The ingots, woreover, are liable to shrink and to become flawed. This mode is adopted at Fagersta, in Sweden; at Zwickau, in Sarony; and Maxhütte, in Bavaria; but it requires all the value that attaches to the production of extra soft steel to induce any one to continue a method so uncertain.
. English method, that of spiegeleisen by explosion.-In this process, silicious pig, such as that of Cumberland, for example, is employed, and the operation is carried considerably beyond complete decarburation. In order to succeed, a cer tain quantity of oxide of iron, neither more nor less, must be
produced in the bath, and which carries off by explosion the produced in the bath, and which carries off by explosion the
carbon of the spiegeleisen which is added. This instantaneous production of oxide of carbon is dangerous, a part of the metal, and sometimes the whole charge, being projected out of the converter, and endangering the operator and his men. Generally the product is soft, but it is liable to Haws, which are not much felt in sheet iron, but which unfit it for rails. Steel makers will choose whichever of these three methods appears to them the most advantageous for the production of phosphorus steel with pig iron of second quality. M. Gautier importhe Bessemer process is destined unlimited extension of the Martin-Siemens process, which, he considers, will take the lead in future, and regulate prices. It is capable of using up old iron, and employing almost all kinds of ore, for puddling is still the only known method of practically getting
rid of the greater part of the sulphur and phosphorus; while rid of the greater part of the sulphur and phosphorus; while
the Bessemer process, requiring silicious pig iron containing the Bessemer process, requiring silicious pig iron containing
little sulphar, must always be of a limited application. The true mode of making phosphorus steel is then in the sole furnace.
II. The Martin-Siemens Process.-In this method the matter is more simple. In order to produce extra soft metal there is but one way, that is to say, to act chemically upon the oxide of iron in the bath. Manganese iron must be resorted to, as spiegel always gives hard products; the proportion is the same as in the Bessemer process, namely, 1 per 40 or 50 per cent of useful metal. cent of manganese iron to cured which bends perfectly when cold, the mangle is pro cured which bends perfectly when cold, the manganese alloy
heated to redness is added, the bath is stirred slightly, and heated to redness is
An account, by M. Grüner, of the process followed at Zwickau and Maxhütte, supplies a striking confirmation of the fundamental properties of phosphorus steel; you may introduce phosphorus into cast steel on condition of eliminat.. ing the carbon, and the less the amount of the latter the greater may be that of the former. Practically, by the German method, which is really but that of Fagersta applied to
ess pure materials, metal is produced which may almost be
said to be without carbon, and, as no spiegel is introduced, there is no element of recarburation. It is not, then, aston ishing that the metal thus obtained should be perfectly mal leable and yet contain a notable proportion of phosphorus that is to say, half the quantity which may be tolerated in a ruly soft steel, when produced in a Martins Siemens furnac with manganese iron

## Having a Hobby.

The question "is there money in it?" is said by some me o be the test by which everything is to be received or re jected. And those who offer this very mercenary gage claim o be the only "practical" men, and the true prophets fo these times, and indeed for all times. Thescience of getting, the art of keeping, and the process of increasing are deemed y them to include all that is useful in the circle of sciences, he field of art, and the aims of thought. Most people concede in the abstract these pretensions of the mercenary
philosophers, though the great majority in practice are betphilosophers, though the great majority in practice are bet ter than their theory.
The maxim, roughly expressed, that "everybody shoul have a hobby," is a good one, provided that the "hobby" one rides should be a mental rather than a sensual one. It hould carry the rider over the route of mental improvement nd development of his reasoning and analytical powers guish him from the brutal and ally him to the divine. To oo back to the question alluded to above,in regard to educaion, the first question asked may very well be: "Is there honey in it?" But if this be the last question as well as the will find relief in bodily of leasceses from mercenary, the seeke will find relief in bodily excesses, from his mental discipline Or, classing drudgery of the mind with drudgery of the body,
he will look for enjoyment where the intellect may be laid he will look for enjoyment where the intellect may be laid
aside, like the tool of the artisan or the ledger of the mer chant.
It was well said in a recent address to young men, in the evening classes of the City of London College, that "they must estend their mental horizon by raising the level of their sight; that they had to adorn their lives as well as to sustain them ; and that they had not only to be tradesmen but men." The speaker told them that they must not only pursue their technical studies, but, as a relief and re creation, follow themes calculated to raise the tone of their minds and carry them beyond the routine of their daily ives. He said that they had not only to live but to enjoy heir lives. He recommended them to take up one subject "to which they could devote themselves with such enthuman immersed in any business pursuit, it is highly desira ble that he should change the cur rent of his thoughts and prevent his whole existence from being confined to one rou intellect and weary his body.-Philadelphia Ledger.

## Steam HIII Ollmber.

A new locomotive for use on Ithaca Hill, N. Y., has made its appearance. The incline has five tracks, of which the two outer are of the usual width, used in the ordinary man ner. When the engine starts up the hill, it rests upon a pair
of rails just within the usual track and upon a set of double flanged small driving wheels which are upon the same axle with the big drivers-they being only about thirty inches in diameter; this inside track is raised about fifteen to eighteen inches above the outer one, and high enough so that the big drivers do not touch the track at all; the engine rests now upon the small drivers, and is independent of the outer ones; then in the center of the track is placed a wide cogged rail, which exactly meshes into the $\operatorname{cog}$ wheel which is be tween these smalldrivers, directly under the center of the locomotive. Thus it will be seen that, by applying power to the big drivers, in the ordinary way, the power is applied to the cogged wheel, which does the climbing. The cogs are about three inches from tip to tip, and the wheel is eight inches wide.

## Bright Deep Blae on IWool

The following is said to yield a tolerably fast color, of de irable luster, similar to that of dark vat blue: The wool or cloth is prepared by boiling for an hour in a hot kettle, with $2 \frac{1}{2} \mathrm{lbs}$. alum, $\frac{8}{4} \mathrm{lb}$. chromate of potash, $1 \frac{1}{2}$ lbs. sulphuric acid, and 2 ozs. tin salt in solution, for 40 lbs. of material. It is then opened out and well cooled, and allowed to lie for 12 hours. The day after, 8 lbs. of logwood are boiled in a fresh bath, and then 3 ozs. of aniline violet (the bluish, soluble in water) are added, and, as soon as it is dissolved, an other $\ddagger \mathrm{lb}$. of sulphuric acid. The prepared articles, after being washed or rinsed, are placed in the bath at $122^{\circ}$ and, after half an hour, are worked at a boil for an hour More aniline violet affords a stronger blue, more logwood a
deeper blue. The color can easily be cleaned in cold water.

Prodoction of Ozone.-Ozone may be easily and abund antly generated in any apartment by means of an aqueous solution of permanganate of potash and oxalic acid. A very small quantity of these salts,placed in an open porcelain dish. is all that is necessary, the water being renewed occasionally as it evaporates. Metallic vessels should not be used.

At the Edinburgh Literary Institute, Professor Geikie stated it to be his opinion that his colleague, McCroall, had pitched upon the precise epoch in which the glacial era had city of the earth's orbit, which took place about 240,000 years ago and lasted about 160,000 years.


## Fiecent Gancricay and foreign exatents.

mproved Washing Machine
Silas W. Holbrook, Catskill, N. Y.--The invention relates to an of the suds box and being free to move at each end between paral el guide blocks. The clothes are put into the space between th ibbed spring plates and a ribbed cylinder, and are carried around washed clean by be'ng rubbed against said plates, and by being car ried around through the water

Improved Seat for Extension Carriages. James V. Randall, Newtown, Pa.-The rear seat is made adjustale toward or from the front of the carriage, and the elastic fron eat is pivoted and supported, so that the weight of the person or ends to throw the lower ends of the standards outward, and thu olds the gudgeons securely in their sockets.

Improved Lamp Burner.
Walter McKinley, Tremont, Ohio.-The object of this invention e simple and detachable in all its parts, and, in consequence of the same, more convenient to clean and easy to keep in repair. It conists in a burner cap provided with a groove, in combination with etachable wick tube, a detachable set of spur wheels for adjusting he wick, and a detachable shaft for operating said wheels. It als iar construction of the sur wh in the
stening the devices together
Improved Ditching Machine.
SenatorTheodore F. Randolph, Morristown, N. J.-Ex-Aovernor
Randolph has for some time past been engaged in developing th novel form of ditching machine which forms the subject of thi patent. The device now completed presents many excellent point of merit, and, in the opinion of the inventor and many of his friends, is the most practical and efficient of the many machines for ditching purposes now before the public. Its construction is such that it will work equally well in clayey or sticky solls and in sandy
or looge soils. It may be readily adjusted and controlled, so as to or loose soils. It may be readily adjusted and controlled, so as to
sink a vertical ditch upon inclined or unevenground, and the ditching wheel may be readily fed down as the ditch increases in depth There is a novel combination of parts for adjusting the angle ant hight of the shoe with relation to the ditching wheel. By suitable construction, the wheel and frame can be raised and lowered witb out affecting the axle, and the axle can take any inclination the surface of the ground may require without affecting the ditching
wheel and its frame. The rear axle may be inclined in either direcWheel and its frame. The rear axle may be inclined in either direc-
tion to accommodate it to the surface of the ground. The edges of the flanges of the ditching wheel are made sharp, so that they may be sunk into the soil at the bottom of the ditch by the weight of the wheel and frame, so as to separate the sides of the slice of soil to be raised from the sides of the ditch. As the soil passes over the top of the wheel it is delivered into a chute, by which itis discharged
upon the side of the ditch, and which is provided with a tongue, upon the side of the ditch, and which is provided with a tongue,
which enters the channel of the wheel and serves as a scraper to disengage the soil from said channel. The frame and ditching wheel may be held in a vertical position, while the axle is inclined in either direction by its wheels in passing over uneven or inclined ground. By this construction, all the necessary adjustments can be made without stopping the machine. Knives shave off the sides of the last previous cut to widen the ditch, and enable the ditching

Improved Sheep Holder
Improved Sheep Holder for Shearing.
Joseph R. Virgo, Texas, Mich.-This consists in an adjustable the legs of the sheep. When a sheep is fastened on the table, it is in an easy position and convenient for the shearer, and can be turned by turning the table to the right or left, as may be required.

