

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


IMPROVED METHOD OF TRANSPORTING BRICKS DURING MANUFACTURE.
In the accompanying engraving, we illustrate a new method of transporting bricks about the yard, from the mamethod of transporting bricks about the yard, from the ma-
chine in which they are manufactured to the points at which chine in which they are manufactured to the points at which
the filled hacks are piled for drying and storage. The general the filled hacks are piled for drying and storage. The general
design is to enable the work to be done more readily and design is to enable the work to be done more readily and
rapidly, and with probably a less number of hands than is rapidly, and with probably a less number of hands than is
usually required. Before proceeding to describe the plan in detail, we desire to direct the reader's attention to the apparatus for manufacturing the bricks depicted in the foreground of the engraving. This machine has already been illustrated in these columns, but is here presented in a horizontal instead of an upright position. The clay is transported directly from the bed and at once dumped into the hopper, whence it passes to a pug mill, within which it becomes thor oughly ground, tempered, and reduced to a homogeneous mass of about the consistence of thick putty. Hence it passes to the molds which are formed in a mold wheel which revolves in face of the pug mill. A follower beside the wheel, traveling along an incline, forces each brick from its matrix with all the angles and faces smooth, sharp, and perfect, so that the brick as it emerges is deposited upon the endless belt, A. The various devices for conveying the bricks from this belt to their storage places will be found represented in the engraving and described in the following lines:
As the bricks are carried from the machine by the belt, they are removed from the latter by boys, who pile them six high upon the hack planks, B. The hack planks are board platforms constructed of three longitudinal boards, with suitable cross pieces and supports below, and resting on a series of fixed rollers which are inserted in socket rails, C , in the ground. After a hack plank is filled, it is easily slid over the roller out of the way, and an empty one bronght up in its place.
At right angles to the line of rollers over which the hacks are transported,and crossing said line, is an excavation which extends entirely across the yard. Running upon rails, laid extends entirely across the yard. Running upon rails, laid
in the bottom of this ditch, is a switch car, D , the platform of in the bottom of this ditch, is a switch car, D, the platform of
which is flush with the level of the ground, so that the which is flush with the level of the ground, so that the
filled hack planks are easily slid from the rollers directly upon said car. The latter is then pushed along until opposite the point where it is desired to stow the hacks. Tracks are laid from such points in sets of three, and terminate at the edge of the excavation, and upon them are trucks, $E$, which

NEW YORK, JULY 17, 1875.

consist of frames wider and higher than the hacks, and pro vided with a hand windlass, chains, and grappling hooks. As soon as the switch car is in place, a truck is run directly pon it and over the hack, the hooks are caused to catch be neath the latter, and then, by turning the windlass, the hack is raised from the ground. The truck is readily pushed by one manalong the track to the point at which the hack is to be deposited, when the latter is let down by the windlass and detached from the truck, which returns for a new load. The truck runs on either pair of the three tracks so that the latter allow of the storing between them of two rows of brick.
The saddles, as represented at $F$, are stowed between the sets of track during the drying of the bricks. This com pleted, they are placed, as shown, in the distant heaps upon the tops of the piles.
In manufacturing brick on a large scale, the matter of re moving them from the press and stacking them in a con venient place, without unnecessary handling, is a very important feature; and the arrangement, patented by E. R Gard and shown in our illustration, seems to accomplish his object admirably.
Further particulars may be obtained by addressing the $G$ reat American Brick Company, 260 Eleventh avenue,corner West 27 th street, New York city.

## The North Polar Region.

In an article upon the occasion of the sailing of the new British discovery expedition to the north pole, the London Times says:
"So what we really begin this 29th day of May, 1875, is in all probability a progressive series of operations for the dis covery of this planet's most intractable and inaccessible quarter. At present there lies within a few weeks of us, and right between us and inhabited continents, a circle, 1,400 miles across, of which we know not even whether it be land r water, or in what respect it is affected by some conditions wholly different from our own. Is it anything more than a great refrigerator for the production of cold-that is, for the bsorption of heat? If water preponderate there, then the cold need not be so extreme as we imagine; and just as the quator is not everywhere hotter than the tropics, just as the eastern hemisphere is warmer by $10^{\circ}$ in north latitude than the western, and the northern hemisphere very
much warmer than the southern, so even the arctic circle may have the benefit of some genial influences. It has at least half a year of continuous day. What if it be found sufficiently habitable for the establishment of stations in which the production and economy of heat will be the only erious difficulty? Science is sanguine, but it confesses it elf to be hoping against hope as to the matter of its expecta tions. An animal or two, seeds that can stand any cold, some of the lowest forms of vegetable life, and perìaps or anisms in the sea, the possible revelations of an atmos phere completely clear of aqueous disturbance, figure promi ently in the catalogue of hope. If, as is suspected, there be ingredients in the earth's atmosphere too subtle for chemical analysis, the spectroscope may detect them in a region where humidity no longer embarrasses the question. Then what is the aurora? Is it of earth, or of heaven? Is it meteoric? s it cosmic? Does it reveal a universal medium? Is it magnetic phenomenon? At about the 70th degree of latiude the expedition will reach the other side of the magnetic pole, and will have to steer by rules the contrary of our own, and becoming more and more complex till the needle points finally to the center of the earth. At the pole not only the compass, but even the sun, moon, and stars will cease to be available for the usual purposes of observation; that is, if anything should happen to the chronometers, for all will then depend on the preservation of Greenwich time. The forlorn ope told off for the pole will have to mark its track ver carefully if it would be sure of retracing its course back again. The geologists, ethnologists, and palæologists fre at their exclusion, but they must admit their chances would be small indeed. They can wait, at all events. Perhaps the ne hope widest felt and deepest is that of something un nown and unconjectured Who would have guessed a nows that the interior of Africa was populous and de ightful, that the ocean was full of life and undergoing change, or that the elements and fabric of the sun would yield to nalysis? The expedition is a lottery, in which we know too well there are blanks, but in which there are sure to be some prizes, perhaps one or two great ones."
Fermentation of food should be guarded against as the warm weather approaches. This action is always liable to cooked vegetables when set aside. Instead of warming up cold messes, it is better to scald them.


## Sriventifir Ammxiran.

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## WORK FOR ARCTIC EXPLORERS.

The scientific work, laid out for the arctic exploring expedition which lately sailed from England, probably excelled in scope and variety that of any preceeding expedition as remarkably as its material outfit did. The instructions for the guid ance of the observers were prepared by the most eminent Eng lishmen in the several departments of research, and are minute and comprehensive enough to keep the explorers from idleness, whatever else may befall them.
Popularly the grand object of the expedition is to reach the pole; practically that is one of the least important of the many purposes of the voyage. And a couple of years spent in arctic regions can scarcely fail to be fruitful scien tifically, even if the pole still remains unwon. There is much to be learned of the natural history of those frigid regions, and many physical phenomena await solution there. Chief and many physical phenomena await solution there. Chief of the latter may lob
portion of our globe.
Accustomed to the
Accustomed to the near coincidence of compass north with astronomical north in this part of the world, it is all but im possible for us to form any adequate conception of the mag. netic confusion that the explorer has to deal with in arctic regions, when compass north is no longer toward the pole but toward an area west of Baffin's Bay, in north latitude $70^{\circ}$, -the magnetic pole. This point will lie to the astronomica southwest of the expedition when it reaches Smith's Sound, where the Alert hopes to go into winter quarters; in other words, astronomical southwest will there be identical with compass north, and the north pole will lie to the southeas by compass.

As a guide to the expedition, three provisional maps hav been constructed, showing, for the whole unexplored area, the magnetic condition which may be expected if the distribution of terrestrial magnetism be such as our present know-
ledge indicates. The most important of these maps of the ledge indicates. The most important of these maps of the
magnetic elements shows the assumed lines of compass dimagnetic elements shows the assumed lines of compass di
rection over the whole circumpolar area, and the region of Greenland, Baffin's Bay, and Davis' Strait, and also, ap proximately, the lines of equal declination between the north pole of the earth and the northern magnetic pole over the same areas. The importance of such information to the ex plorers is shown by the following example
Suppose the expedition to have arrived at the parallel of
$85^{\circ}$ in longitude $60^{\circ} \mathrm{W}$. of Greenwich, at which point the pole will be due east by compass. They start in an astropole will be due east by compass. They start in an astro-
nomically easterly direction for a sledge journey along the nomically easterly direction for a sledge journey along the
parallel of $85^{\circ}$. In longitude $20^{\circ} \mathrm{W}$. of Greenwich the north paralle of $85^{\circ}$. In longitude $20^{\circ} \mathrm{W}$. of Greenwich the north
pole will bear northeast. When longitude $40^{\circ}$ E. of Greenpole will bear northeast. When longitude $40^{\circ}$ E. of Green-
wich is reached, the astronomical and magnetic meridian will wich is reached, the astronomical and magnetic meridian will
correspond; the north pole will lie between the explorers and correspond; the north pole will lie between the explorers and
the magnetic pole, and the compass will therefore point to the true north. In longitude $180^{\circ}$ the pole will bear due west and in longitude $112^{\circ} \mathrm{W}$. of Greenwich, the explorers will have arrived between the north pole and the magnetic pole, and consequently the north pole will bear due south.
Should the expedition be so lucky as to reach the pole, all the points of the compass will be south ; latitude and longitude will vanish; the north star will lie directly over head, and all the other stars will revolve around it, neither rising nor setting. The moon will remain for days above the horizon, and the sun, in summer time, will make an unbroken circuit of the heavens, yet always in the south. Time in its ordinary sense will cease ; morning, noon, and night will be one ; the dial of the heavens will be a blank. The astronomical instructions prepared by Mr. Hind, su perintendent of the " Nautical Almanac," give data for two eclipses of the sun in the polar area in 1876 and 1877; also a list of occultations of stars by the moon visible in or near the probable winter quarters of the expedition, $82^{\circ} \mathrm{N}$. latitude and $60^{\circ} \mathrm{W}$. longitude, between September 1875 and March 1877, which will enable the observers to employ the best means of determining their longitude.
Special arrangements have been made for the spectroscopic study of the aurora, the instructions for which were prepared by Professor Stokes.
Profesor Tynall
Professor Tymall furnishes hints for the observation of lacial phenomena; the rapidity of the conduction of heat through ice ; the rate at which the ends of glaciers advance into the sea; whether icebergs are formed by the buopancy
of the masses of ice thrust under the water, or by the weight of the masses of ice thrust under the water, or by the weight
of overhanging ice cliffs whose bases have been worn away by the waves; what kinds of matter are brought down from the interior by glaciers and transported by icebergs; the condition of rocks and hills along the sides of glaciers; the colo of the ice and its veining at the ends of glaciers; also the color of the sky, the presence or absence of germs in the air the range of sounds, and so on.
The solution of many weather problems will be looked for through continuous meterological observations, especially with regard to storms which pass over the extreme northern part of Europe, many of them being connected with areas of barometrical depression which follow tracts lying within the arctic sircle.
Especial attention will also be given to tidal phenomena particularly of the tidal wave which sets southerly through the northern part of Smith's Sound, and indicates an open passage along the northern coast of Greenland. Pendulum
observations will also be made, with a view to obtaining data toward the determination of the earth's figure in high north ern latitudes.
The natural history of the region explored will be attended to with equal care. The instructions for biological and botanical observations were furnished by Professor Huxley and Dr. Hooker. The latter particularly refers to the deficiency of our knowledge respecting the hybridizing of cercain o ga, and salix. He suggests also that the pollen of the various species should be carefully examined, and observations made as to whether it is carried by wind or by insects, and gives minute directions for observations touching the power of eeds to resist cold without loss of life. In this connection $i t$ may be remarked that not more than 762 species of flowering plants have been found in arctic regions, the number be-
longing exclusively thereto being about fifty. Arctic Greenlonging exclusively thereto being about fifty. Arctic Green-
land furnishes 207 species, of which 195 are Scandinavian ypes, while only 12 are American and Asiatic types. Botanically, therefore, Greenland is much nearer to Europe than to America. Among the four plants collected by Dr. Bessell, of the Polaris, in latitude $82^{\circ}$ N.-the extreme northern mit of phanerogamic vegetation, so far as known-was a near relative of our familiar dandelion.
With microscopic plants and animals the arctic seas are abundantly furnished, and Professor Huxley directs especial attention to them in connection with the composition of the sea bottom for the testing of certain modern palæontological heories. Instructions for the collection and preservation of uch low forms of life were furnished by Dr. Allman, who lso directs attention to the phosphorescence of the sea, as ar as it is due to living organisms.
The explorers are also furnished with descriptive lists of the mammalia which may be seen, with directions for observation and the preservation of specimens; also with instruc ions with reference to the collection of geological and mine alogical specimens, meteorites, meteoric dust, and other matters of interest.