Improved Fifth wheel for Vehicles.
George F. Putman, Fonda, N. Y.-The head block or axle is pro-
vided with fifth wheel, for protecting king bolt and wheel.

Improved Parlor Fountain
Herman Wenzel, Now York city.-Air is forced by the upward pressure of water in the base through a pipe, over the water in a chamber below, and, by its compressive force, eects the liquid within the base, and connected with the lower chamber of the basin by a pipe, so as to enable the water in the base to be forced into the lower chamber of the basin, and kept there in full supply.

Improved Combined Fluting and sad Iron.
Charles Raymond Rand, San Francisco, Cal.-This invention reates to an improved fluting and sadiron which is heated internally
with gasoline or other volatile distillate of petroleum. It may be readily used on different sides, either as a sad iron or for fluting. A detailed illust

## Improved Bridle Bit.

Petor Casey, Newport, R. I.-Side pieces pass through mortises in the ends of a movable bar. Theside pieces, in order to render them
adjustable, are provided with holes, which receive the ends of set screws, so that the bar is securely held in place. The driving lipes are attached to the loops of the bar.

Improved Wagon Jack
Samuel Chard, Mianus, Conn.-This invention consists in a cramping band and pillar, with a hoisting lever having a fulcrum pin and holding hook. The long end of the lever being depressed, the weigh will be thrown upoa the fucrum pin,
the stand and prevent it from slipping.

## Improved Range.

Edwin O. Brinckerhoft, New York city.-The arrangement of the flues in this range is such that it may be thoroughly and uniformly heated for baking purposes, that it may be used for boiling pur
poses without being wholly heated, may have a strong draft, and uay be easily manipulated to control the heat.

## Improved Saw Mill.

Charles Lindner, Hockley, Tex.-The intermediate wheel for run ning the carriage back is mounted on the lever, which is pivoted to a fixed pivot, so as to have a little end motion. It is connected at
the other end by a link to lever, in which the shaftis journaled, and the other end by a link to lever, in which the shaft is journaled, and feed, it throws out the running back gear ; and when it is shifted so as to gear the running back train, it throws out the feed.

Improved Shoe Blacking Case.
William H. Morse, Hast New York, N. Y.-A foot-rest bar rests in
notches in the inner sides of the box, and is kept from rising by a notches in the inner sides of the box, and is kept from rising by a
plate or tenou, which enters a groove. In a block which fits in plate or tenou, which enters a groove. In a block which fits in
the box is a round hole to receive the box of blacking, which is secured in place by a curved spring. The cover is supported, when turned down, by a wide cleat, which, wit
handles for lifting and carrying the case.

## Improved Hay Gatherer.

Chesley Thomas Noell, Clarksville, Mo., assignor to hinself and rake provided are connected. When the load of hay has been drawn to the place of stacking, the rake may then be drawn from beneath the hay and Improved Fanning Mill.
Asa Y. Felton, Plain View, Minn.-The sieve is of shect metal,
the perforations being of the same size and farther apart in the upper the perforations being of the same size and farther apart in the upper
portion, where the grain is received on it, than in the lower porportion, where the grain is received on it, than in the lower por-
tion. This causes a larger portion to slide along the sieve before
fylling through, and spreads the falling grain more evenly throughout the area of the siere so that the gir will act to better advantage The sieve supports are shifted up and down in the side boards of the
shaker, and fastened at any point to hold the sieves in the proper *haker, and fastened a
descent by slide bolts.

Improved Die for Making Chain swivels. Philander H. Standish, Jefferson City, Mo., assignor to himself and
J. H. Bodine, of same place.-When the link blank and eye piece are J. H. Bodine, of same place.- When the link blank and eye piece are
put in their places in the dies, and pressed together, the overlapping put in their places in the dies, and pressed together, the overlappin
ends of the link blank will be folded around the neck of the eye and welded together, and at the same time be shaped and nished in regard to form by one or two blows of the dies. The prongs of
the eye piece are then heated and bent up, shaped, and welded in the eye piece are
any approved way.

George S. Brower, George W. Brower, and Edwin A. Brower,
Crawfordsville, Ind.-Devices are provided to swing the inside plows laterally to the row, for regulating them to the curvatures and to correct the effect of irregular driving; and to so shift the
plows, hangers are connected to cranked foot levers, which are to plows, hangers are connected to cranked foot levers,
be worked by the driver's feet as he rides in theseat.

Improved velocipede.
Walter Knight, San Andreas, Cal.-The feet rest on supports during the revolving of the front crank axle by the hands, and turn a lever and therewith turn the wheel to either side for guiding and
steering the perambulator. The steady hold which is exercised by the simultaneous action of the feet on the fulcrum lever keeps the steering wheel in any desired position, so that the carriage may be ensily guided in the required direction.

Improved Churn.
August Meyer, Port Washington, Wis.--In the cover is formed an
uir hole, in which is inserted a tube, to the upper end of which is air hole, in which is inserted a tube, to the upper end of which is
attached a knob. 'The base of the knob is made of a larger diameter than the tube, so as to prevent the ssid tube from dropping through the cover. The lower end of the tube is flanged with stops, to prevent it from being drawn out of said cover. The lower end of the
tube is open, and in the sides of its upper part are formed holes, so tube is open, and in the sides of its upper part are formed holes, so
that, when the said tube is drawn up, the air may pass out and in freely, and when the said tube is pushed down the passage of air may be prevented. The milk is prevented from spattering into the plate
Improved Draft Equalizer.
Edwin A. Beers, De Kalb, In.-By this invention, the draft of
three horees, when used abreast, is equalized. the front of the wagon, and the tongue is attached to the rod by braces. These braces have eyes which slide on the rod, and the
tongue may be adjusted in any desired position by means of collars, tongue may be adjusted in any desired position by means of collars, in which are set screws. The evener is attached to the tongue at a
point about one third of the length of the evener. A single whiffletree is provided for the right-hand horse. A lever is fastened by a attached to the lever at a point about one fourth the length of the lever from the loose end. This chain is attached to the rod by an adjustable slide. A whiffletree is attached to the loose end of the
lever for the middle horse. A band is attached to the under side of lever for the middle horse. A band is attached to the under side of
the evener, and surrounds the lever and limits its action back and the evener, and surrounds the lever and limits its action back and
forth. Lastly, a whiffletree is attached to the evener for the outside

## Improved Window ventilator

Samuel W. Couch, Cold Spring, N. Y.-Two sets of plates are
placed directly over the top bar of the upper sash, and the to placed directly over the top bar of the upper sash, and the top bar
of said sash is grooved upon its upper side to such a depth as to receive the plates when they are closed up. With this construction, when the upper sash is lowered, the plates descend with it or open
out, and when the said sash is raised they are closed up and inclosed out, and when the said sash is raised they are closed up and inclosed
in the groove of the upper sash bar, so as to be entirely out of sight in the groove of the upper sash bar, so as to be entirely out of sight.
The air passes in and out through the spaces between the plates.
Improved Spring Bed Bottom.

Improved Spring Bed Bottom.
Joseph Fowler, New York city, and John R. Dewar, Bergen, N. J.-This improvement relates to connecting the slats of the bed
bottom in pairs or sections, and also preventing endwise movemen of the same, by means of notched blocks, which engage or lock with the springs that support the bed.

Improved Music Leaf Turner.
William H. King, Petersburgh, Ind., assignor to himself and Jerome Borer, of same place.-This is an attachment consisting of music rack, to be wound around the knob of the music leaf turner. It passes then over suitable pulleys to a lever pivoted to the under siate with segmental ratchet, and operated by the leg or foot, turning the leaves, on raising the ratchet plate, by means of the elurn strap in one direction, and by means of the lever in opposite
direction.

## Improved Pawl and Ratchet.

Ralph Tomlinson and Joseph Smith, Boston, Mass.-The pulley is oose on the shaft, the ratchet is keyed to it, and the pawl is fixed on phivot at or about the middle, and has a projection with relation the will hold the pawl either in or out of connection with the ratchet according to which way it is shifted.

Improved Revolving Spice Box.
Thomas W. F. Smitten, New York city.-This consists of two or diments, pivoted on the vertical spindle of a stand, to swing hori zontally around it. There are as many imperforated covers as ther are cases, less one, so contrived that, the one case to be used being sifted to the place where it is uncovered, the others will, by the
ame operation, be brought under cover, so that the holes will be same operation, be brought under co
closed in all except the one to be used.

Improved Whip Tip Ferrule.
Edward 13. Light, Denver, Col.-A short solid cylinder is titted nto the center of the ferrule, and secured there by a pin. A rod rigidly secured. Upon each end of the rod is cut a screw thread n using the device, the butt end of the tip is screwed into the fer ule until it strikes the end of the cylinder. The small end of the hip stockis afterward screwed ho the other end of erre ferre ferrules, a whip, when broken, can be cut into tit the break and conveniently repaired, without the use of any tool

## Improved Level.

Christian C. Schwaner, Winterset, Iowa.-The case is made hollow with a slot in the middle part and with semicircular projection ppon its upper edge. Upon the front projection is formed a scale.
The rod of a pendulum passes up through the slot, and has a knife dge crosshear attached to its upper eud. A pointer is piroted to the pendulum and receives a pin, which serves as a fulcrum. The pin is bent at right angles, and is passed through a hole in another
pin, which may be turned with a screw driver to adjust the pin first n, which may be turned with a screw driver to adjust the pin firs The upper end of the pointer passes up to the scale, so as to indicat the angle of inclination of the object to which the instrument may

Improved Garden Rake.
Frederick 13. Hedge, Greenport, N. Y.--This invention consists of garden rake having a series of concave teeth or tines with sharp side, for being used, as required, for breaking the earth or for drawing furrows.