## INSTABILITY OF THE EARTH'S SURFACE

We are so accustomed to consider the solid earth to be the type of perfect stability that it requires quite an effort of the mind to elevate itself to the thought that even the rocks, which appear to be the foundation on which everything else rests, are of an unstable nature, subject to upheavals, de pressions, and dislocations. Every observing mind that has seen bold mountain regions, railroad cuttings, or mining shafts must have been struck with the evidences of mighty disturbances, although perhaps a book on geology never came under his eye. It is the study of these disturbances which has created this science, one of the most interesting i the whole field of human knowledge

It was formerly supposed that the only cause of such changes was volcanic action, and that all the metamorphoses which have taken place were sudden and violent. The observations of volcanic action and of the changes which it rapidly produces in the earth's surface necessarily led to such conclusions; but patient investigation, during long period of time, has led to the knowledge of a mode of change, for merly unsuspected, by slow upheavals and depressions, taking place gradually, at a rate of one or more feet in a century. Such changes have been and are now constantly taking place, and necessarily must, if prolonged for a sufficiently long period of time, essentially change the earth's surface, not only as to the relative hights of continents and islands, but, in connection with the ocean, as to the whole cosmography of our globe.
We will not speak of the supposed continent Atlantis, mentioned by the ancient mytho'ogicai writers, which was, they asserted, sunken in the Atlantic ocean; but we will only mention positive facts, recorded as a result of careful obser vation. That the coasts and bottom of the Baltic sea are rising is an old and well established fact, the ancient shores being several thousand feet from the present water's edge; while Great Britain and part of the west coast of Eu rope, Holland, Belgium, and France are in a sinking condition. The evidences in and around the British Channel hav long since proved the probability of this, while the Astronomer Royal has announced that minute observations prove that Greenwich Observatory, with the ground upon which it stands, has been sinking ever since its establishment
In regard to cur continent, it has been proved that the whole Pacific coast, especially California, with all its mountains, is perpetually rising, and that at a comparatively rapid rate. The land containing in its bosom our great American Lakes is slowly sinking; while southern Indiana, Kentucky, and the surrounding States are rising. Geological investigations prove that our great lakes, except Ontario, had formerly a southern outlet; until, by gradual northern depres sions and southern upheavals, a northern outlet was formed from Lake Erie into Ontario, about 40,000 years ago. This outlet, the Niagara river, is still wearing away its channel The division line, of the watershed south of the lakes and the Mississippi valley, has since that time been steadily tra veling southward; and when Chicago recently turned the waters of Lake Michigan, through the Chicago river, into the Mississippi valley, the old state of affairs was artificially reestablished.
New Jersey is sinking, with New York city and Long Island, at the estimated rate of about 16 inches per century The coast of Texas is aseending at a comparatively very rapid rate, some observers stating that it is as much as 30 or 40 feet in the last half century.
Combining these observations with the results of the recent deep soundings of the United States steamer Tuscarora in the Pacific Ocean, we find that the bed is evidently a sunken continent, abounding in volcanic mountains some 12,000 feet high, many of them not reaching the surface of the ocean and others which do so forming the numberless islands o the Pacific. The study of the coral rocks proves that this sinking has continually been taking place during several cen aries, and observations of the coast will undoubtedly revea the fact that it has not yet ceased.
The most eminent German geologists and ethnologists now maintain that the locality of man's primitive origin, the sea of the so-called Paradise, was in the Pacific Ocean south of Asia, whence the race slowly diffused itself northward to Asia, westward to Africa, and eastward to Australia. When he great Pacific continent slowly sank, so that the ocean commenced filling the valleys, man retreated to the mountains, which, by continued sinking, were transformed int slands, and now form the many groups of Polynesia. Th nsularity of the thus preserved races was not productive of ivilization, which requires conflict, in which the superior in the end gain the victory over the inferiors. In thos slands, the inferior races were preserved for want of this conflict, hence their savage condition even at the present day while primitively the greatest advance took place at the spo of the most intense conflict, the continent of Southern Asia Even at the present day, it has been said that gunpowder is the greatest civilizer.

## the colorado potato bug

The farmers in our vicinity are just now having their po tato fields invaded by the celebrated Colorado bug, and the demand for Paris green has become so great throughout the ountry that, were it not an article obtainable in almost un imited quantities, the price wculd be greatly enhanced
Let every user of the article keep constantly in mind that Paris green is a deadly poison, and great care should be ta sen in the handling of it. Hands from which the skin is braded, or on which any sore exists, should be protected with gloves, and all precautions should be used against inha ling the poison while mixing it.
The following, from the Maryland Farmer, seems to be a practical mode of applying the poison to the vines. W would, however, suggest, that, on small patches, the dip ping of a broom in the liquid and shaking it over the vinos
be used as a substitute for the appliance which our contemporary suggests
THE COLORADO BEETLE-THE BEST EXTERMINATOR
Sweeten a barrel of water with 1 gallon of cheap molasses then add and well incorporate 1 lb . good Paris green, and ap ply the same in one application to 1 acre of potatoes. Th best mode of applying the liquid to the potato vines is in the use of a can that will contain 4 or 5 gallons, which may be lashed on the back of a man, who may apply the liquid, very
niformly and rapidly, by having two short pieces of $\frac{8}{4}$ inch divide by the number of revolutions per minute. Example: ndia rubber hose attached to the bottom of the can, the other end of the hose terminating in a tin rose, similar to that on watering pots. The liquid should be well stirred at each filling of the can, and it should be frequently and violently shaken during the time of applying it. An active man can apply the poison to four acres of potatoes in a day with ease, and two applications, at proper intervals, will save the crop. The cost is estimated as follows: Hauling water, mixing, and applying the liquid, 30 cents per lb., two applications, 60 cents; 2 gallons

## THE POWER OF SMALL ENGINES.

One of the most frequently recurring questions, asked by our correspondents, relates to the power that can be obtained fro $m$ an engine of given dimensions, with a specified steam press ure and number of revolutions per minute. As we have freq uently explained, questions of this sort can only be determ ined definitely by means of tests. 'j he rules, ordinarily foun $d$ in works on the steam engine, for calculating the hors ${ }^{e}$ power of an engine,give results that rarely accord with thos obtained in practice. Indeed, it is impossible to lay down rules that will apply to all cases, the construction and performance of differentengines being so varied. We feel, however, that we must do something to satisfy the many readers who want information about the small engines which they are building or using. We have therefore compiled a table, from the best data at our own command, by which the performance of small engines of good design can be approximately estimated. We have also added some examples to illustrate the use of the table. It is designed for engines with cylinders up 6 inches in diameter, and for piston speeds
up to 400 feet a minute: the connection of the engine with up to 400 feet a minute: the connection of the engine with the boiler being supposed to be tolerably direct, the ports and pipes being of sufficient size, and the steam valve closing when the piston has made $\frac{8}{4}$ of the stroke. Even with all these suppositions, which probably represent the average conditions of small engines, the table will give results that are too large in some cases and too small in others, for the very reason that it does represent average conditions. With these explanations, we will proceed to illustrate its use

1. To find the area of a piston, knowing its diameter: Mul tiply the square of the diameter by 0.7854 . Example: The diameter of a piston is 3 inches. What is its area? The square of 3 is 9 . Multipying 9 by 0.7854 , we obtain $7 \cdot 0686$ as the area of the piston in square inches. It may be well to observe that, whether the piston has either a flat, rounded, or raised end, its effective area is to be calculated from the diameter, as explained above.
2. To find the speed of a piston in feet per minute, when the length of stroke and the number of revolutions per minute are known: Multiply twice the length of stroke, in inches, by the number of revolutions per minute, and divide by 12 Example: An engine has a stroke of 3 inches, and makes 300 revolutions a minute. What is the piston speed? Twice
the length of stroke is 6 inches. Multiplying by 300 , and di the length of stroke is 6 incs. Multiplying by 300 , and diminute.
3. To find the horse power of an engine, when the diameter of the cylinder, the length of stroke, the number of revolutions per minute, and the pressure of steam in the boiler are known: Find the area of the piston, in square inches, and the piston speed, in feet per minute. Find the number in the table, the nearest to the given steam pressure and cal culated piston speed, and multiply it by the area of the piston Example: An engine has a cylinder 2 inches in diameter and with a length of stroke of 2 inches. It makes 400 revolutions a minute, with a boiler pressure of 50 lbs . per square inch. What is the horse power? Square of diameter of piston 4 $\times 0.7854=3 \cdot 1416$, area of piston, in square inches. Twice the length of stroke $4 \times 400=1600 \div 12=133 \frac{1}{8}$, speed of pis on in feet per minute. Nearest piston speed in table is 130 and the number in table corresponding to piston speed of 100 feet per minute and boiler pressure of 50 lbs . is 0.074 add the number corresponding to piston speed of 30 feet pe minute, 0.022 ; this will give the number corresponding to iston speed of 130 feet per minute, 0006 . Multiplying this by area of piston, $3 \cdot 1416$, we obtain, horse power, $0 \cdot 3+$
The power so calculated is that available for useful work, such as would be developed on a friction brake, in an experi ment made by the method explained on page 273 of our volume XXXI.
If any of our readers test their engines in this manner, we would be glad to receive the results of their experiments which will be useful in enabling us to correct the table, if ecessary.
4. To find the diameter of cylinder for an engine to develope a given horse power, when the piston speed, in feet per minute, and the pressure of steam in the boiler are known: Find, in the table, the number nearest to the given piston speed and pressure of steam. Divide the required horse power by 0.7854 times this number, and take the square root of the quotient. Example: An engine is to develope 2 a boiler pressure of 100 lus. per square inch. What a boiler pressure of 100 lbs. per square inch. What
should be the diameter of the cylinder? The number in should be the diameter of the cylinder? The number in
table, for piston speed of 100 feet, is $0 \cdot 161$, and for 50 feet is 0.081 , giving a total of 150 feet $=0.242$. Multiply this by 0.7854 , and we have a result of 0.1900668 . Divide the horse power by the figure $0 \cdot 1900668$, and the quotient is $10 \cdot 5226+$. The square root of 10.5226 is $3.24+$, or about 34 inches, the equired diameter of cylinder.
5. To find the length of stroke, in inches, when the piston speed, in feet per minute, and the number of revolutions per minute, are known. Multiply the piston speed by 6 ,and
divide by the number of revolutions per minute. Example:
The piston speed of an engine is 200 feet per minute, and the The piston speed of an engine is 200 feet per minute, and the
number of revolutions per minute is 300 . What is the length of stroke? Multiplying 200 by 6 , and dividing the product, 1200 , by 200 , we obtain 4 inches, as the length of stroke.

In this article. we have presented the subject as plainly as possible, so that it can be used by all who have queries on power developed by small engines.
effective horse power of an engine with a piston one square inch in area, for different stean PRESSURES AND PISTON SPEEDS.