Improved Motor for Light Machinery.
David Baldwin, Midland Park, N. Y.-This machine is a stool or cat, on which the operator sits and gives a rack the reciprocating
notion instead of using his feet, the reciprocating motion being onverted to a rotary motion. The motor is adapted to sewirg
machines and similar light mechanism. machines and similar light mechanism.

## Improved Street Sprinkler.

William Westerfield, New York city.-In the main tank is a valve ank, to contain the valves, and to which the sprinkling tubes ar connected, the said tank being connected to the principal tank by to be readily removed to afford access to the valves, for adjusting them and for other purposes.

## Improved Clothes Line.

Thomas S. Cary, Brooklyn, N. Y.-This invention consists in having a double pulley block attached at a window sill; and opposite it,
near the other end of the same window sill, is a single pulley block set on a building opposite, through which the traveler rope runs. Thus, when fully extended, there will be two clothes lines full instead of one, as heretofore, thus saving time, labor, and
both in extending the line and also in taking in the clothes.

Improved Feed Water Heater.
Horatio N. Waters, West Meriden, Conn. -The corrugated pipe the heater, and thus suspended within it ; and a branch pipe extend herefrom, down through the bottom of the heater, to carry off the water of condensation. Said branch pipe is fitted in a stuffing box
so as to have free vertical movement corresponding to the vertical o as to have free vertical movement corresponding to the vertical
expansion and contraction of the corrugated steam pipe under the expansion and contraction of the corrugated steam pipe under the
variations of temperature. By this construction and arrangement of parts, the leakage incidental to the ardinary feed water heaters is effectually avoided, since the joints or other parts of the heate are subjected to
mproved Sawing Machine.
John Gehr, Clear Spring, Md.-The invention consists in the main shaft of a sawing machine provided with ratchets, pawls, bars, and yokes, whereby light work may be done rapidly, and heavy work
slowly, by hand, while horse or other power may readily be applied slowly, by han
when desired.

Improved Car coupling.
William Green, Hyde, England.-The invention consists in employing as a car coupler a pivoted hook closed by a rear spring and often lost or stolen, and dispensing with all complication of parts that render it liable to frequently get out of order.

## Improved Bee Hive.

Julius S. Coe, Mont Clair, N. J.-This invention consists of a bee house and bee hives combined, and is so constructed and arranged that the room containing the hives is protected on all sides by a
series of dead air spaces, and provided with thorough ventilation. The air inside may thus be kept at any desired temperature, quite indepensures a certain crop of honey, fully protects and preserves the bees in winter, prevents the operator's being stung, and that, when thus constructed, a house and fifty hives will cost a third less than the same number of good outdoor hives, and yield a much larger and more certain profit.

## Improved Hydraulic Packing.

John F. Taylor, Charleston, S. C.-This invention relates to an improved hydraulic packing, and it consists in a ring of rubber or other elastic material contained within a cup ring of leather, and attached to the same at one side and free at the other, and the whole disposed
within a groove in the cylinder. The water enters the loose side of the cup ring and presses it tightly against the ram, the rubber ser ving to accommodate the unequal thickness of the leather, and kee the latter always in proper place.

## Improved Wooden Barrel

H. W. Fitzhugh, Bay City, Mich.-The invention consists in using straight staves having parallel edges, with constricted bands whose
overlapping ends are fastened by a screw extending into the wood. This enables the barrel to be made entirely by machinery, and ren

Improved Shirt Bosom Supporter.
James S. Edmunds, Princeton, Ky.-The object of this invention is to cause the shirt bosom to stand out prominently and evenly
from the breast of the wearer. The device consists of elastic longitudinal metallic strips connected by ribs and plates.

Improved Fish Plate and Rail Fastening. Joseph M. Kenny, Blairsville, Pa.-This invention relates to cer-
tain improvements designed to give greater security to flsh plates and fastenings for railroad rails; and it cousists in a bolt having a locking bit which, when turued, occupies the position transverse to
the slot in the rail and plate. The rail is slotted to allow for expansion and contraction, and the bit rests in a space between the rail and the fish plate which receives the nut. The said plate is indented upon its exterior surface with depressions which prevent the nut rom tuning, and the bolts are provided with diamond-shaped heads, by means of which the position of the locking bit upon the nside may be determined.

Improved Lamp Extinguisher.
Professor Wm. H. Zimmerman, Chestertown, Md.-The object of this invention is to provide a means for extinguishing lamps, in whoided, and the habitually foul snuffing devices dispersed with. It consists in a hollow rubber ball, or other compressible air chamber, combined with the burner of the lamp by means of a flexible tube,
so as to direct a blast of air upon the wick by squeezing the ball. so as to direct a blast of air upon the wick by squeezing the ball.
The vents or quenching tubes are of a construction adapted to any kind of lamp burner; and the blast directed by them upon the wick
being horizontal, or inclined upwardly if desired, the danger resulting from the old way of blowing down the chimney is avoided.

## Improved Corn Planter.

Silvanus P. Evans, Ash Ridge, Ohio.-The invention relates to mprovements in walking planters. The machine includes means shaped seed-spreading or distributung device which is pivoted within the seed spouts, so that it may swing and adjust itself to the vertical inclination of the seed spouts, and also to devices forming an adustable connection between the
covering the seed in the furrow.

Improved Gate Latch.
Robert C. Bernard, Rocky Mount, Va.-This invention relates to ion with a double catch attached to the 1 consists in the combinato the gate at one end and weighted at the catch, and a second lever pivotedin the middle and weighted at the end farthest from the atch, so that gravity causes both levers to latch the gate, one above the catch and the other below the same. These two levers are connected by a vertical bar, by means of which both levers are operated
a once to open the sate, for the convenience of persons on horse ance to open the sate, for the convenience of persons on horse
back, in connection with which said bar and levers a knob is used bor pedestrians.

Improved Hydro-Electric Lamp.
Professor Wm. H. Zimmerman, Chestertown, Md.-The object of this invention is to provide a safe and practical self-lighting lamp, and it consists in a hollow lamp pedestal filled with sulphuric acid nverted bell jar with suspended bits of zinc in the same to form a öbereiner apparatus. To said pedestal are attached two brackets, one of which is supported a small galvanic battery, and in the ing with the hydrogen generator, which directs a jet of hydrogen upon the wick of the lamp. Said jet passes over a piece of platinum wire conducting the two electrodes of the battery, which, when the elements of the battery are brought into operation, ignites the jet,
the batteryand the hydrogen generator being so connected that the the batteryand the hydrogen generator being so connected that the
depression of a single lever synchronously turns on the hydrogen, epression of a single

## Improved Lemon Press.

Heury Newberger, Fort Wayne, Ind.-The object of this inven放 is to press lemons so that the juice will be more thoroughly any admixture of dust or specks from the air. The device consists of a convex plunger which fits into a correspondingly concaved basin that receives the lemon or section of lemon, and has a med

Improved Horse Hay Rake
Beujamin Mellinger, Mt. Pleasant, Pa.-This invention relates to ertain improvements in horse rakes, and it consists in a frame hav ag a bent lever pivoted thereto, and provided with a stop hook, a ttached to branched rods, all combined and arranged for the pur pose of affording an improved means for lifting and manipulating the rake.

## mproved Cartridge Belt

David Taylor, U. S. A., Leavenworth, Kan.-The invention consists in a cross slotted belt provided with an interlacing strap, and a clamp having lower extensions bent backwards, and wings forward-
ly bent toward each other until the opposite edges nearly or quite ly bent toward each other until the oppositc e
meet.

## mproved Motor.

Johu M. Cayce, Franklin, Tenn.-The object of this invention is to enhance the practical value of a gravity motor, by securing the bestiture of power for restoring the actuating weight to its origina
pend position for a continuance of the motion. It consists in the combiation with a pivoted support bearing a weight, of a spring an rock seat, the latter rigidly attached to each other, and so combined the rock seat to the running gear, and yet to admit, through the auxiliary agency of the springs, of the shifting of the weight to the opposite side of its fulcrum by a smaller application of power than
its own gravity. It also consists in the devices for shifting the said its own gravity. It also consists in the devices for shifting the said welght, and in mean
dustrial purpeses.

Improved Invalid Bedstead.
James Goodwin, Lennoxville, P.Q., Can.-This invention relates to certain improvements in invalid bedsteads, and it consists in an ad hinges at the four corner posts, by means of which the whol stretcher may be adjusted inclinedly at one time, for adapting it be used as a fracture bed. The stretcher is also provided with hinged head and foot frame operated by cords and pulleys for plac ing the patient in sitting posture. It also consists in a shaft unde the bed provided with radial arms which are united at their exremities by a connecting rod passing through the hem of the sheet,
by means of which the patient may be turned from one side to by means of which the patient may be turned from one side to the pulleys.

Improved Blacking Brush.
Andrew McElrath, New York city.-The invention relates to a receive the implements commonly required in the operation of pol ishing boots or shoes, such as a cleaning tool and brush, a brush for pplying the blacking, a box of blacking, etc.

## improved Tea and Coffee Pot

Louis Evans, Pittsburgh, Pa.-The invention consists in a coffee pot having a cone-shaped bottom, a perforated false bottom, and a cup, so arranged that, as the water percolates through the coffee an false bottom, all the essence thereof is carried into a separate cham-
ber, all the internal parts being so connected that they can be lifted ber, all the internal parts being so
out together by a central handle.