## THE KEELY MOTOR DECEPTION

We publish on another page a communication from the counsellor of the Keely Motor Company, Mr. Collier, and his colleagues, in reply to an article on the above subject given in our paper of June 26. We devote this space, first, because the parties interested, feeling personally aggrieved by our remarks, have requested, as a matter of fair play, an op portunity for reply; and second, because we have hopes tha some of our readers may be led thereby to study out the pro able processes by which these gentlemen have been precipi tated into this delusion. Such studies may result in usefu uggestions or new knowledge. It is not often that the active participants in delusions like this are willing to come forward and chronicle themselves in the broad and publi manner that these persons have done. The mental or psy chological phenomena will, we think, be found interesting ubjects for investigation.
An example somewhat similar to this Keely motor busi ness occurred in London, in 1871, when Dr. William Crookes, he well known scientist, published his astonishing accoun of the spirit motor of Home, in which the spring gage was made to move by the simple pointing at it of the operator's inger. The truth of this performance was attested by Dr Crookes, who himself prepared the apparatus, by Dr. Wil iam Huggins, by Edward William Cow, a distinguished law er, and by numerous other witnesses of undoubted relia bility. Dr. Crookes and others were convinced by this exhi bition that a new force, which he termed psychic force, had been discovered; but Dr. Iluggins, while attesting that th gage moved (in fact, the movement was made to record itsel on paper), declined to express an opinion as to how the move ment was produced. An account of these performances, with an engraving of the arrangement of was pubished in the Scientific Ambrican, page 99 August 12, 1871.
This motor of Dr. Crookes appears to surpass the Keely device in some respects. The power is workable at a lo w pressure, involves but little expense for apparatus, require no blowing of air from the lungs, uses no hydrant pressure nd its success does not depend upon " cold vapor"
No one, we believe, has ever questioned the honesty of Dr rookes, or supposed for a moment that he had, personally, any hand in giving motion to the gage. The more reasona ble supposition is that somebody, in some manner unob-
served by those present, applied the necessary force to the served by tl
The human senses are but weak instruments at best, easily played upon and deceived; and those who have most highly prided themselves upon the possession of superior percep tions, by which they were confident of their ability to detect the unreal from the real, have become lamentable examples and led astray by mere appearances
In matters of Science and Mechanics, especially in those branches pertaining to the correlation of forces, it is only by the application of the most careful methods, coupled with the searching tests of mathematics, that reliable knowledge an be acquired and delusive conclusions avoided
As in the present example of the Keely motor, so in the case of the Paine electro motor in 1871 ; the originator of the deception made the most solemn assertions that the machine which he then had in operation derived its sole power from the four small battery cups, which the witnesses saw stand ing on a shelf at the side of the apartment. The mavhin was tested, with brakes, as to power, by well known practical
electricians of this city, whose names are now before us, wh
reported large gains of power and detected no fraud. Thei experiments were corroborated by many other intelligent witnesses. Special exhibitions were given to capitalists, who pronounced the show wonderful.
We expressed the opinion that the whole thing was a de ception, warning the public against investivg means in th motor shares. We reproduced the well known mathematic of electric action, we showed the exact amount of force de rivable, under the most favorable circumstances, from the con sumption of a given amount of zinc and acid, as determined, after exhaustive experience, by the most eminent savans and from these teachings, we pointed out the necessary falsity of the statements made in behalf of the new motor. Paine, in reply to our strictures, reaffirmed all that he had before claimed for his motor, which he now alleged was far below the actual truth; he said that he was tiren engaged in build ing a great and powerful engine which would be ready in ng a great and powerful engine which would be ready in
ninety days, which would develop 500 horse power from ninety days, which would develop 000 horse power fom
single cup, completely annihilate the figures given by us, and single cup, completely annihilate the figures given by us, and
show to the world that people who, like the editor of the show to the world that people who, like the editor of the
Scientific American, undertook to doubt or criticise the performances of a machine they had never seen and wer practically unacquainted with, were jackasses, or "a fool, as our friend Mr. Collier suggests others might properly say I am familiar," said Paine, " with the experiments of Grove, Carpenter, Mayer, Faraday, Liebig, and a host of others, relative to the doctrines of correlation and conserva tion of forces. Therefore, I am no tyro, but the peer of an authority you may quote; and as such I unqualif anser that, instead of the miserably small result of 67,000 for American) we should realize $67,000,000$ foot pounds. The forces developed by the action of a single Bunsen quart cell if utilized and converted into power, would drive the larges hip afloat with a velocity only limited by the strength of the ship's frame; and you and I will live to see the day, if our lives are lengthened to the usual term, when this state
ment will be verified, and that, too, without involving the question of perpetual motion.
This sort of talk prevailed with the capitalists; they swal owed the bait,paid in their money,took their shares-" with out being urged "-and that was the end of the five hundred The is but a repetition of the Paine affair. The originator is very honest; all the people who assist at the deception believe in him and in his machine. They know not precisely how the hing is done, or by what laws it is governed, but they know hat it is done; and any suggestion to the contrary they seem to consider as a reflection on their personal intelligence and onor
The Keely performance is as follows:
Keely blows from his lungs, for a period of 30 seconds, into nozzle upon the generator. He connects the same nozzle by means of a small rubber tube, with the hydrant, and lets in five gallons of water under a pressure of 264 lbs . to the inch, then shuts off the water. He opens the valve of a pipe of $\frac{1}{10}$ of an inch bore, between the generator and a gage o pressure indicator; and lo! the gage indicates $10,000 \mathrm{lbs}$. to he square inch
Such, in sum and substance, is the Keely motor, as se forth by the learned counsel of the company and corroborated y various mechanical experts, in the statements they hav ow freshly prepared for the especial benefit and enlighten ment of the readers of the Scientific American : corrobor ted also by scores of other intelligent persons, so Mr. Collie assures us.
The majority of our readers will doubtless conclude with us that, on the showing of the parties themselves, the whol hing must be classed as a second rate juggle-a mechanical Katie King arrangement, too contemptible for serious consid ration.
In our article of June 25, we assumed that the chief pur pose of the deception was to wriggle money out of silly peo ple. It appears, from the confession with which Mr. Collie has favored us, that the very first practical use he made of the pretended invention was to obtain money from New York capitalists; that the second use was to procure mone rom the same source; the third the same, and so on, until he treasury is considered full enough for the time being. W ttribute to Mr. Collier no dishonorable motives or method in financinghis company; but we think he confirms our state ment as to the uses of the alleged invention. In connectio with the letters from the various parties, given elsewhere some further comments will be found.

## Synthesis of Therpylene.

Some time ago M. Berthelot published investigations in which he showed that the essence of turpentine, represented by the formula $\mathrm{C}_{20} \mathrm{H}_{16}$, resulted from the condensation of a special carburet, $\mathrm{C}_{10} \mathrm{H}_{8}$. This last, termed therpylene, no one has ever seen until the present time, when M. Bouchar dat announces that he has produced it by synthesis.
Monday, the day following July 4 (which this year comes on Sunday), will be, as usual, observed as a holiday in this
city. Pressmen, as well as men in other occupations, will city. Pressmen, as well as men in other occupations, will suspend work on Monday; therefore if subscribers to the Scientific American fail to get this issue of the paper till day or two later than usual, they will know the reason.

The body of an American, John Blackford by name, has ecently been found in a large ice block in the vicinity of Mont Blanc, after several days of thaw. The unfortunate tourist had tried three years ago to ascend Mont Blanc without a guide, and had not since been heard of. Features and clothes are perfectly preserved.

IMPROVED ENGRAVING MACHINES.
We illustrate herewith two specimens of a series of ma chines, designed and constructed by Mr. Ferdinand Lotz, of Offenbach, Germany, for the use of engravers, and having a very wide range of application, as they are intended for the production of line engraving, producing enlarged or reduced facsimile copies, and for making copies of reliefs of all kinds. Fig. 1 is a machine employed for engraving reliefs, medallions, etc., either the same size as the original, or enlarged or reduced. With it straight and curved lines in various com-
with the atmosphere, two or three distinct layers of scale form on the surface, and, unlike the skin upon cast iron, can be readily detached, as by the bending or by hammering th metal. The outer layer of this scale is more highly oxidized than the inner, and is slightly redder in tinge from the presence of a variable excess of ferric oxide over that contained
in the inner layer. The oxide in the inner layer. The oxide occurring in the outer scale is fusible only at a high temperature, is strongly magnetic, and slightly metallic in luster; while the inner layers are
more porous, dull, and non-metallic in luster, less brittle
cases, and recourse must be had to scrapers and hard brushes to remove the scale or rust. Having obtained a clean sur face. the question arises what paint should be used upon ron? Bituminous paints, as well as those containing varia ble quantities of lead, were formerly considered as solely vailable, but their failure was made painfully apparen when the structures to which they were applied happened to be of magnitude, or subjected to great inclemency of weathe or to constant vibration. Recourse has, therefore, been had


Fig. 1.-LOTZ FNGRAVING MACHINE.
binations can be produced. The differentnatures of lines are formed by the use of change wheels, the forms of which vary with the design to be engraved. One of these wheels is shown mounted in place; and it will be seen that bearing up. on it on the upper side is a steel point, to which motion is imparted as the wheel revolves, the motion of course vary ing with the form of the wheel. This movement is then transferred from the arm carrying the steel point, through a set of levers to the bar carrying the diamond point, shown resting on a lithographic stone. For ruling straight lines the upper rack, shown in the engraving, is dropped, throwing out of gear the parallelogram which transmits motion to the carriage. The latter is then moved to the left hand side of the frame. By turning the crank handle, shown in the engraving, motion is imparted through the gearing and rack graving, motion is imparted through t
and pinion, to the slide rest carrying the diamond point holder, and a line is drawn upon the stone. On turning the lever in the opposite direction, the graver is raised out of the way. The slide rest is provided with a self-acting feed, which can be graduated with the utmost nicety. Sliding blocks are placed on the frame to regulate the travel of the carriage. Thick lines may be produced by giving the screw spindle, upon which the lateral motion of the graver depends, one twenty-fourth of a turn. The lines are then so close together as to appear as one, but dark lines may also be produced by loading the cutter bar with shot, and thus increasing the pressure. In copying reliefs, it is necessary to move the carriage to about the middle of the machine, and to connect it with the pantograph shown in the engraving. The steel point actuated by the design wheel, and that part of the machine transmitting the motion thus applied to the steel point, have to be removed.
The original is fixed upon a cross plate below the carriage, in the position indicated on the engraving, and the steel point is then carefully carried over each part of the original, the motion being transferred to the diamond point.
The horizontal spindle of the carriage, to which the original is secured, carries at one end a ratchet wheel and crank, and by this combination the points are shifted through the space of one line, so as to occupy fresh ground. In reducing or enlarging originals, a suitable connection is made between the carriage and the pantograph.
In forming straight and curved or wavy lines, a design wheel of the required pattern is fixed in the position shown, and operates as already described.
Fig. 2 represents an adaptation of the same principle, and is intended chiefly for engraving bank notes, checks, etc. With this, reductions or enlargements can be made, by the aid of the pantograph attached to the instrument.