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W. H. A. will find directions for bleaching for silver-plating solution on p. 299, vol. 31.-W. H. M. will find directions for coloring putty on p. 107 vol. 31.-R. C. J. can plate iron with silver by the
process given on p. 314, vol. 24.-W. H. W. will find an explanation of sailing faster than the wind on p. 176, vol. 28.-R. H. H. will find directions for
bronzing on iron on p. 283, vol. 31.-H. E. will find bronzing on iron on p. 283, vol. 31.-H. E. will find
directions for case-hardening iron on p. 69, vol. 31 - F. E. H. will find a recipe for marine glue on p 43, vol.32.-E. E. W. will find the recipe for furni ture polish and also for finish for black walnut on p. 315, vol. 30.-J. K. S. and J. S. S. should each consult a physician.-C. G. M. will find a descrip-
tion of the wonder camera on p. 26, vol. 31.-C.C.S. tion of the wonder camera on p. 26, vol. 31.-C. C. S.
will find directions for preparing muriate of ammany others are assured that there is not and can not be an instrument for indicating hidden treas-
ure.-J. D. will find directions for softening and ure.-J. D. will find directions for
toughening wood on p. 319, vol. 31 .
(1) W. J. A. asks: Will nitro-glycerin ex
plode through a capillary tube? A. If we under plode through a capillary
stand your question, yes.
(2) C. D. B. asks: What kind of oil is the best to preserve shoe leather, and to k
A. You will find neatsfoot oil the best.
Will a compound of cologne, hartshorn, tincture of cantharides, oil of lavender, oil of rosemary,
and oil of nutmeg injure the skin? A. Probably and oil of nutmeg injure the skin? A. Probably
not if used only a few times, and not in excessive quantity. Cologne is mostly all alcohol, which has
a very injuriouseffect upon the skin, if used frequently, by dissolving out the natural oils, leaving the skin harsh and dry. If in the formula you pregent then the cologne is of no use on the skin the cologne is in excess, the oils are of no use the uncombined alcohol is free to unite with the oils and fats of the skin. Unless the skin is dis(3) F Set 1
(3) F. S. asks: How can I use india rubber in either turpentine or naphtha withoutimpairing its elasticity? A. Caoutchouc dissolves in bisul-
phide of carbon, coal naphtha, and rectiffed oil of turpentine. In these liquidsit first swells up very considerably, and eventually forms a ropy liquid, which, on evaporation, leaves the caoutchouc with original elasticity
(4) F . W. asks: How is nitro-glycerin mad Is there such an invention as the screw of Archimedes for elevating water? $A$. The screw of Archimedes, called after the philosopher that ining water, and operates at only short distances it ing water, and operates at only short distances. cylinder, the lower end of which dips beneath the water at an angle of about $35^{\circ}$, the upper end beened on a crank, which serves to rotate it.
(5) R. S. G. asks: What are the ingredients
of Seidlitz powders? A. Rochelle salts 1 drachm carbonate of soda 25 grains, tartaric acid 20 grains. Dissolve the two first in a tumbler of water, the (0) l. P.
(6) N. P. K. asks: 1. How can I prepare
hard enamel? A. Mix 100 parts of pure lead with hard enamel? A. Mix 100 parts of pure lead with
20 to 25 of the best tin, and bring them to a low burns nearly as rapidly as charcoal, and oxicize very fast; skim off the crusts of oxide successive--
ly formed, till the whole is thoroughly calcined. Then mix all the skimmings and again heat as be ore, till no flame arises from them, and the whole is of a uniform gray color. Take 19) parts of thi
oxide, 100 parts of white sand, and 25 or 30 of common salt, and melt the whole by a moderate heat Tiuis gives a grayish mass, often porous and ap
parently imperfect, but which runs to a good en amel when afterwards heated. 2. How can I bring a low quality of gold to the color of 18 carat gold A. Alloy it with the proper proportion of silve
and copper. 3. I have a quantity of silver melted with lead; it is so brittle that I cannot roll it . How can I get it in condition to work? A. The desired object may be attained by melting the alloy in a
cupel formed of bone ashes. The lead is gradual ly oxidized, melted, and absorbed by the porous material composing the cupel.
(7) H. P. A. says: I am now using the sap part of the white wood tree, cut to the thickness
of 36 to the inch. In order to cleanse it of the sap and woody taste, I boil and frequently change the water, yet do not get it tasteless. How can I of the wood? A. Try weak lye, and water after-
(8) T. B. C. asks: Is there any way of restoring marble that has been spotted with lemon juice? A. Marble being a carbonate of lime, the action of such an acid upon it would be to enter into combination with the lime, expelling the carinal marble; and from the fact of its being mealy powder, it was easily wiped its being notice, leaving behind it the blur or depression in the surface of the polished plate you speak of We do not think it can be remedied.
(9) H. S. says: What is the simplest way to make an apparatus for blowing glass, such as is used by men that travel the conntry? A. What produced from a wide illuminating surface, as a large wick, or, better, a gas flame widened and then subjected to the current of air.
(10) A. C. B. asks : 1 . Is there any way to harden coin silver? A. We do not know of any Cor fine work, and will not scale when can be use Try the alloy known as packfong, or German silver, a compound of nickel, zinc, and copper, in which the proportions vary considerably. A good
alloy consists of 5 equivalents of copper, 3 of zinc alloy consists of 5 equivalents of copper, 3 of zinc,
and 2 of nickel. Packfong is of a yellowish white color, and, when $n$

## (11) F. C. asks

(11) F. C. asks: Will anything dissolve Yes, ammoniacal salt.
(12) H. H. asks: How can I make bisul of tin ( $\mathrm{Sn}_{2}$ ), known also as mosaic gold it it form of tin ( $\mathrm{Sn}_{2}$ ), known also as mosaic gold; it forms tained by preparing an amalgam of 12 parts of tin and 6 of mercury; this is reduced to powder and mixed with 7 parts of sublimed sulphur and 6 of sal ammoniac. Thismixture is introduced into a fask with a long neck, and is heated gently so lon as any smell of sulphuretted hydrogenis percept ble; the temperature is then raised to low redness
calomel and cinnabar are sublimed, and a scaly mass of $\mathrm{Sn}_{2}$ remains. If the heat be pushed to far, part of the sulphur is expelled and the operation fails; the sal ammoniac appears by its vola-
tilization to moderate the heat produced during tilization to moderate the heat produced during
the sulphuration of the tin, which would other ise rise so high as to decompose the bisulphide. (13) F. C. and others.-Most medical authorties agree that the rightside is the better to sleep pon; but this is not always the case, the numbe as those who use the right side. It is simply matter of convenience and ease, it being folly to insist upon a
discomfort
(14) J. W. asks: 1. What is the tenacity of gold wire having ake $24 \cdot 20$ lbs. weight to break limeter, if the gold be annealed. If the gold be drawn, it will require 61.60 lbs. to break it. When gold is consumed by fire, what is the color the flame? A. Molten gold exhibits a sea gree
color. 3. What is the color of light transmitted through a pellicle of silver? A. Bluish. 4.When sil ver is consumed by fire, of what color is the flame? A. The spectrum of silver is green. 5. How can cinnabar be converted into a yellow pigment
A. Continued pulverization will change the brick A. Continued pulverization will change the brick
(15) F. W. B. says: I have some white silk wich has become yellow by washing. How can restore it to its original color, without injurin the silk? $A$. Try steeplag it for a short time in vinegar or lemon juice, after
cleaned it. Rinse in cold water.
(16) J. H. L. asks: How can I illuminate color without resorting to the use of disagreeable compounds? How can I prepare and use the cal cium light for the above purpose? A. The magnesium light is sometimes used for this purpose. maguesium ribbons which may be obtained from any chemist or dealer in theatrical goods. In the calcium or lime light, an ignited jet of the com-
pound gas (oxygen and hydrogen) is caused to impinge against a small cylinder of caustic lime. In the apparatus used for this purpose, the gaees are conducted by separate tubes to the burner, which they enter at opposite sides, a few inches from the
tip of the burner. The burner or jet should be bent towards the vertical surface of the lime at an angle of about $45^{\circ}$. The lime should approac are kept in separate bags of india rubber. The oxygen gas is obtained by heating together, in an iron or copper bottle, chlorate of potash with one drogen gas may be obtained by acting upon scrap The frat portions of the gas, if obtained in this The irst pould be alowed to escape, otherwise its mixture with the air in the apparatus forms a very explosive misture. Ordinary illuminating or coal gas, if obtainable, will answer the purpose as well as pure hydrogen. Both the above gases are washed before being allowed to enter the bags This is arranged as follows: A small bottle is ob a tightly fitting cork in the mouth of the bottle pass two glass tubes, one of which passes down
and dips beneath the surface of the water, the other barely passes through the cork. In order to
ting flask, and thy rubber tubing to the genera just passes through the cork, is attached to the receiving bag. Thus arranged, the gas as generated is required to pass through the water. Care should
be taken (in the generation of the oxygen) at the end of the operation that the water in the bottle does not run back into the generating flask, otherwise an uncontrollable quantity of steam will be
generated from contact of the moisture with the generated from contact of the moisture with the (17) F. N. J. and others.-The statements made as to the preparation of musk are on the
authority of a work recently published on perauthority of a work recently pub
fumery, and presumably reliable.
(18) D. S. M. asks: 1. What effect will ing wheat before grinding it? ing wheat before grinding it? A. Probably the
same as when applied after the wheat is ground as is often done by bakers. 2. Will it toughen the wheat so as to give a better yield? A. We think not. 3. Is it injurious to health? A. Yes. This
method of whitening the bread is prevented by heavy fines and penalties in England.
(19) S. C. B. asks: Does soap boilers' refuse contain anything unfavorable to its use for agri (20) W. O. P. says: We frequently find melted lead flowing from stove and grate in whic we are burning coal. A boy once showed me a
piece of what I presume was lead ore; I could cutit with ease with my pocket knife. A few days ago we heard a snapping report in the stove, and melted lead splashed out on the floor and burnt
my brother's hand. Are not these facts indica tions of lead in quantity somewhere in the dis trict? A. Yes. 2. If so, would it be found above or below the coal vein? A. It might be found be-
low as well as above. 3. If there be lead, how could the vein be mosteasily found? A. By care-
con fully examining the exposures of the rocks for the vein, and by surface indications of minerals containing lead.
(21) K. B. F. asks: Is carbolic acid a poison taken internally or applied outwardly? A. It is a
poison in both cases. It acts similarly to creosote. (22) S. T. asks: How are paper magnetic sh made, so that when they are put in the palm o he hand they will draw up and turn over as i alive? A. They are made of thin gelatin, calle for the same purpose. Will tobacco smoke have any effect upon soft rubber tubing? Will vinegar corrode
ther will have any permanent effect.
(23) J. S. \& Co. ask: What is a good solution for tempering steel for drilling rock? A. Be ing, and quench in salt water, drawing to a brown ing, an
(24) J. P. S. says: I recently came across a of small stones about the size of a hen's egg. It seems to have been ground off on the outside, for it is perfectly smooth. It lies balf a mile from a small stream, and on a hill fully 100 feet above the stream. What is it? A. Such rocks are called conglomerates, and are quite common in some
parts of New England and elsewhere.
(25) O. A. Jr. asks: How can I drill hard drill to a straw color, and run it slowly. A. See p. 251, vol. 31 .
(26) W. W. B. says: An apparatus for gold and silver plating is constructed as follows: Bath: 4 ozs. cyanide of potassium and 4 ozs. carburet of
mmonia, dissolved in 1 gallon rain water. Then add 22 grains gold (or silver), apply battery, and add blu itriol until a blue color is obtained. Battery Put nitric acid in the porous cup, and diluted suln the porous, and zinc in the outer, with smal copper wires. I use the gold solution hot. I am very careful to clean thoroughly the articles plated, but thework will not last six months. Can you in form me of a process by which I can do plating
that will last one, two, or three years? A. To hat will last one, two, or three years? A. To make a silver solution, dissolve the silver in fou cid is heated in a vessel and the silver added by degrees. After the metal is dissolved, put it in large vessel and dilute with water. Then add a so lution of cyanide of potassium so long as a whit precipitate is formed. When the precipitate of cy nide of silver has settled,the clear solution is cate which is again decanted as soon as the precipitate hassettled. Repeat this three or four times, and the add a solution of cyanide of potassium until the precipitate is all dissolved. The solution is the ready for use, after filtering. Dilute the cyanid f potassium so that the plating solution shall con ain one ounce of silver to a gallon. A prepara-
ion of solution of gold is prepared by dissolving rold in three parts muriatic acid and one of nitric cid, which forms the chloride of gold. This is diested with calcined mageesia, and the gold is pre cipitated as an oxide. The oxide is boiled in strong itric acid, which dissolves any magnesia in unio with it. The oxde, being well wached, is done in cyanide of potassium, which gives cyanide o
gold and potassium. A Smee or Daniell battery is better than a carbon battery for silver and gold plating:
(27) B. D. T. asks: How are plow castings them cool in the mold
(28) L. G. acks: 1. What kind of grease is best to use in the oil cups of engine cylinders? A.
Tallow. 2. Which oil is best to use on engine lides? A. Lard oil.
(29) Y. P. says: I have made a nickel solu mon of ibs sulphate of nickel, and 4 ozs. Eal am
phate of nickel. I used fluid ammonia to make it neutral. I use a 3 cell Smee battery. The work
comes out black. Can you give me a remedy? comes out black. Can you give me a remedy?
A. Dissolve the nickel in nitric acid and then add Wash $t$ tis well and dissolve it in cyanide of potas sium. Use a plate of nickel for a positive electrode. Dissolve your platinum wire in a mixture o nitric and muriatic acids. Wash your silver plate in nitric acid and brush it until a frosted appear-
ance is obtained. Then wash it in water thorough$\mathbf{y}$, and place it in a vessel containing dilute sulphuric acid and a little nitro-muriate of platinum. Place in the vessel a porous tube containing a few drops of dilute sulphuric acid. Put in the tube a Fiece of zinc and connect the zinc with the silver posited upon the silver as a black powder, and the latinized silver is ready for use
(20) H. M. D. asks: What is the best method of truing up an ordinary carpenter's grind-
stone ? A. Use a $3 / 4$ bar of iron, or a gas pipe, for stone? A. Use a $3 / 4$ bar of iron, or a gas pipe
(31) A. J. G. says: I have a tin roof laid on matched boards, which is $20 \times 34$ feet. It is nearly a very heavy coat of hoar frost collects inside; and when it thaws, the moisture drops down to the plastoring and is spoiling all of the ceilings in the upper stories. Can I prevent the hoar frost collecting by putting a ventilator in the center of the
roof? If so, what construction is best? A. The roof? If so, what construction is best? A. The roof would seem to indicate a concealed leak in the tin; but if the frost shows itself in every part, the tin; but if the frost shows itself in every part,
and there is evidence that it arises from the con-
densation of water from the atmosphere, it is, to densation of water from the atmosphere, it is, to
say the least, rather unusual, and the remedy should be sought in an increased ventilation. Your best plan to effect this will be to provide openings sides thereof, so that the air may pass through the roof space: these may be placed close under the roof cornice, so that they may be protected from the entrance of rain, etc.
(33) W. M. L. asks: What kind of treadle should I put on a foot lathe to use either end of
the lathe? A. Make your treadle as long as your the lathe?
lathe bed.
(33) F. E. W. says: In your answer to W. E. W. you say that musk is prepared from a root.
In Griffith's "Universal Formulary" may be found the following: "Musk is a peculiar concrete substance obtained from the moschus moschiferus, a
small animal of the deer kind, inhabiting the mountainous regions of Contral Asia. The musk
is secreted in the male, in an oval sac, situated near the generative orgars. It is found in com-
merce in these sacs; it is concreted or granular, of a brownish color, soft and greasy to the touch, of a powerful, penetrating odor, and of a bitter, unpleasant, and somewhat acrid taste. From its
high price, it is very liable to adulteration. It is antispasmodic and stimulant, and has been much used in spasmodic diseases of all kinds, as well as
a stimulantin low states of the system. The dose from five to ten grains.'
(34) W. M. N. asks: How can we temper steel springs made from the ends of Bessemer
rails? A. Try a very low red heat, and quench right out in water.
(35) S. C. C. D. says: 1. F. wants an inter both to revolve in definite proportions (say two or three to one). I contend that there must be an in termediate to transmit the motion. Am I right?
A. Yes. 2. Please give the relative proportions. gears.See p. 187, vol. 29 .
(33) J. L. H. asks: 1. How can I temper
oold chisels and punches? A. Heat to a red, and quench in water, drawing to a blue. quench in water, drawing to a blue. 2. Can I make
knives (for a shaping machine) out of vertical mill saws $\frac{3}{16}$ inch thick? A. They are excellent material for the purpose. 3. How can I anneal and
temper them? A. Anneal in lime, and draw to a
(37) W. P. S. asks: Will a circular cutte on a lathe mandrel answer for beveling the edges
of pasteboard for bookbinding? A. No. Such of pasteboard for bookbinding? A. No. Such
material should be cut with shears, to avoid a burr material shou
What kind of wood is best for cutting
with a chaser or screw box? A. Boxwood
(38) R. T. W. asks : What can I use in lard oil to prevent it from chilling or becoming thick?
A. A good variety of kerosene oil would answer A. A good variety of keros.

How can I procure the drawings, etc., of all ma chinery patented in the United States? A. Apply by letter at our office for copie
See our prospectus in this issue.

$$
\begin{aligned}
& \text { See our prospectus in this issue. } \\
& \text { I have a mercurial thermomete }
\end{aligned}
$$