## Painting of Wrought Iron.

Mr. E. Spon, in a paper read before the Society of English Engineers, says:
In considering the painting of wrought iron, it must be noticed that, when iron is oxidized by heating in contact


## Fig. 2.-LOTZ ENGRAVING MACHINE.

2 per cent of sulphuric acid. The metal is afterwards rinsed in cold water, and if necessary scoured with sand, put again into the acid bath or pickle, and then well rinsed. If it is desired to keep iron, already cleansed, for a short time before painting, it is necessary to preserve it in a liquor renderer. alkaline by caustic lime, potash, soda, or their carbonates. Treatment with caustic lime water is, however, the cheapest and most easy method, and iron which has remained in it for some hours will not rust by a slight exposure to a damp atmosphere. Although desirable, this method of cleansing the surface is impracticable in the majority of
oxide paints are made of two qualities. The first quality is the best adapted for iron work, and is made by purifying the uxides and placing them in retorts, when the various colors are mixed with them. They are altogether submitted to seven distinct processes in the course of manufacture. To insure large surfacing qualities, or the power of covering a large area with a small quantity of paint, the ingredients should be reduced to an impalpable powder before they are mixed with the oil; and after mixture in first quality paint, they are ground for seven or eight hours. The second quality have their colors chemically combined by mixture, quality have not so carefully prepared, although they are excellent and are not so carefully prepared, although they are excellent
for common work. A pound of iron oxide paint, when for common work. A pound of iron oxide paint, when
mixed ready for use in the proportions of two thirds oxide to mixed ready for use in the proportions of two thirds oxide to
to one third linseed oil, with careful work, should cover twenty-one square yards of sheet iron which is more than is obtained with lead compounds. Oxide of iron paint endures a very great heat without material alteration, and keeps both its color and preservative qualities well. The author is of opinion that, when used under proper supervision, no better protection can be found for iron structures than oxide of iron paints. There is this difference to be noticed between the painting of iron and wood, that, with the former, when a painter comes to spots of rust that cannot be removed, he should endearor to incorporate them with the paint rather than paint over them. The repainting of iron involves carefully washing down and removing all dust, dirt, and so on from the entire surface, every particle of rust being scraped and chipped off, the work receiving from two to four coats in oil, properly applied. The author would observe, in conclusion, that the real value of any paint depends upon the quality of the linseed oil, the quality and character of the pigment, and the care bestowed on the grinding and mixing; and as all this is entirely a matter of expense, cheap paints are not to be relied upon. He is convinced that the superi crity of most esteemed paints is due to the above causes rather than to any un known process or material employed in the manufacture, and their comparatively high price corroborates this opinion.

## A NewSix WheelEmery Grinder.

The Lehigh Valley Emery Wheel Com pany, of Weissport, Pa., are now making a new six wheel grinder especially de signed for the use of plaving mills, sash door, and blind factories, and for mold door, and blind factories, and for mold ing manufacturers. The wheels are mounted on a 1 inch steel arbor, and are located three on each end, a cone pulley by which the speed may be regulated being placed in the middle. They are as follows: One wheel of 1 inch square face, one of $\frac{1}{4}$ inch square face, another $\frac{1}{4}$ inch round face, constituting one set of three. The other set includes a wheel of $\frac{1}{2}$ inch square face, and another of $\frac{1}{2}$ inch round face, and a $\frac{1}{2}$ inch saw gummer. An adjustable rest at each end enables the operator to grind a perfectly true bevel of any degree required. The machine is already in use in several establishments, and is proving itself a convenient and useful invention.

## the electric light.

A modification of Geissler's tubes has recently been made for the purpose of illumination. It consists of a carbon and for the purpose of illumination. It consists of a carbon and
vacuum tube, of about one sixteenth of an inch internal divacuum tube, of about one sixteenth of an inch internal di-
ameter, wound in the form of a flattened spiral. The ends ameter, wound in the form of a tlattened spiral. The ends
of the tube, in which the platinum wires are sealed, are about two inches in length, and half an inch in diameter. They are inclosed in a wooden case, leaving only the spiral exposed. When the discharge from a Ruhmkorff coil is transmitted through the platinum wires, the spiral becomes intensely luminous, exhibiting a brilliant white light. The quantity of the light, however, is small, and it is of no practical value. It is only valuable as an experimental appara tus, or for scientific exhibitions.
Electricity of great tension and power is required for the electric light, and the easiest and least expensive mode of getting it for these experiments is by using a large Ruhm korff coil, but the current from a battery of 200 cells would answer the same purpose. An electric light, without me chanism at the burner, can be made by placing two carbon points in hollow brass rods which are connected by wires with a galvanic battery. The rods slide in the heads of two glass pillars, so fixed to a stand as to admit of the points being placed at different distances. The wires from the battery poles being properly connected, the points are made to touch, and are then just separated, when the most dazzling light appears, rivaling the light of the sun in purity and splendor. The light is due chiefly to the intense whiteness of the tips of the carbon rods, and partly from an arch of flame extending from the one to the other. The positive pole is the brighter and the hotter, a fact which may be proved by intercepting the current, when the positive pole continues to appear red for some time after the negative pole has become dark. Any kind of carbon is well suited for the points. The more compact forms of charcoal answer very well, but baked carbon answers better. This is made as follows: The fine dust of coke and caking coal is put into a close iron mold, of the shape required for the carbon pencils, and exposed to the heat of a furnace. When taken out, the burnt mass is porous and unfit for use: but by repeatedly soaking it in thick sirup or gas tar, and reheating it, it acquires the necessary solidity and conducting power. The best carbon points, both for brilliancy and durability, are made, however from the coke that is sublimed inside the retorts in the distillation of coal in gas works. During the maintenance of the light, a visible change takes place in the condition of the poles. The positive pole experiences a loss of matter; parti cles of carbon pass from it to the negative pole, some of them reaching it, and some being burnt by the oxygen of 'the ai on the way. The same occurs, though to a much less ex tent, with the negative pole; so that, while the positive pole becomes hollowed out or blunt by its losses, thenegative pole is kept pointed by the additional particles.
The wasting away, particularly of the positive pole, in a short time renders the distance between the poles too great for the passage of the current, and the light is suddenly extinguished, until again renewed by contact between the carbon points and their separation. If a powerful battery is used, the points may be removed one sixth or even one fifth of an inch before the circuit is broken. The transfer of matter between the poles is considered to account for the ex istence of the arch of flame, and the passage of the curren through the air, as thereby a conducting medium extends be tween the poles. The light is not caused by the combustion of the carbon, but by its being brought into a state of incandescence. With a battery of fifty Grove or Bunsen cells, a
a light of very great brilliancy is produced; but a light of very great brilliancy is produced; but when very great power is to be obtained, as well as brilliancy, twice or
thrice that number must be employed Fifty thrice that number must be employed. Fifty cells give electricity of sufficient tension to produce the light; and if more are used, they should be so arranged as to add to its strength and not its tension. Thus, if 150 cells be used, they should be arranged in three series, the positive poles of all three being joined to form one positive pole, and similarly with the negative poles. With a battery of 50 cells it is not necessary to point the rods, as the action of the electricity will do it. A battery of 50 large-sized Grove or Bunsen cells will produce a light 34 times the power of th lime ball light, or one fifth as great as that of the sun.

Various arrangements have been invented for maintaining the steadiness of the electric light. The aim in all such is to keep the carbon points by some mechanical contrivance within such a distance of each other that the current can pass between them. Duboscq constructed an electric lamp of this description. In it, by aid partly of clockwork, the two points are made to travel towards each other at rates corresponding to those of their consumption, the positive pole in this way traveling faster than the negative.
Foucault's form of regulator, Fig. 1, has two systems of wheel work, one for bringing further apart. Fig. 1 represents othe apparatus, moving them further apart. Fig. 1 represents the apparatus, with the omission of a few intermediate wheels. $L^{\prime}$ is a barrel driven by a spring inclosed within it, and driving several intermediate wheels which transmit its motion to the fly, o. L is the second barrel, driven by a stronger spring, and driving in like manner the fy, $o^{\prime}$. The racks which carry the carbons work with toothed wheels attached to the barrel, L', the wheel for the positive carbon having double the diameter of the other. The current enters at the binding screw, C, tra-
verses the coil of the electro-magnet, E , and passes through the wheel work to the rack, D , which carries the positive carthe wheel work to the rack, D , which carries the positive car-
bon. From the positive carbon, it passes through the voltaic arc to the negative carbon, and thence, through the support, H , to the binding screw connected with the negative pole of the battery. When the armature, F, descends towards the magnet, the other arm of the lever, F P, is raised, and this movement is resisted by the spiral spring, R, which, however, is not attached to the lever in question, but to the end of any other lever, pressing on its upper side, and movable about the point, X . The lower side of this

lever is curved, so that its point of contact with the firs lever changes, giving the spring greater or less leverage according to the strength of the current. In virtue of this arrangement, which is due to Robert Houdin, the armature instead of being placed in one or the other of two positions, as in the ordinary forms of apparatus, has its position accu rately regulated according to the strength of the current. The anchor, $\mathrm{T} t$, is rigidly connected with the lever, F P and follows its oscillations. If the current becomes too weak, he head, $t$, moves to the right, stops the fly, $a^{\prime}$, and release $o$, which, accordingly, revolves, and the carbons are moved


Fig. 2.-MAGNETO-ELECTRIC LIGHT MACHINE.
fixed, supplies the place of the clockwork in the above de scribed lamp of Foucault, and an electro-magnet lets it descend, or locks it, as the carbons are consumed.
The attempts which have been made to substitute the elec tric light for coal gas, in lighting up streets and public places, have hitherto proved unsucessful. One element of mpe:fect success, in the practical use of the electric light is due to the uncertainty of the light and the care attending its use. By contrivances like those we have described, the light may be continued for hours; but even then it is by no means steady, and the apparatus cannot be safely left with out an attendant. It has, however, been used withexcellen effect where a limited space had to be lit up for a few nights, as well as for lighthouse illumination. Its power to pene trate fogs is immensely superior to that of the usual oil light. Lighthouses at Dungeness and elsewhere have been lit with electric lights since 1863, the current being obtained from magneto-electric machines driven by steam engines. Fig. 2 represents the machine. It has eight rows of compound horseshoe magnets fixed symmetrically round a cast iron frame. They are so arranged that opposite poles always succeed each other, both in each row and in each circula set. There are seven of these circular sets, with six inter vening spaces. Six bronze wheels. mounted on one centra axis, revolve in these intervals, the axis being driven by steam power transmitted by a pulley and belt. The speed of rotation is usually about 350 revolutions of the axis per minute. Each of the six bronze wheels carries, at its circum ference, sixteen coils, corresponding to the number of poles in each circular set. The core of each coil is a cleft tube of soft iron, this form having been found peculiarly favorable to rapid demagnetization. Each core has its magnetism re versed sixteen times in each revolution, by the influence of the sixteen successive pairs of poles between which it passes and the same number of currents, in alternately opposite di rections, are generated in the coils. The coils can be con nected in different ways, according as great electro-motive force or small resistance is required. The positive ends are connected with the axis of the machine, which thus serve as the positive electrode; and a concentric cylinder, well in sulated from it, is employed at the negative electrode. Two of these machines are provided for each light, though only one is used, except in very foggy weather. These are driven by a six horse power steam engine, and all parts of the ma chinery, including boilers, are kept in duplicate. Coke is used for fuel, and about 56 lbs. are consumed each night. The machines are connected with the lamp by means of underground cables. Each lamp contains two pieces of carbon, about ten inches long by three eighths of an inch square They are made from coke dust, and are consumed at the rate of thirty four inches per night for each light, at a cost of two cents per inch, exclusive of waste and breakage. They are moved toward each other by means of automatic appara tus; and the only danger of irregularity of the lights arises from the presence of foreign matter in the carbons. This however, is instantly corrected. The annual cost of the elec tric light at Dungeness is about $\$ 4,000$.
The most powerful light which has yet been constructed is that of the flashing electric light at Soutter Point, En gland, three miles below the mouth of the Tyne, the con densed beam of which is equal to 800,000 candles.
There are two electric lights situated on the South Fore and, three miles from Dover. These are 1,000 feet apart ne being 372 and the other 275 feet above sea level. The rear light is utilized, by means of totally reflecting prisms to reinforce the front light, which is required over a range of $180^{\circ}$ only. Both lights are fixed. The power of each beam is estimated as equal to 180,000 candles; and when ob served from Dover, a distance of three miles, they throw a very distinct shadow from objects on the pier.