$5^{\circ}$ Fah. this winter. Canit be correct? Indicate mersury congealed at $-39^{\circ}$. A. Mercury freezes
at $39^{\circ} 5^{\circ}$ Fah. Lower temperatures are measured by thermometers in which the mercury is replaced
colored spirits of win
(39) H. L. C. asks: How much fuel is re-
quired to melt 1 tun of cast iron? A. Probably quired to melt 1 tun of cast iron?
2 or $21 / 2$ times the weight of the iron.
(40) N. D. S. says: I have a water tank
nade of two inch pine planks. It is round and made of two inch pine planks. It is round and
hooped like a barrel, and is about 4 feet high and 4 feet in diameter. It is about 20 feet above the
supply. I want to attach a supply pipe to the tank, put in a check valve with a safety valve on the top, and fill the tank with steam: and as it con-
denses, let it fill Itself by the supply pipe. Will the tank stand the pressure? A. It will most likely be difficult to make your wooden tank steam.
tight and keep it so. A better way to flll it by the tight and keep it so. A better way to flll it by the
direct action of steam is to provide a smau cylin-
der below, supply the steam at
have two pipes leading from the bottom, one down
to supply the water to the cylinder, and the other up, through which to force the water to the tank Provimenter at the top and expel the air; condense the steam by a jet and the water will enter from the supply pipe and fill the cylinder; let the steam
enter again on top of the water and it will force it down and out through the rising pipe to the tank then condense the steam again, and the operation
will be repeated. Now, if you make your valves (41) (41) N. C. H. asks: What will remove a
oating of paint from windows? A. Try turpen ine and linseed oil.
(42) W. B. W. asks: 1 . Are the carbon Bunsen's batteries? A. Yes. 2. Would a doubl convex or a plano-convex lens increase the bril-
liancy of an electric light any more than a plain window glass with a strong reflector placed be hind it? A. No
(43) F. B. asks: What are the arrange-
ments of the circuit in an induction coil, and what ments of the circuit in an induction coil, and what
is the best material for the core? The coil is in is the best material for, the core? The coil is in
tended for a shocking machine. A. An induction coil consists of a primary and secondary coil separate bobbin, and the one placed inside the
other. The primary coil is made of wire nch in diameter and covered with cotton or wool; the secondary coil is made of silk-covered wire
s. $^{1}$ of an inch in clameter, and is ten or twenty imes as long as the primary. The core consists two ends of the primary coil, and when the circuit is closed or broken, a shock will be produced by taking hold of the two ends of the secondary (44) W. E. D. asks: 1. Which is the strongest magnet, one wound with fine or with coarse
wire? A. For lifting weights, coarse wire; for wire? A. For lifting weights, coarse wire; for
working over long telegraph circuits, fine wire. working over long telegraph circuits, fine wire.
2. Does the size of the iron of which the poles are made make any particular difference as to th
strength of the magnet? A. The iron should be about one third as thick as the coil. 3. I have
and made a magnet with spools $21 / 2$ inches long x13/4 inches diameter, outside measurement, and made
the poles of $1 / 3$ inch iron. I wound the spools with the poles of $1 / 2$ inch iron. I wound the spools with
No. 26 insulated wire, putting 600 feet on both would be. What is the cause? A. If you use more battery, your magnets will be stronger. 4.
Will lightning strike insulated wire? A.Lightning Will lightning strike insulated wire? A.Lightning
will strike anything. 5. Supposing a line of galvanized wire is used outside, and is connected with insulated wire where it enters the house, would
that be dangerous if $I$ do not use lightning arresters? A. It would be dangerous to the instruments You had better use the arresters.
(45) B. J. K. asks: 1. Is it true that, with Edison's automatic telegraph, 500 words can be
transmitted per minute? A. Yes, on shortlines, say 100 miles long or less. 2. Do you think it will ever be generally adopted and drive the sounder out of use ? A. No. 3. Can you give me a de-
scription of it? A. It is substantially the same as Bain's telegraph. The additions are a new me--
chanical puncher and a method of neutralizing, to some degree, the static charge. 4. What books should a telegraph student read to obtain a perfect knowledge of telegraphy? A. Culley's, Sabine's,
Pope's, Turnbull's, Sbaffner's, Prescott's, Jenkin's, Pope's, Turnbull's, Sbaffner's, Prescott's, Jenkin's,
and Bakewell's in English. In German, Schellen's and Bakewell's in English. In German, Schellen
is the most complete work.
(46) $\Lambda$. F. O. says: I have heard just
nough about the single fluid bichromate of potenough about the single fluid bichromate of pot-
ash battery to cause me to desire to know more ash battery to cause me to desire to know more
about it. If it is, in point of simplicity and efficiency, what it seems to be, it is a most desirable fluid, that can be kept in bottles for any length of time; the zincs and carbons cannot deteriorate when laid away, and must be ready for immersion
at any time. No porous cells are needed. What are the chemical reactions, and in what manner does the exciting fluid deteriorate, how may it be single fluid bichromate of potash, or Grenet, battery is a very good form of an experimental bat-
tery where constancy of current is not required, as, for example, in the laboratory and mechanical workrooms. The cell is in the form of a bottle, and contains a mixture of 2 parts bichromate of
potash, dissolved in 20 parts hot water and 1 part potash, dissolved in 20 parts hot water and 1 part
sulphuric acid. The top is provided with a brass frame, to which is fastened a wooden cover. To this cover are attached two carbon plates which
permanently dip into the fluid; and between the carbon platesa zinc plate is suspended, which may when the zinc is withdrawn,the action ceases. The battery gives a powerful current for a short time, but rapidly polarizes. The length of time during the use which is made of the battery. It is not
then suitable for continuous use; but in all cases where
a powerful current is required for a brief period, a powerful current is required for a brief perio,
it isa very desirable and economical apparatus. (47) C. E. G. asks: Can I warm a three
story wooden building, $80 \times 45$ feet, thoroughly by story wooden building, $80 \times 45$ feet, thoroughly by
putting two hot air furnaces in the cellar? A. Your building is not so large but that it may be
heated by two good sized ordinary hot air furnaces. Apply to the party from whom you intend to procure your furnaces before you build, so
that the location and size of the flue 3 (which should that the location and size of the flues (wh
be large) may be properly determined.
(48) I. O. T. apys: 1 . I am making an induction coil; it is $\overline{71} / 2$ inches long, has a center
bundle of soft iron wires of $5 / 8$ inches diameter, and I propose to make it with a diameter of about
inches. The inducing coil consists of copper 4 inches. The inducing coil consists of copper
wire $(100$ feet to 1 lb.$)$ and there is a about 40 yards
feet to 1 lb .) and I get quite a strong shock. How
much more of a smaller size ( 18,000 feet to 1 lb.) much more of a smaller size (18,000 feet to 1 lb .)
ought I to coil on this to get a spark of at least 1 inch long? A. You would require to add a condenser to accomplish this. 2. My battery is of the
Callaud gravity kind, made in quart glass jars How many of these will equal one of the Daniell kind? A. One. The electromotive forces of the Callaud and Daniell battery are similar. 3. In ingthe wire from the copper plate on the bottom of the jar uncovered? A. It would be eaten off 4. If the strength of the induced current depends upon the intensity of the inducing current, why
not pass the current into a small induction coil not pass the current into a small induction coil and then use the induced current as an inducing
one for a larger coil? A. It does not depend upon the intensity, but upon the quantity. 5. What is he black substance that falls from the zinc to the
oottom of the jar? A. Copper, deposited in a me tallic form. 6. Does it do any harm to let it collect? A. It ought to be removed occasionally.
The zinc is sheet zinc, amalgamated. Is this right The zinc is sheet zinc, amalgamated. Is this right
A. It ought not to be amalgamated. 8. What is A. It ought not to be amalgamated. 8. What
the best form of battery that can be transported, and used while it is being transported, or while the iquids are agitated a little? A. Daniell's or Le clanche's. 9. What is the white salt-like substance hate of zinc, crystalized.
(49) C. M. B. asks: Should the follower pinch the rings of the piston, or should they be
loose so as to be acted on by the springs? A. Let loose so as to be acted on by th
them be just movable by hand.
(50) C. F. B. says: 1. I made a battery o two cells, which fails to give a current. I filled the
outer glass Jar, 6 inches deep and 4 inches in diamter, two thirds full of a concentrated solution o electrode ( 5 inches long by 34 inch diameter. The carbons were packed tightly into the porous cups with a mixture of finely powdered black oxide of manganese and gas carbon, 3 parts of former to 1
of latter. Where is the mistake? A. You should use coarsely powdered manganese oxide. 2.In th battery made by C. and F. Fein, of Stuttgart, how tion between the copper wires and the charcoal
plates? $A$. They are clamped together large are the plates? A. They vary according to the size of the Jar. 4. How many Leclanché cells are required to ring an electric bell with 300 yards
of ordinary telegraph wire, insulated? A. About 4 . (51) A. M. R. asks: How can I get inter mittent rotary motion of a wheel, 12 inches in diameter, by cogs, an 8 inch wheel being on the
driving shaft? A. Have cogs on the driving wheel Is there a dry color lighter than blue that will dissolve in water when cold A. We think itquite likely. Apply to a manufacturing chemist.
( 52 ) R. B. R. asks: How does the engine, illustrated as operating the water belt on p. 278 of
Science Record for 1875 , operate? A. A reciprocating engine will answer, as all that is necessary is to make the large wheel revolve at a high speed.
In the engraving it appears to be a rotary engine. (53) J. V. asks: Will ice form on the bottom a riveras well as on the surface, on eitherrocky or sandy botto
(54) E. B. T. asks: What is a good preparation with which to cover the deck of a boat? A.
Good timber, well seasoned, is advisable. There are numerous patent processes for preserving tim-
ber by which it is said that green wood is rendered durable.
(55) X asks: Why does the lead eccentric more quickly a link motion engine wear away does more work than the other.
(58) H. P. asks: What sizes of cast iron路 press, pressing 500 or 600 lbs. bales with one horse?
A. Cast iron, 3 to 4 inches diameter; wrought, 2 to 3 inches. 2. Will an ordinary lifting pump raise water 32 or 33 feet? A. No. 3. What is the probable horse power of an engine, with a cylinder $6 \times 12$
inches stroke, pressure 50 lbs. at 100 revolutions per minute? A. From 10 to 12 .
(57) F. H. H. asks: 1 . Will any object sunk in very deep water remain suspended after reach-
ing certain depth? A. It is quite probable. 2 . Is it true that divers have to hang weights upon themselves so as to keep at their work? A. It is
frequently necessary, because the diving suit in frequently necessary, because the diving suit in-
oreases the displacement, and the water at the bottom is more dense than at the top.
(58) C. asks: Which part of a wheel revolv-
ing on the ground travels fastest going horizontally through the atmosphere? A. The top.
(59) L.E.D.asks 1.Does a native of a trop-
ical climate suffer as much from cold in his own cal climate suffer as much from cold in his own
country as in a temperate one? A.A person accuscountry as in a temperate one? A.A person accusone, sulfer as much from cold as in the colder climate? A. He will suffier more by a certain fall of
temperature in the warm climate than by the same decrease of temperature in the cold climate.
(60) W. L. says: I have a private telegraph line about one quarter of a mile long, and use a return wire instead of the ground. During a re-
cent storm, a bracket came off one of the poles cent storm, a bracket came off one of the poles
and for about one hundred feet the wires are wound one around the other. I supposed that the
current from the batteries at either end would follow one wire to where they came together, and then return by the other wire to its original battery, and so make two local circuits,but no through
current. But on opening my key, I fourd I could communicate with the office at the other end without any difficulty whatever, and we have been
working with the line in that condition for a working with the line in that condition for a week
with scarcely any inconvenience. It recently
ained nearly all day, and for a short time I was had no difficulty. I have conse to the conclusion that the wires are very rusty and thus insulated. he wires swing enough to scrape all the rust off of re insulated by the rust? A. When two or mor aths are open for the passage of an electric cur ies afforded. In the case in point a portion of the current returned via the cross, but enough got through to work the instrument. If the two wire had been a couple of hundred miles in length, very ittle of the current would have reached the dis tant end. If your wo wires were laid on the ground without any insulation, they would work,
because the current follows the wire in preference the earth for so short a distance.
(61) I. M. W. asks: What is the difference etween a galvanic and a faradic current, or be-
ween galvanization and faradization? A. The erm galvanic is sometimes applied to currents produced directly from a battery, and firadic to those produced by induction. In other worcs, the former term is applied to primary and the latter
to secondary currents. The distinction is rather to secondary currents. The distinction is rather
fanciful, and not sanctioned by the bost authors (C2) T. B. S. asks: What is the rule for de termining the electromotive force necessary to quired depends upon the power you wish to $d$ velope. The Atlantic cable can be operated with a battery consisting of a percussion cap, a bit cif
zinc wire, and a pinch of salt. This minute bat zinc wire, and a pinch of salt. This minute bat-
tery, which has an electromotive force of only tery, which has an electromotive force of only
half a volt, is sufficient to overcome the rcsistanco of $a$ wire extending across the ccean, and then to meter. On the otber to wort Tliomson's galvaro frequently only has 50 fect of coarse wire, and re quires a battery of 50 volts to workit. The powe or strength of current is ascertained by dividing the electromotive force by the resistance. Thus if represents the electromotive force, $R$ the resist following formula will always give it corrects $\mathrm{P}=\frac{\mathrm{E}}{\mathrm{R}}$.
(63) F. G. asks: What is the momentum of 11b. after 17 inches fall? What is its momentun after 198 inches fall? What is the formula used to solve such problems? A. Multiply the weight in lbs. by the time in seconds.
(64) J. L. B. says: 1. I am running in 8
horse power portable ensine, and am troubled horse power portable engine, and am troubled prevent it? A. It is probably caused by dirt It may be due to a de blow ofr frequently may be cue to a defect in the boiler. 2. The
barrel of my boiler is 30 inches in diameter, of $1 /$ inch iron, the firebox being a little thicker. Aocording to Eourne's rule, I make the highest safe
working prossure about 80 ibs. per equare inch. working prossure about 80 lbs. per $\varepsilon q u a r e$ inch.
Would it be unsafe to carry 100 lbs., which would be but little more than $\frac{1}{6}$ of the bursting pressure A. We would not recommend it. 3. In a recen and frequent blowing mean to blow off a portion of the water from the bottom of the boiler? A. Yes. 4. Suppose two
tight cylinders or barrels, each having a perpentight cylinders or barrelf, each having a perpen-
dicular pipe inserted, the pipes being of cqual dicular pipe inserted, the pipes being of cqual
hight but of different diameters (1/2 inch and two nches respectively), and all these filled with wa same in each barrel? A. At the same relative point in each, it would.
(65) W. H. G. asks: How is brass spun ? A. The brass is secured to a pattern on a revolving Is there any work on the subject? A. We think Is ther
not.
Wha
is a te is a technical name of a machine for A. The mule is a te
ton.
(66) W. F. C. says: 1. I supposed that wa er is only slightly condensed by the greatest prese-
ure, but Steele's "School Philosophy" says the water at the bottom of the ocean is very much A. Water is compressed about 0.0000033 for each pressure of one atmosphere that is applied. 2.How much does this condensation amount to at the
greatest depths? Is it true that, in the deepest greatest depths? Is it true that, in the deepest
parts of the ocean, heavy bodies, s'rch as rocks or even iron and lead, do not sink to the bottom substan great pressure upon deeply sum substances tend to increase their buoyancy inde-
pendently of the condensation of the water ? A. It is easy to see that,even with this slight compression, water may beconse much more dense at great depths. A submerged body is pressed downward an equal volume of water, so, of course, if the wa ter is sufficiently compressed, any substance will foat in it. 3. Do you think the freshly drowned
human body, divested of clothing, will sink to the human body, divested of clothing, will sink to the (Cr) E G
(Gachine to says: 1. I am making a sawing machine to run by foot power. What sized saw
can I use? A. About 6 inches in diameter. 2. How many revolutions per minute should the saw run?
A. About 400 or 500 . 3. How many revolutions should a bit in a boring machine run per minute? 400 or 500
(68) T. B. K. seys: Our steam tug ordinarily draws 9 feet of water, when loaded 10
feet. Her propeller is 7 feet 1 inch in diameter,with
4 blades; the greatest width of blades is 30 inches It is placed as low down as admissible, so that its ordinary immersion is 2 feet below the surface of the water. It is driven by an upright 24 inch direct action cylinder, of 24 inches stroke. With 45 to 50 lbs. of steam she handles the wheel like a toy, and
tows well. We are about to build a new hull, with