In addition to the above mentioned electric lights, there are in France two fixed lights a La Hève, and a revolving light at Cape Gris nez; in Egypt, a revolving light, at Port Said and in Russia, a fixed light, at Odessa. The plan in operation at La Hève is very similar to that of the South Foreland. Six-plate magnets, of a power of 145 to 155 lbs , are used. and some three-plate magnets, with a power of 75 lbs. The carbon points are manufactured from the residue contained in gas retorts. They are 10 inches long, and from one third to one hal of an inch thick. The optical apparatus is abou 1 foot in diameter, and it sends the light tan gentially to the surface of the sea. Many ac cidents, however, have occurred at La Hève ; in one instance the lights were extinguished for a space of an hour. Much trouble has been ex perienced with the machinery, which is now placed in a more satisfactory condition. Of the cost of this light, we have no data later than 1869; but it appears that the average of that and the four previous years was $\$ 3,215.34$, the total number of hours of illumination averaging 4,135 annually. The machines are started 10 minutes before the time of illumination, so forward. If the current becomes too strong, $o$ is stopped, $o^{\prime} \mid$ that the currents may be well established, and the light is ex is released, and the carbons are drawn back. When the anchor, $\mathrm{T} t$, is exactly vertical, both fies are arrested, and the carbons remain stationary. The curvature of the lever on which the spring acts being very slight, the oscillations of he armature and anchor are small, and very slight changes in the strength of the current and brilliancy of the light are mmediately corrected.
Mr. Hart, of Edinburgh, Scotland, has invented a simple lamp, in which the weight of the rod, in which the carbon is
hibited 15 minutes after sunset, and extinguished 15 minutes before sunrise. Double lights are produced whenever the fog is so dense that the keepers cannot see the beacon lights on the north pier at Havre, and this occurs about eighty hours every year.
The disadvantages attending a general use of electricity are due chiefly to the large amount of space required for the steam engines and the magneto-electric machinery, for storing coal, coke, etc., and for collecting and preserving the
water for the engines. The repairs needed require also special workmen, not usually found in the vicinity of lighthouses. Consequently th9 electric light can at present be made available only in certain localities. It would be disadvantageous in lighthouses at sea, or that are not easily ac-
cessible, or those which are distant from centers of populacessible, or those which are distant from centers of popula.
tion. But where there is pleyty of space, and where cities tion. But where there is pleuty of space, and where cities
are within easy reach, their substitution for other lights is strongly approved by mariners.

## fituregumderte.

## The Keely Motor:

## To the Editor of the Scientific American:

In your paper of June 26 there is an elaborate editorial article entitled "The Keely Motor Deception," in which article you treat the alleged invention of Mr. Keely contemptuously, and speak of him and his "confederates," myself included, as juggling tricksters "whose chief purpose ap. pears to be the wriggling of money out of silly people." am not willing to believe that journalists professing to conduct a publication devoted to inventions, and advocating, professedly, the rights of inventors, will persist in denouncing an alleged discovery with which personally you are wholly unacquainted, especially when your denunciation involves, necessarily, an assault upon the integrity of reputable gentlemen. I have practised my profession in Cincinnati, o., and in this city uninterruptedly for a period of about eighteen and in this city uninterrupteady for a period of a bouve devoted years, for about eight years of which time I have devoted
myself exclusively to patent litigation, with probably the myself exclusively to patent litigation, with probably the
arerage success of professional men : not altogether unknown arerage success of professional men : not altogether unknown
in my profession, I would be entirely willing now and at all times to leave the vindication of my professional character, when assailed, in the hands of my professional brethren, and to the judges of the courts before whom I have practised. Therefore, if I alone were involved in your article referred to, I should remain silent; but inasmuch as others than myself are also impugned, and inasmuch, further, as the alleged invention of Mr. Keely, for which interest I have been and am counsel, is derided, it is proper that I should publicly notice your article
The invention of Mr. Keely is controlled by a company organized under the laws of the State of Pennsylvania; and probably I can best vindicate the invention, the inventor, and those connected with him, whom you call his ' 'confederates," by stating in outline my connection with the enterprise up to the present time.
A year ago, several gentlemen of this city, one of New Jer. sey, and another of New York, held contracts with Mr. Keely whereby they were entitled to certain rights in his invention thereafter to be patented. By mutual consent of the contracting parties, it was agreed to merge their respective rights into a corporate company, thereafter to be organized and now known as the "Keely Motor Company." The
writer was asked to act as their counsel. The initial step writer was asked to act as their counsel. The initial step
desired to be attained was the procurement of the requisite amount of money necessary, first, to discharge some indebtedness theretofore contracted by Mr. Keely for materials supplied to him; secondly, to complete his structures then being constructed; and thirdly, to defray the expenses incident to the procuration of letters patent in our own and in foreign countries. At this time, personally I knew but little foreign countries. At this time, personally I knew but little
of Mr. Keely's invention. I had seen in his workshop, a of Mr. Keely's invention. I had seen in his workshop, a
room say ten feet square, a "receiver" charged with a vapor or gas having an elastic energy of 8,000 lbs. to the square inch. I interrogated Mr. Keely critically as to how he had produced this substance; pointing to an inoffensive-looking machine, which stood in close proximity to the receiver, he said to me that he introduced a certain quantity of air into that machine under no greater pressure than was the capacily of his lungs, a certain quantity of water under no greater pressure than was the ordinary hydrant pressure at his residence, and then, by a simple manipulation of the machine, unaided by any chemical substances, heat, electricity, etc., he converted a small portion of the introduced water and air into the cold vapor then contained in his receiver. My credulity, as may be supposed, was taxed to its utmost limit. dulity, as may be supposed, was taxed to its utmost limit.
Before undertaking to enlist a dollar of capital in the enterBefore undertaking to enlist a dollar of capital in the enter-
prise, I instituted the most careful inquiry as to the character of Mr. Keely. Those of whom I inquired endorsed his integrity in unqualified terms; and one gentleman, Mr. Boeckel, for whose mecbanical ability and moral integrity I
had great respect, and who knew much of the invention, and who spoke without having a fragment of interest in the invention, impressed me greatly by what he communicated to me. So also did Mr. Rutherford, Chief Engineer, U. S. Navy. Thereupon, I had a conversation with Mr. Keely, in be grateful to me for kindnesses received at my hands, the importance of which, indeed, you greatly exaggerate. I am asked to become the exponent of your invention, and to enlist capital for its development. While I may with propri-
ety expend my own money as I please, I cannot, except with ety expend my own money as I please, I cannot, escept with
greatest caution, enlist the money of others. You, Mr. greatest caution, enlist the money of others. You, Mr.
Keely, know absolutely whether you produce the results which I have seen as you state to have produced them. This, with you, is not matter of opinion, but of absolute knowledge. If, therrfore, you do not so produce these results, and I , upon the supposed truth of your statement, am the
means of procuring the capital of others to be invested in your enterprise, I will have suffered at your hands as great a wrong as one man can inflict upon another." He reasserted that which he had before said in the most solemn language. the same time telling him, in the prosence of his wife, that,
if I procured a dollar for the enterprise, it would be based upon the truth of his written declaration, which, if false, made him a criminal, and that for my own vindication I
would see that he was appropriately punished. With such would see that he was appropriately punished. With such
precautions I visited your city, called together some of your best known and influential citizens-among whom was Charles H. Haswell, Esq., who himself, prior to this time, had visited Mr. Keely's place, seen his receiver when charged with this enormous vaporic pressure, and had reported upon it. I said to these gentlemen that I had not seen Mr. Keely make the power, and therefore had no personal knowledge of how it was done; stating, at the same time, however, the resul of my inquiries as to his character as above, and, further that there was the negative evidence, afforded by the total
absence of anything (so far as I could discover) to produce absence of anything (so far as I could discover) to produce
the power other than the simple machine whereby he claimed the power other than the simple machine whereby he claimed
to produce it. As the result of my interview, the gentlemen to produce it. As the result of my interview, the gentlemen
present subscribed for $\$ 10,00 \mathrm{C}$ of the stock of the proposed company. I made Mr. Keely's written declaration a part of my contract with them. They paid to me $\$ 3,000$. I returned to Philadelphia, and gave this to Mr. Keely; and within two
hours, he had paid to the constructors of his machine $\$ 2,850$ hours, he had paid to the constructors of his machine $\$ 2,850$
By the terms of the agreement, entered into by me with these parties, Mr. Keely was obligated, before any further money was to be called for, to explain the principle of his invention. I took with me to his place my engineering assistart, Mr. Bell, and we entered upon the subject, but nei of the machine, made from the machine by Mr. Bell - could of the machine, made from the machine, by Mr. Bel-could
understand why the result would follow from its operation, understand why the result would follow from its operation,
as claimed by Mr. Keely. I so stated to him, and requested as claimed by Mr. Keely. I so stated to him, and requested
that he should repair, put together, and operate the machine (then dismantled), and produce for me the result which he claimed to be able to produce. This he did, giving to me (in the presence of ten other gentlemen, among them Mr.
Boeckel, Mr. Rutherford, and Mr. Bell) an exhibition on the night of the 10th of November, 1874, the result of which ex hibition I reduced to writing and subsequently to print, for the information of those only who were interested in the enterprise. This report you evidently have seen, as it is com mented upon in your article.
After I had written this report, I submitted it to Messrs. Rutherford, Boekel and Bell, for their careful examination, and for their endorsement of it, if they found it correct. They gave it their unqualified endorsement Next, I sub mitted it to Professor B. Howard Rand, of this city, an emi nent scientist, as a precautionary measure, in order that he might, if he could, account for the results alleged to be pro-
duced, through any known chemical agencies or laws of phyduced, through any known chemical agencies or laws of phy-
sical forces. He said that, assuming the truth of my statements of facts-for he had not seen the machine, and of his own knowledge knew nothing of it-he could not account for the results alleged to have been produced upon any known chemical or philosophical principles; and at my request, he reduced this statement to writing. He was not asked, and did not assume, to endorse the Keely motor, and your assertion that he did so is purely gratuitous, and places him in a false position before the public. With this report thus prepared, I proceeded again to New York, submitted it to the parties with whom I had contracted, stated to them that, while I did not understand the ultimate philosophical principle involved in the production of this vapor, I was convinced that it was produced precisely as asserted by the in ventor; that I stood ready to return to them their money pre viously advanced, if they desired to withdraw from the enter-
prise. 'I'hey did not so desire, but on the contrary paid to me the balance $(\$ 7,000)$ of the $\$ 10,000$ subscribed, which money was subsequently from time to time disbursed for the construction of apparatus connected with the invention. (1) My original contract with these partios gave to them an option of $\$ 40,000$ more of the stock of the company at its par value. Prior to the agreement out of which this company had its Keely, the individuals thein holding contracts under Mr. ties looking to the disposal of rights in the New England States, which contract became obligatory upon this, the Keely Motor Company. Tnder and by virtue of the several contracts, the contracting parties were entitled to an exhibi tion of the production and practical application of this power. This has been given to them, and was witnessed by about 30
gentlemen, among whom were many men of long and exten gentlemen, among whom were many men of long and exten
sive experience in the construction and operation of machinery, such as steam engines, air-compressing machinery, electrical apparatus, etc. As the result of such exhibition, the parties respect:ully have, unurged, paid to the treasurer of this company an aggregate, with the ten thousand dollars referred to, of one hundred thousand dollars. This company, with the single exception above referred to, has not sold or offered for sale a dollar of its stock; neither has it desired to give any publicity to its business, until it shall be ready to introduce to the public its machine
Of the money which has thus been paid into its treasury, Mr. Keely was entitled, in his individual right, to the sum of fifty thousand dollars. This, however, he yielded to the company, stating that he did not desire to make a dollar of
profit out of his invention until patents had been obtained, and he had established, to the satisfaction of the world, the validity of his assertions. After having long been living in most humble circumstances and working under great disad vantages, a comfortable house and a convenient workshop have, without his solicitation, been purchased for him, and he is now giving his undivided time to the completion of his ructures. That he is endeavoring to "wriggle money out calumny. The money which has been paid into the tressury
of the company, it is the declared policy of the company to etain intact for the completion of its various structures now in progress, and for the procuration of letters patent throughout the world. As for myself, I have given to the
development of this invention and to the affairs of this comdevelopment of this invention and to the affairs of this com-
pany my almost undivided time for a period of several pany my almost undivided time for a period of several
months, having the meanwhile to beg the indulgence of months, having the meanwhile to beg the indulgence of
clients for whom I have the charge of important causes, and clients for whom I have the charge of important causes, and
have not been compensated to the extent of a dollar: my dehave not been compensated to the extent of a dollar: my declared policy having been to attest by my actons the conil Mr. Keely's inventions, resting content to await that moder ate degree of fame and of fortune which shall probably be mine, if the correctness of my judgment shall be vindicated in the future. So much, personally, as to Mr. Keely and his in the future. So much, personally, as to Mr. Keely
conates." (2) Now what about the invention?
In my report of November 10, I undertook to narrate as In my report of November his I undertook to narrate as precisely as I could facts which I had observe
therein substance, and I now reiterate that I saw:
First : The apparatus, of which I at the time had an ac. curate sectional drawing made from the machine, subjected to such tests as I believe would have satisfied any intelligent mind, as the tests did satisfy the minds of the eleven persons present, that there was nothing in the apparatus but air at atmospheric pressure.
Second: I saw the inventor blow from his lungs, for the period of, say, 30 seconds, into a nozzle upon the " generatube when I saw him connect this nozzle by a small rubber direct fr the nozzle of his hydrant, and introduce water "generator" until say five gallons of rubber tube into the generacor under a pressure, as indicated by a gage applied to the hydrant, of $26 \frac{1}{4}$ pounds, the communication with the to the hydrant, of 264 pou
Third: A connection being then made between the generator and a register of force, by a tube of one tenth inch bore (the register of force consisting of a piston of one square inch area,pressed down in a cylinder by a lever of the third order, and weighted so as, according to the calculations of Mr. Rutherford and Mr. Bell, to require upwards of 1,430 lbs. to the square inch to raise the lever.) I saw Mr. Keely, by a very simple manipulation of his generator, requiring no more force than a child could exert, make an "expulsion"" as he terms it, of his vapor, and with it raise this weighted lever and this he repeatedly did.
Fourth: I saw him, in the same manner, make expulsions filing a chamber of $3 \frac{1}{2}$ gallons capacity, with his vapor, at a pressure proved to be a fraction less than $2,000 \mathrm{lbs}$. to the square inch. Tlis operation I saw repeated several times, and saw the produced vapor conducted through a tube of the dimensions aforesaid upon, not "a dollar toy engine," but one which did not cost less than two hundred and fifty dollars to construct, which was run at a speed of several
hundred revolutions a minute, developing no inconsiderable hundred revolutions a minute, developing no inconsiderable
power. (3) These expulsions were made in an inappreciable power. (3) These expulsions were made in an inappreciable
period of time, unaccompanied by noise or the use of heat, and period of time, unaccompanied by noise or
without appreciable production of heat.
Now, what I assert is stated not as matter of opinion, but of fact. You may deny the fact and assert that I falsify. If so, I retort that you are ruthless traducers of character, and will hold you personally responsible for defamation. Again, you may, with propriety, assert that I am mistaken. To this, I will reply that what I saw was witnessed by ten other gentlemen, who will at any time attest to my accuracy, and three of whum, at least, were of equal ability with your self. Again, you may accept the truth of the facts and undertake to account for the results upon other hypotheses than as claimed by the inventor, and to disparage their im portance. You have in your article of the 26th inst. undertaken to account therefor. While I have not space to review your attempted solution of the matter, I will simply say that, if the writer of your article had seen and examined Keely's generator, and another, not seeing it, had written what appears in your columns, your editor would have said he was a fool. I simply say he is mistaken. Again, I have repeatedly seen, in Mr. Keely's workshop, a receiver with a capacity of twenty-six gallons, containing his vapor at a pressure of $10,000 \mathrm{lbs}$. to the square inch : $I$ have seen this vapor conducted through a tube of one tenth inch bore to an engine which was propelled by it at a speed of about 1,500 revolutions a minute, developing a power of certainly 10 horses. This fact I can corroborate by the testimony of scores of persons: among them some of your best known and most influential citizens. You think that we confound "pressure with power." We do not. We understand, pro-
bably as well as you do, the distinction between " pressure" and vis viva. You may say, accepting the fact, that it is condensed air. If $s 0$, please enlighten us as to the means whereby it could be so condensed. You may say that it is a gaseous product from chemical action ; remarking that this vapor is totally negative in its properties and pure as mountion air, please inform us from what chemical substances it may in your opinion have been produced. I append hereto. some communications addressed to me on this subject.
conclusion I would repeat that the Company is a private corporation. It does not offer, nor has it offered, its shares in the open market, nor can it be held responsible for the action of individuals who, having acquired, may have again offered its shares, which was, however, their undoubted right. It will not, in "thirty days," though I believe it will before many months have expired, exhibit to the world that which it claims to have. In the meantime, it has not sought nor does it now seek notoriety; but the invention on which it is based having. through newspaper corresnot shrink from, fair and logitimate criticism ; and if you