Can we not, with perfect propriety, carry a larger
wheel? Our present shaft is $51 / 2$ inches. If we enlarge the wheel, will it be necessary to enlarge the shaft? A. We think that you can safely increase the diameter of wheel to 8 feet, and that a $51 / 2$ inch shaft will be large enough.
(69) L. H. R. asks: 1. I heard a gentleman from Utica say, the other morning, that his mercury thermometer stood at $-41^{\circ}$ Fah. Is it not to be doubted? A. The thermometer could not quite Fah. 2. Has alcohol ever been frozen? A. No. (70) J. I. S. asks: Why would not the roof January 23 , 18\%5, make a rood steam engine by admitting the steam at $D$ and exhausting at $E$ ? A. It would probably not be economical. How much will a cubic inch of nitro-glyceri expand on explosion? A. About 13,000 times. (1) C. S. A. says: The amount of rain that has fallen in this country for the past ten years will average about 46 inches. If a vessel is set to
catch rain water, and the water allowed to stand in the vessel as it falls during the year, what perof the year the water will be in the vesse athe ons evaporation? A. It will vary in different localities, and must be determined by experiment. What is meant by dry steam? A. It is steam that has no water mingled with it, and is commonly produced in a well designed boiler
What is the average cost of buildi
mbankment, 6 feet high, with upper a railroad feet and lower base of 28 feet, of earth dug along the sides of the embankment? A. Your question is too indefinite. You will find some valuable estimates for different cases in Trautwein's "Fngineer's Pocket Book.
Are the engineers now at work on the tunnel
from Jersey City to New York? A. No.
(72) S. T. says, in reply to L. H. H., who ysked what to do with belts that have become and oil with neatsfoot oll. Attend to it once a month with the scraper and oil ; the scraper should not be too sharp nor be straight on edge, but rounded a triffe. If your belt cannot be run slowly, take it off: but it is etter to keep it on if possible.
(73) C. L. says, in reply to M. W. H., who asked if cherry tree gum is of any value for muciage : Having made use of it for two years, I can answer, yes. It is darker, but I think fully as
strong as gum arahic.
(74) H. A. H. says, in answer to several correspondents inquiries regarding the power neces-
sary to propel steam yachts, and the speed to be obtained by theuse of a definite a nount of power: Assuming that we wish to give the vessel a modir
greatest immersed section :
$V=\frac{V^{2} A}{L H}$, and $H=\frac{L^{2}}{K L}$ where $K=$ coefficient for
speed and horse power, $V=$ velocity in miles per hour, $\mathrm{A}=$ area greatest immersed section, $\mathrm{H}=$ horse the speed in miles equals the square root of the length on water line multiplied oy the horse power and by a coefricient, $K$, and divided by area of ond formula is : The horse power equals the square of the speed multiplied by the area of greatest immersed section in square feet, and divided by the ength on water line multiplied by the coefficient. The coefficient mentioned above varies with the $\cdot 9$ in very flie lines. The above rules are found o agree very nearly with the performance of va rious steam yachts now constructed.
(75) H. M. W. says: It may perhaps interest off the tin from tinned plate without acid. I read a short account of it in the Jahresbericht der Chemie. It consists in boiling the scrap tin with soda lye in presence of litharge. This ought to pay, as there are plenty of objections to
of acids, which unfit the iron for some uses.
(76) C. says, in answer to G. W. B nquires about removing clinkers from My experience is that if, when the stove is inor-
oughly hot, a few lumps of lime, or even oyster hells, are placed in the stove, as near the clinkers as possible, the latter will be softened or fluxed; and as the fire burns down,
off with a poker or shovel.
(77) W. says, in reply to the question of A. B., asking the distance passed over by a fly on the rim of the driving wheel of a locomotive while he locomotive runs 50 miles, the driving wheel be Ing 8 feet in diameter: The fly passes over a cy-
cloid at each revolution of the wheel, and with cloid at each revolution of the wheel, and with tion; and while the locomotive runs fifty miles, the thy will travel 63 miles, $3,4944_{1}^{4} f$ feet.
Minerals, etc.-Specimens have been re ceived from the following correspondents, and examined, with the results stated:
J. F. W.-It is galena, a valuable lead ore.-A. B -No. 1 is 3 xide of iron, with silex. No. 2 is coppe pyrites, a valuable copper ore. No. 3 is black ox ide of iron. Nos. 4 and 5 are talcose schist, not
valuable. No. 6 is chlorite schist, not valuable No. 7 is chlorite and micaceous schist. Nos. 8 and 10 are yellow oxide of iron in schist, not valuable No. 9 is magnetite in steatite. No. 11 is red oxide of ron in schist. No. 12 is iron ore. No. 13 is coppe prites, raluable. No. 14 is magnetic iron ore rood. No. 14 is mica schist, containing quartz, silex, and oxide of iron. No. 16 is mica schist
No. 17 is micaceous schist. Two other specimens are sohist, somewhat stained with green carbonate
nate of lime and magnesia,containing iron pyrites. of iron. No. 2 is silicate of lime with eugite No 3 is augite, a silicate of iron, manganese, lime, and magnesia. No. 4 is copper pyrites.-E. P. C.-It is oog iron ore, containing a large amount of insoluble silicious matter.-W. H. I.-It may be used as a polishing or cutting powder for metals and min-erals.-G. S.-It is marcasite or white pyrites, and
contains 47 per cent of iron and 53 of sulphur.-J. J. T.-It is composed of the same material as pure sand, which is used in glass making, etc., but it is too common to be of especial value. Finely crystallized pieces are prized as rock crystal. Some of the lower priced ornaments are sometimes cut om the last.-J. H. P.-The finer colored varieties Y. T.-It is blende, and contains 67 per cent of zinc and 33 per cent of sulphur. - We have received in a box without any address, 1 specimen of valuable hematite ore, 1 of trap rock, and 4 of a con-
glomerate containing red hematite, from Bucks glomerate
county, Pa.
H. L. asks: What kind of a purchase have used a chain and a with? great deal of trouble and hard work to keep the chain from slipping.-C. W. J. asks: What is the best and speediest plant for a good, compact, and secure hedge?-G: W. W. asks: How can I pulverize mica very fine in large quantities?-W. E. asks: 1 . Has chloride of aniline been successfully wool, more especially on felt hats? 2. Which is the best mode of dyengg a bright black on felt hats?
G. H. F.asks: What is the ornamental work -G. H. F.asks: What is the ornamental work on to the wooden pattern?-A. J. H. asks: How is a silver gray color produced on fancy panel work, ndigenous to the North importedinto the South by means of our armies during the late war (see p. 131, ol. 32)?

## COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC American ac iginal papers and contributions upon the following subjects:
On Talking Ants. By W.C
On Alkaloids by Synthesis. By R. B. W.
On a New Tempering Composition. By T. J. B.
On a Prolific Snake. By A. A.R.
On Glycerin in Boilers. By W. F.
On Domestic Medicine. Ry G. H.J. On Kaolin. By C.T.S.
Also enquiries and answers from the following J. M. S.-J. D. H. -A. O.-W. M.-C. B. L.-C. C.-
T. B. G.-R.

## HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear
hould repeat them. If not then published the should repeat them. If not then published, they may concm. The odress of the w, clines them. T
ways bo given.
Enquiries relating to patents, or to the patentability of inventions, aseignments, etc., will not be published here. All such questions, when initials nly are given, are thrown into the waste basket, a it would fill half of our paper to print them all; by mall, if the writer's address is given.
Hundreds of enquiries analogous to the following are sent: "Who sells aniline blue dyes? Who hangings? Who sells Who makes wooden paper sells giant powder? Who sells a substitute for cloth for billiard tables? Who sells the cheapest toy engine? Who sells boilers for heating larg ting process?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal,"" which is specially set apart for that purpooe, subject to the charge men ioned at the head of that volumn. Almost any . tiously obtanned.
[OFFICIAL.]
INDEX OF INVENTIONS

Leiters Patent of the United States wer
Granted in the Week ending
March 2, 1875,

## and each bearing that date

## Apron supporter, W. H. Chipley (r).

Bag fastener, A, Mille
Bag holder, L. Crofoot.
Bale tie, w. A. Jordan..

Bed bottom, D. C. Kellam..............
Bed spring connection, A. C. McMaius
Belt shifter, T. S. Crane
Btll flle, R. H. Hoffman
Btll flie, R. H. Hoffman...............
Binder, temporary, A.
Bit, rubber-covered,
Bit sock, W. Tucker
Boot heels, making, w. stevere................................
Boot heels, trimming, W. H. Rounds.
Bottle stopper, T. J. Holmee..........
Bottling aerated liquids, H. E. Clinton
Brick machine, E. Deshler.
Brush, shoe, A. McElrath
Rrush, shoe, A. McElrath.
Bucket, earthen, W. F. To
Bucket, earthen, W. F. Towns...
Burner, ,tove vapor, F. Rosengre

Butter worker, F. B. Aldrich.
Button fastening, J. H. Keatin
Cable stopper, D. G. Thompsonn.
Calendar, J. J. Caulon.
Cams, turning pattern, w. Tucker.
Candlestick, w. Kllburn. Candy mixing machine, S. F. Whitman Candy mixing m
Cap, M. Mendel.
Car brake, L. T.
Car brake, L. T. Hay.
Car brake, G. M. Hopkins...
Car brake, Soohodo and Luxa

## Car coupling, C. F. Bake. ar coupling, $O$. T. Baker

Car coupling, , . F. F. Cakenhead.....
Car coupling, Hoopes and Smith
Car coupling, w. C. Scoles..... Car, frelght, Paal and Sibley, Car wheel, $\mathbf{G}$. Palmer.
Cars, apron for stock, C............
Carbureter, etc., H. J. Ferguson
Carbureter, etc., H. J. Ferguson
Carrlage, hand, w. o. Cmetead..
Carriage painter's easel, A. Ho
Cartridge, D. C. Farrington.
Cartridge holder, N. s. Goss
Cartridge shell holder, Holabird and Parks.
Cheese safe, W. P. Quackenbush
Churn, George and Stutzman
Churn, J. W. Simmons...........
Churne, etc., motor for, H. Odel
Chute reverser, drop, Crowthers and Wilikins
Clgar machine, J. Wettste
Clothes and quilting frame, M. Churchill....
Clothes line support, J. N. Fuller.
Clutch, friction, E. s. M. Ferna
Cock, gage, T. J. Nottingham
Coffee roaster, G. Boyd
Colter, , M. M. Davis....
Cooler, beer, J. B. W
Cooler, millk, McEwan and Gibson.
Copyler, tlnnIng sheet, W. Jenkin.
Corn sheller, S. H. Moore..........
Cotton Rin, Buckiln
Cultivator, P. D. Roquemore....
Cultivator teeth,
Cultivator teeth, grass, E. Leona
Curtain fixture, s. H. Phinney...
Dental engIne, Edson and Evan....................
Dlamonds in drills, setting, C. $\Lambda$. Terrey
Dish, artight, P. Shaw
Door check, G. Moyle.
Door chects, etc., attaching rubber to, J. Shepa
Dough-kneading board, L. L. B
Draft regulator, J. Woodruff....................
Drillng machine, portable, M. Stephenson.
Elevator, H. J. Reedy
Engine, oscillating, G. G. Lobdell.
Engine, reciprocating steam, G. B. Dlxwell
Engine, prro-indicator, G. B. Dixwell
Engine reversing litk, J. Simpson
Equalizer, draft, L. J. Seely:
Equalizer, draft, L. J.
Faucet, $F$ F. Messmer.
Faucet, F. Messmer....
Faucet, J. D. Seagrave.
Feed.cutting machine
Faucet, J. D. Seagrave..................
Feed-cutting machine, W. J. Jones...
Fifth wheel, Barraclough and
Fifth wheel, Barraclough and Pritchard.
Fire escape elevator, Thoway
Fire anheld, J. J. M. Johnson.
Flue cleaner, w. G. Pike...
Frut dryer, H. J. Allen...
Frut dryer, T. C. Walter
Frult dryer, H. J. Allen...
Frult dryer, T . C. Walter.
Furnace for burning perroleum, C. Hilbert.
Furnace, smoke-consuming, Argerbright et at
Farnaces, regulating air to, T. S. Prideaux.
Furnace dampers, J. Woodru
Furnace steam jet, G. steele..
Gas exhauster, steam jet, E K
Gas exhauster, stean jet, E. Korting
Gas governor, H. J. Ferguson.....
Gas machine, carbureting, A. C.
Gas regulator, A. Hickenlooper.
Gas retorts, charger for, J. West
Grain conveyer, w. Stanton
Grann sampler, F. A. Furst.
Grape and flower picker, L.
Grate, shaking, J. Mahony.
Hammer, drop, N. C. Stiles.
Hammer, drop, N. C. Hayne
Harness sap, c. . Haynes.
Harrow, sulky, J. Kimball...
Harvester sheaf dropper, s
Harvester sheaf dropper, s. G. G. King
Hem folder, hand, F. Henry.
Hem folder, hand, F. Henry..........
Hinge, double reversible, E. Halsey
Horse collar, L. W. Harhaugh
Index, A. J. Jon
Index, c. virgo.
Knitting machine, we...............................
Lamp extingulsher, w. T. Wood............
Lamp for lighting:and heating, E.
Lamp holder, J. D. Pierce.
Lap board, W. F. Mitchell.
Lawn settee, H. H. Gratz.......................
Leather, manufacture or, H. and C. Klemm.
Lock, seal, J. Kinzer............ 160, sen, 1an, 337
Lock, seal, wheeler and Laffrey.... .......
ock, seal, Wheeeler and Laifrey.
Loom shuttle guard, J. L. Dow.........
Magnet for relays, etc., '. A. Edison.
Matches, making, McC. Young................
Mattresses, stuming, Spurgin and Freenisn
Mechanical movement, Hart and Scott
Medical compound, J. M. Adamson.
Metal rolling machine, J. Holmes....
Metals with metal, coating, I. Adams, Jr. (r).
Mill, cider, E. Curtiss..
Millstone balance, H. C. Byram.
MinIng, apparatus for, Buechley and Thorn.
Mitten, J. H. Peabod, ... .... ......
Molding machne, G. W. Wetmore.
Mortising machine, W. I. Ludlow
Motor, H. Odell.....................
Motor, H. Odell...................
Music leaf turner, G. L. Dimpfel.
Music leaf turner, E. A. Maedel
Nail plate feeder, W. H.
Necktte supporter. B. F.
Ordnance, breech-loading, B. B. Hotchkiss.
organ attachment, reed, J. R. Lomas
Organ tremolo, revd, L. K. Fuler................
Organs, etc., pedal attachment for, R. Burdett
Organs, etc., pedal att
Oren, baker's, J. Hall.
Pail, housemald's. E. C. Wooster
Paper bag machine, w. Liddell..
Paper, cutting wet, J. Eachus
Paper, pasting wal,
Peat-molding machine, Bocquet \& Bénard
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gating and Fire-Lighting Coal Oil Can. 4.451.-Wm. J. Manchester, Jr., stittarille, Ont. Fold Ing Bash Findow. March 3, 1875.
,452.-C. A. Shaw, Boston, Mass., U. S. Oxidized Lamp Wiok. March 3, 1875.
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Gas Machine. March 3, 1875 . 4.456.-C. C. Jordeson, Montreal, P. Q. Revolving Screw
Windlass. March 4, 1875. 4,457.-H. Bolton, Elizabethtown, Ont. Dog Power.
March 4, 1875 . Chine. A. Trumble et all., Ottawa, Ont. Washing Ma
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