Messrs．Editors，can satisfactorily explain or account for in disputable results which are astonishing in their characte and have produced profound impressions upon many excel lent and able men，no one will be more grateful to you than Chas．B．Collier， 702 Chestnut street，Philadelphia，Pa．June 28， 1875.
（1）Remarks．－It appears，from your present evidence，that Pro－ fessor Rand never saw your machine，nor your cold gas or vapor，
and yet you induced this eminent scientist to give you a profession－ l certificate about nothing，which，with other statements，you sub－ mitted to the New York capitalists on behalf of the Keely Motor， and they paid you $\$ 7,000$ ．
（2）See our remarks on page 33.
（3）In your report you affirmed that you ran a small beam engine， but did not give its size．We stated that，＂judging from the Barker wheel with $2 / 2$ inch arms，this＇beam engine＇was probably about not less than $\$ 250$ ；but you are silent as to size．Mr．Gloeker，how－ You say in your report that you ran this miniature engine at the You say in your report that you ran this miniature engine at the
rate of 400 revolutions per minute，but you do not venture to affirm that you ran it for so long a period as one entire minute． You state，however，that you worked the whirligig for that space of time．＂At 9：8 P．M．the reaction wheel was again rotated until $9: 9$
P．M．＂This is the only complete period of running time cited in your report for either of the little devices．It was on the strength of this contemptible exhibition，made to you by Keely，so you now Rand＇s certificates thour report thereof backed by that yen up th balance of their $\$ 10,000$ subscription．We accept your confession of facts without denial．

## Communication of John W．Keely．

Chas．B．Collier，Esq．，Attorney Keely Motor Co
In view of publications in the CIEIENTIFIC AMERICAN de riding me and my invention，I feel it to be my duty to de－
part from my intended policy of making no public declara－ part from my intended policy of making no public declara－
tion relative to my invention．I now publicly assert that I have produced the resuits which many persons have seen， tion of atmospheric air into my machine，a limited quantity of natural water direct from the hydrant at no greater than the ordinary hydrant pressure，and the machine itself，which
is simply a mechanical structure．With these three agents is simply a mechanical structure．With these three agents electricity，or galvanic action， 1 have produced，in an inap－ preciable period of time，by a simple manipulation of the of ten gallons，having an elastic energy of ten thousand pounds to the squareinch（4）．This I solemnly assert，and am raady to verify by my oath．I only ask of the public their a demonsitrate that which I now publicly assert． Philadelphia，June 25，1875，JOHN W．KEELY．
（4）Counsellor Collier gives，on the preceding page，a more de－
tailed statement of the way you produce your＂cold tailed statement of the way you produce your＂cold vapor＂＂as
ascertained by himself and＂scores＂of intelligent witnesses．He does not agree with you that it is done＂in an mappreciable period of time．＂He affirms that you blow into the＂generator＂for hal a minute，that you then turn in five gallons of water，and the proceed to manipulate the machine，when the＂vapor＂appears． Juggles more marvelous than yours have
practitioners in less time than you require．

## Communication of G．F．Glooker

Chas．B．Coblier，Esq．，Attorney Keely Motor Co：
Dear Sir ：－Having constructed for John W．Keely，Esq the multiplicator with which he operated on the 10th of November，18i4，ref rred to in your report，I desire to stat that said multiplicator is correctly represented in the sec
tinnal drawing made by Mr．J．Snowden Bell，and now in your possession．I further state that，in said multiplicator your possession． or compressed air could be contained，and no spaces not fully accussible to a srream of water passed through the ap－ paratus；further that，in said apparatus，there are no pistons or moving parts oth $\rightarrow r$ than valves
I have also constructed for Mr．K
ing double cylinder engine，having cyliniers of 3 inche ing double cylinder engine，having cylinders of 3 inche
bore and 3 inches stroke，and a fly wheel 24 inches in diame ter and 4 inches face，weighing 200 pounds，which engine have seen rotated at a speed of not less than 300 revolution have seen rotated at a speed of not less than vapor generated in said multiplicator． A small wrought iron chamber，of a capacity of $1 \frac{3}{4}$ gallons，
which I made for Mr．Keely，was delivered to him by me on which I made for Mr．Keely，was delivered to him by me on
May 13,1875 ，about 8 A ．M．，the chamber being at that May open at one end；and upon the evening of the same day．said cha uber，to my knowledge，contained vapor at a pressure of $10,000 \mathrm{lbs}$ ．per square inch and upwards，as evidenced by both a gage and a weighted lever I am 51 years of age，and have been employed at the Port
Richmond Iron Works of Messrs．I．P．Morris \＆Co．，Rich－ mond and York streets，Philadelphia for nearly 26 years las past．I have for a long time been in charge of their too have had knowledge and observation of machinery of variou descriptions constructed by them．In view of recent publi－ ment as an evidence toat my experience has been such as to enable m $\theta$ ，at least，to form a correct judgment as to the the operation of apparatus of my own construction．
Respectfully yours，
Philadelphia，June 25， 1875.

Communication of Wm．Boekel．
Philadelphia，Pa．，June 25， 1875.
Chas．B．Collier，Esq．，Attorney Keely Motor Co
Sir：－In answer to the accusation published in the Scien－ ongaged in a fraud upon the public，through my connection with the invention of Mr ．Keely，I desire to state as follows ：
I am now 50 years of age，have lived in Philadelphia I am now 50 years of age，have lived in Philadelphia since the practice of which I gain my livelihood．I refer to all who practice of which I gain my livelihood．I refer to all who know and deal with me as to my honor and integrity． quiry as to my private character and business standing，he might have been fully impressed with the responsibility he incurs in denouncing me as a confederate in fraud of any de－ cription，more especially in reference to my connection with I have read the he knows absolutely nothing．
date，addressed to you．I have for geveral years been int
mately acquainted with him，and with his inventions．I have
seen him produce many＂expulsions＂from his generator， sen him produce many＂expulsions＂from his generator elastic vapor，in volume of $3 \frac{1}{2}$ gallons，at a p pressure of about 2，000 pounds to the square incl．I believe that it was imposs－
sible for him if he had so desired，to practise any deception sible for him，if he had so so desired，to practise any deception
in the matter；and from what I have seen，to t 隹her with my in the matter；and from what I have seen，together with my
intimate knowledge of the construction of the machine and intimate knowledge of the construction of the machine and
its operation，I have no doubt whatever that he produces the


## Communication of H．C．Sergeant．

## Chas．B．Collier，Esq．，Attorney Keely Motor Co

Dear Sir：－My acquaintance with Mr．John W．Keely be an about one year ago，and I have been permitted．from time to time，to witness certain exhibitions made by him with his vaporizer or generator，producing a vapor，transmitting it to
and running his engines．I have been permitted to examine and running his engines．T have been permitted to examine
the internal construction of his generator，and I am fully sa－ the intrnal
tisfied that Mr．Keely has discovered that there exists a pow－
e in air and water which by purely mechanical manipula－ er in air and water which，by purely mechanical manipula－ tion，will evolve a cold vapor；and，by peculiar graduations of
his machine，he is capable of producing a pressure of 10,000 his machine，he is capable of producing a pressure of 10,000
to 15,000 lbs．per square inch in a receiver of greater volume to 15,000 lbs．per square inch in a receiver of greater volume
than that contained in his generator，with great rapidity than that contained in his generator，with
Yours very respectfully，

382 Second Avenue，New York，June 26， 1875.
This gentleman，in another confession of faith in the Keely motor ablished in the New York Times of July 3，1875，says
＂ 0 ne of the remarkable things about the
（the new rapor）cannot be transmitted at a lower pressure tha 1，000 lbs．（per square inch）．It can be used，of course，at a lowe put its tranerit is put in action．It can be regulated like steam， but its tran，
densation．＂
This is a curious statement for an intelligent steam engineer to make．If its transmission at a less pressure than 1,000 Ibs．cause under any circumstances below that pressure．It cannot be used unless it is＂t transmitted．＂

Communication of Chas．H．Haswell．
New York，June 26， 1875
Chas．B．Collier，Esq．，Philadelphia，Pa．
Dear Sir ：－Your letters of the 23d and 24th instants，in Counded assertion in one of our city papers，are this day re ounded assertion in one of our city papers，are this day re－
ceived；and although I am indisposed to make any commu nication regarding the Keely motor untilits elements of ope－ ration are made known to me，，cannot refuse to reply to
your queries as to the nature and extent of such of its ope－ your queries as to the nature and extent of such of its ope
ations as have come under my observation，and my deduc rations as have
tions therefrom．
Referring，then，to your several queries，in the progressive dvise：
1st．I have witnessed the development，by Mr ．Keely，of
old vapor，void of pungency or of temperature in excess he surrounding atmosphere，having an expansive energy o ully 7，800 lbs．per square inch， 2d．I have butations thereon．
2 d ．I have been present when Mr．Keely has applied pressure of $10,000 \mathrm{lbs}$ ．per square Mr．Ashcroft，to advise myself of his capacity to make such a gage，he replied that he had made gages that would indi－
cate such pressure，and that he had delivered some of them ate such press
Philadelphia．
3d．I have satisfied myself fully and conclusively that the of any external attachment，other than that of a chain sus pension and a flexible connection with a water service pipe
4th．I have seen a double cylinder encine， 3 by 3 ivches perated by a like vapor from a reserv irr，through a conduc ing pipe eight feet in length，and having a bore of but one
tenth of an inch diameter，although it was resisted by a fric tenth of a n inch tiameter，although it was resisted by a fric保生 individuualy operated for a period of 15 minutes with－ austion of the intensity of the vapor in the reservoir from which the supply was drawn．
5 th．I have seen reservoirs which were said to contain va por at pressures of 5.000 and $10,000 \mathrm{lbs}$ ．per square inch，and
in volume of 2 and 26 gallons，but my only means of verify nolume of 2 and 26 gallons，but my only means of verify ng such pressures were in the operation of
he indication of the steam gage referred to
6 thl．I am of the conviction that the rapor is not genera－
ed by any chemical decompositions or heat，or that it is at mospheric air compressed by an external conection． 7th．I was present upon one occasion only when Mr．Keel ssayed an＂expulsion，＂as he terms it，that is，the opera－
tion of generating the vapor，and the result was not suffi－ iently conclusive whereon to base a conviction of its integ－ reasonably attributed to the imperfections of the original and rude instrument of generation．
In conclusion，my assertion，in the communication referred o，was that I have never endorsed the integrity of the Keely motor；and my declaration is，$I$ do not now do it，and for the
manifest reason that $I$ am wholly ignorant of the manner manifest reason that I am wholly ignorant of the manne
in which the vapor is generated；and in the consideration o a physical operation，I could not，in the absence of a know－ ledge of its elements，endorse the declaration of any one．
My position has been confined to reporting that which My position has been confined to reporting that which I
have seen．I have said，however，and I now write，that Mr Keely has submitted to me a cold vapor of an expansive en ergy of fully 10,000 ibs．per square inch， it in ins characte and that，if he can generate it with the facility，economy，den sity，and continuity that he declares，he has arrived at a result hitherto unattained，and one that is as valuable as it
is novel；but untilI am in the possession of the elements of is novel；but until I am in the possession of the elements on conclusions as to its merits．

## am，very respectfu <br> $\stackrel{\text { etc．，}}{\mathrm{CH}}$

位s not now and never did endorse the Keely motor，being that he gnorant of the manner in which＂the vapor＂is made，or the physical operation，by which it is produced．He further inti－ was a failure attempt to manufacture the vapor in his presence which more strongly supports the deception than any document Which the parties immediately connected with the＂generator，＂Mr．Haswell＇s re
pay their money
In the fourth paragraph of the above，Mr．Haswell fails to state the speed of the en cording to the Keely Company＇s account of the apparatus used du－ ring the exhibition at which Mr．Haswell officiated（see Scientific AMERTCAN，May 2，1874），the＂generator＂was of globular form， 3 inches thick and about 15 inches in exterior diameter，connected capacity $34 / 4$ gallons．
Mr．Collier has rated the speed of the engine at 400 revolutions per minute．Mr．Haswell＇s statement in the fourth paragraph， therefore，purports that，from a generator containing about $31 / 4 \mathrm{gal}$－ lons of the vapor，he personally operated a double cylinder engine，
having cylinders of 3 inches bore and 3 inches stroke，for a period of 15 minutes，without the least indicated reduction of the pressure 15 minutes，without the least indicated reduction of the pressure
contained within the generator．If we are wrong in this estimate Mr．Haswell will correct us．

## Communication of $\mathbf{J}$ ．Snowden Bell

Chas．B．Colliter，Esq．，Attorney Keely Motor Co．
Dear Sir：－Having been cited in an issue of the Scientific American，dated the 26 th inst．，as one of the＂confederates＂
of Mr．Joln W．Keely in a＂juggling exhibition，＂etc．，I de－ ire to stat：
1．My connection with the operation of the invention of Mr Keely，which is designated as above，consisted in my attend－ ance upon an exhibition thereof，given by him November 10 ， 1874，and in my attestation，over my signature，of the
ness of a report，made by yourself，of said exhibition．
ness of a report，made by yourself，of said exhibition．
2．Such attestation was given after a thorough and critical 2．Such attestation was given after a thorough and critical
examination of the working of the apparatus of Mr．Keely， examination of the working of the apparatus of Mr．Keely，
and related solely to matters of fact entirely within my own knowledge．I now publicly and emphatically reiterate and
reaffirm my endorsement of said report，and declare further reaffirm my endorsement of said report，and declare furthe senses，I should find it in the utter inability of the most de termined opponents of the invention to furnish any＂decep－
tion＂theory，accounting for the results produced，which is
by me．
3．I have examined the patents mentioned in the ScIENTI－
FIC AmERICAN article above referred to，and find that there is o manner of analogy between them and the inventio of Mr Keely．As to the suggestion of an experiment to be mad with＂ten communicating water tubes，＂I have to say that itial pressure upon air in a close vessel would evol pound responding resultant，I am unable to perceive what relation oxists between such familiar fact and the evolution of vapor f 2,000 pounds pressure to the square inch from water and air at an initial pressure not greater than 26 pounds to the
square inch． 1 further admit that，if a weight of 1 pound bo square inch．I further admit that，if a weight of 1 pound bo asm ；but as such lever was used i the exhibition of November 10,1874 ，this explanation mus likewise be dismiss $¢ \mathrm{~d}$ as insufficient．

Respectfully yours，J．Snowden Bell，

## Communication of Wm．H．Rutherford

Philadelphia，June 26， 1875.
has．B．Collier，Esq．，Attorney Keely Motor Co．： Dear Sir：－－have read the editorial article which ap
eared in the ScIENTIFIC Amprican advanced issue，dated 26 th inst．，entitled＂The Keely Motor Deception，＂，and pre－
sume I am included as one of the＂confederates＂of Mr． Keely，with yourself and others．
IWas present at the exhibition given by Mr．Keely on the
night of November 10,1874 ，of which you made a repor This report being submitted $t$ ions therein stated，my unqualified endorsement，and I now affirm the same．
I have read the communication of Mr．John W．Keely ad dressed to yourself dated the 25th inst．，and of my own know Chief Engineer，U．S．Navy
（6）The following is，substantially，the report of the Keely exhi ires now to＂publicly and emphatically reiterate；＂and to which W．H．Rutherford，Chief Engineer U．S．N．，now re－affirms and ves his unqualified endorsement
＂Mr．Keely then proceeded to make an＂expulsion，＂that is to say，to develop a force or pressure from the multiplicator suffi－ ient to exert a pressure of $1,4303 \mathrm{lbs}$ ．This he did by blowing roultiplicator．He then shut the cock and turned on the water from the hydrant．The operation was completed in about two minute fter the attachment to the hydrant was made，by simultaneousl opening two cocks upon tubes connected with the first and secon rums，when the lever and weight of the force register wer ＂A．＂The operation of the engines now took place as follows Barker＇s mill，＇having two arms of about two and a half inches nto rotation at a very high veservoir，and，at 9：03 P．3．，wo ocks．At 9：05 P．M．，the reaction wheel was removed，and conne tion applied to a small beam engire，which was rotated at 400 revo
lutions．At $9: 08$ P．M．，the reaction wheel was again rotated unt lutions．At $9: 08$ P．M．，the reaction wheel was again rotated until ：09 P．M．＂The machinery was then stopped，and the gaseous fluid the engine was run again for a few turns．＂At $9 \cdot 17$ P M，the reac tion wheel was run acain，and at 9.20 ，the experiments being con cluded，the multiplicator was taken apart and inspected by thos present．There was no heat perceptible in any part of the appara－ report，run for a minute or two at a time，at various intervals， ending over an entre period of 15 minutes．There was no he against the multiplicator
＂The report，after giving the foregoing facts in regard to actual ows：1．The invention prol 2，000 lbs．per square inch．2．The force was almost instantly pro duced．3．It moved instantly through a distance of 12 feet．4．It was atened int introduced into the apparatus to proscree eltricity，or galvanic action was discernible to neat sparks were observed in the spur gearing of the engine，caused by friction．8．Hydrant water， $26 \mathrm{lbs.t}$ to the inch，was admitted．9．
The water was drawn off unchanged after theperformance． 10 ．The vapor had no smell or taste and did not burn．11．The interior of the apparatus was found to contain no residuum or substanc gas light．Every facility for the closest investigation was offered

## IMPROVED RAILWAY TRACK

The invention illustrated nerewith consists in securing the rail upon an elastic continuous bed, by a simple method of fastening which dispenses with the nuts, bolts, and other means usually employed for that purpose. The principal advantages claimed are that the wear of rail and rolling stock will be lessened, and that there will be less probability of breaking rails owing to the elasticity of the bed.
A, Fig. 1, is a wooden beam which forms the bed upon which the rail rests. The base of the rail and all of the beam are inclosed in the space formed by the inverted T-shaped metal bars, $B$, one of whichis shown detached in Fig. 2. These have inner base flanges which meet beneath the beam. The bars ars tied to ether by metal plates, C, and screw bolts, the nuts of the latter being prevented bolts, the nuts of the latter being prevented from working loose by the elasticity of the wooden bar. The vertical part of each of the bars, B, is curved in ward at the top, form ribs which bear on the base of the rail.
The inventor states that the cost of altering the tracks of a road, to conform to the above described plan, will involve only the extra expense of a light steel or iron rail, as the old rails will make the flanged pieces, and the saving of ties, the sleepers. The flanged pieces are put together with alternate splices, and their hold on the rail increases proportionally with the load. They are easily loosened by inserting a bar under the bases and prying upward, this causing their upper portions to spread apart, when the rail and portions to spread apart, w
bed may be readily removed.
Patented March 3, 1874. For further par ticulars address the inventor, Mr. Geo. Potts, ticulars address the inventor, Mr. Gers,
Unionport, Jefferson county, Ohio.

## Uninflammable Products.

It is well known that certain substances, notably phosphate of ammonia, incorporated in the fibers of tissues render the same incombustible, or, rather, admit of their burning very slowly and carbonizing with the production of flame. M. L'Abbé Mauran, says La Nature, has recently discovered that a mixture of borax, sulphate of soda, and boracic acid, in suitable proportions, while rendering cloth uninflammable, will also prevent any alteration of color, flexibility, or lasting qualities through the effect of combustion.

## IMPROVED FIRE BOX FOR LOCOMOTIVE FURNACES.

It is a common fault in locomotive furnaces, made in the usual way, that the flanges and rivets of the end sheets, at the points where they are connected to the side sheets, soon become burnt, and thus cracked and leaky. The result is that the end sheets have to be renewed several times before the sides are worn out, involving considerable trouble and expense. To obviate this difficulty, the invention illustrated in the annexed engraving has been devised, and it consists in forming the side sheets to bulge inward throughout the entire width, as shown in Fig. 2, at A; or where the central portion of the sheet is on the same plane as the joints, bulges, B, Fig. 3, may be made adjacent to the flanges to protect said joints. In Fig. 1 is given a view of the interior of the fire box, showing that the device causes but a slight modification of the usual form. By this means, it is claimed, the joints are protected from the intense heat of the fire, and are preserved and rendered as durable as any other portion of the furnace. The cost for the labor of making a locomotive fire box of this design is, we are informed, only three to five dollars in excess of that of constructing the box in the usual way. The iron for the side sheets is required to be from one and a half to two inches longer than when the sheets are made straight.
Patented through the Scientific American Patent Agency, April 27, 1875. For further particulars address the inventors, Messrs. W. Dawson and J. Hughes, Scranton, Pa .

## Spirit Photography under a Cloud.

 M. Buguet, of Paris, a spirit photographer, came to London early last summer, and, after advertising in this journal for premises, he obtained them, where he received many visitors and sitters. Was not the genuineness, it was asked, of the spiritual origin of the Buguet photographs attested by Mr. W. H. Harrison, a whilom contributor to this journal, and the present editor of the Spiritualist? And did not a whole host of dilettanti, including the names of some who stand very high in Science, say it was all correct? And were not all the uncles, aunts, grandfathers, grandmothers, and other relatives of several of the sitters recognized in these spirit photographs? All this, we admit, is quite true.Returning to Paris from this country, and laden with what were the equivalents of testimonials from men of notefellows of the Royal Society, lecturers in University College, editors, and simple commoners-M. Buguet practised "spirit photography " with renewed zeal in that gay capital. Par
isian policemen seem to have been materialistic to an unusual extent; they wished to know more about this kind of practice. One fine morning two of the " force "-one of them an inspector, the other a photographer-called upon M. Buguet inspector, the other a photographer-called upon M. Buguet
to have a spirit photograph taken. Waiting till the dark slide with its sensitive plate was about to be inserted in the camera, they produced their warrant, had a developer applied to the as yet unexposed plate, and saw a "spirit" developed

Remarkable Railroading in Switzerland.
A railroad has recently been opened to the summit of Moun Uetliberg, Switzerland, which overlooks, at a hight of about 1,300 feet, Lake Zurich, and is much visited by tour ists for the sake of the view. The total length of the road is about 30,000 feet, or more than $5 \frac{1}{2}$ miles. The lowest grade is 232 feet per mile, but 59 per cent of the whole length is of grades exceeding 264 feet per mile. The curves are of 500 and 450 feet radius, the latter co inciding with a grade of 327 feet per mile. The track is of the standard gage, and the rails, of iron, weigh 60 lbs per yard. There are three tank locomotives of the Krauss pattern, with six drivers coupled, eash 36 inches in diameter, and with a wheel baseof only 6 feet 8 inches. They weigh $41,800 \mathrm{lbs}$ empty, and in service, from 52,800 to 55,000 lbs. The heating surface is about 770 square feet, the diameter of piston $12 \frac{1}{2}$ inches, the stroke $21 \frac{1}{2}$ inches
The first ascent was made April 24 of this year. The engine pushed up three cars loaded with ballast and workmen, a total gross load of $27 \frac{1}{2}$ to 30 tuns. This load wa moved without difficulty at a speed varying from 8 to $10 \frac{1}{2}$ miles per hour, maintainin a steam pressure of 170 lbs .
The descent is made with compressed air, by means of an apparatus used on the en gines of the Rigi Railroad. The speed was $15 \frac{1}{2}$ to $18 \frac{1}{2}$ miles per hour
At trials made by the professors of the Zurich Polytechnic School, the weight hauled Zurich Polytechnic School, the weight hauled
was about $627 \frac{1}{2}$ tuns, the traction exerted was about $627 \frac{1}{2}$ tuns, the traction exerted
about $7,500 \mathrm{lbs}$., and the work about 200 net horse power.

A peculiar feature in the working of this

A search was then made, the originals of this and other spirit forms were discovered, and the ingenious photographer was subsequently lodged in "durance vile," from which, after confessing that he was an impostor, he was liberated on bail. In the meantime spirit photography has still many true believers in London; and, although the editor of one of the weekly periodicals devoted to this topic denounces Buguet as a " thorough scoundrel," that of the other looks upon him as a kind of Galileo, who has made a confession he knows to be untrue in order to be released from prison, quite over looking the fact of the seizure, by the police, of the tools and implements by which the trade in the so-called "spirit photographs" was carried on.
It is said, however, that many of the "spirits" evoked by M. Buguet have been recognized. Far be it from us to say a he wheels of the locomotive, sufficient to wash the rail completely. It was observed long ago that the influence on adhesion of a slight humidity such as that deposited by a fog, and that of a veritable layer of water deposited by rain are entirely different. On the Swiss Central Railroad, a jet of water is used on the front wheels of certain engines to facilitate the passage around carves, and the effect on the du rability of the ty es has been remarkable; but this jet of water, which was only intended to lubricate the inside part of the rail head, moistens the whole surface in contact with the tyre. No mo dification of the adhesion has been observed as the result of th is ; this jet of water does not dispense with as the result of th is ; this jet of water does not dispense with
the use of sand, while at Uetliberg absolutely no use is made the use of sand, while at Uetliberg absoluty
of sand, but water is employed exclusively

Another Swiss mountain railroad, the Rigi Kulm and Lake of Zug line, is about seven miles long; six miles of it are worked with a peculiar cogged wheel arrange ment, or something similar in effect, by which grades of 1,056 feet per mile are sur mounted, there being one section more than a mile and a half long with a grade very little less. The radii of the curves, which are uniform, is 600 feet.

Water and its Inhabitants
The quality of water in relation to its fauna and flora has been the subject of investigation by some of the French Acade micians. In substance, the results seem to prove that water in which animals and plants of higher organization will thrive is fit to drink; and on the other hand, water in which only the infusoria and lower cryp togams will grow is unhealthy. If the wa ter become stagnant and impure, aquati plants of the higher order will languish and disappear, and the half-suffocated fish will rise near the surface and crowd togethe rise ne the till be in parts where there may still be a little of the purer element trickling in, and if driv en from these places they soon die. Physa fontinalis will only live in very pure water valvata piscinalis in clear water; limnaea ovata and stagnalis and planorbis marginatus in ordinary water ; and finally, cyclas cornea and lithynia impura in water of middling quality ; but no mollusk will live in corrupt water. Plants also exercise a reactive in fluence on the quality of water. The most delicate appears to be the common wate cress, the presence of which indicates excellent quality. Veronicas and the floating

## DAWSON \& HUGHES' LOCOMOTIVE FIRE BOX.

that they have not; but we do not travel beyond our own experience in such matters when we assert that a muslin mask, fastened upon the face of a courageous medium, has been re cognized, by a person of more than average intellectual powers, as a deceased relative; and that in a deposition of sil ver on the back of a wet collodion plate, caused by contact with our own fingers, the bearer of a name well known in spiritualistic circles has recognized a visible manifestation fraught with much interest. Surely, one might say, if spirit photography be the incontestible fact some people say it is, there ought not to be much difficulty in convincing the world of the reality of such fact, and this opinion we endorse.-British Journal of Photugraphy.

Sir Joinn Franklin's widow is hopelessly sick
water weeds flourish only in water of good quality. The water plantain, mints, loosestrife, sedges, rushes, water lilies, and many others grow perfectly well in water of moderately good quality. Some of the sedges and arrowheads will thrive in water of very poor quality. The most hardy or least exacting in this respect is the common reed, or phragmites communis.

IT is said that iron goods treated as below described, ac quire a bright surface, having a white glance without under going any of the usual polishing operations. When taken from the forge or rolls, the articles are placed in dilute sulphuric acid (1 to 20) for an hour; they are then washed clean in waacid, dried with sawdust, dipped for a second or so in nim.

KNEBWORTH PARK, HERTFORDSHIRE, ENGLAND,
To every student of English literature, the name of the late Lord Lytton is familiar. Few there are who have not read the charming productions of his pen; and though he has passed away, he has made for himself an enduring name apart from all inherited or bestowed. But though his works have been read by myriaas, yet those who have seen his residence and its gardens may be counted only by bundreds. He was a man of taste, and hence it might be expected he would $\mathrm{b}^{\circ}$ no means neglect his garden; and though in size and appliances it has no pretension to rivalmany of the great establishments, it is, nevertheless, one of the prettiest gardens we know.
Knebworth Park covers about three hundred acres of nearly the highest ground in the county of Hertford. The manor passed into the possession of Sir Robert Lytton in the fifteenth century, and it has continued in the possession of his descendants. The ancient manor house was pulled down in 1811, and the present mansion erected on nearly the same site. Of the west or garden front of this, our first engraving is an accurate representation and, owing to the elevation of the site, the tower, which forms a prominent feature in the architectural design, commands the view of a wide range of the surrounding country. Extended before it is a flower garden on grass, the beds framed in gravel, plentifully embellished with vases and statuary, and covering altogether about four acres. The design is somewhat complicated, and from its character difficult to plant so as to combine harmony of color with variety, while the number of plants required, some 36,000 , is large for the means of pro ducing them. The effect, however, as will be seen from ou second engraving, is excellent; and though at the time of our visic the glory of the flower beds had departed, enough
of their beauty was left to show what it had been when they of their beauty was left to sho what it had been when they
were in their pride. The lawn surrounding the beds is beauwere in their pride. The lawn surrounding the beds is beautifully kept, and extends on both sides of the broad central walk to the high laurel hedges which form the boandary of this garden. It is dotted with some fine araucarias, welling tonias, cryptomerias, and other conifers. Some of the arauca rias, after the dry summer of 1866, appeared, to be dying but Mr. Kipling the ordeng buve them a rood mulching loam, leaf soil, and a litle oam, well decayed manure, and the improved wonderfully. The ivy-covered summer house on the mound on the southwes side, and which forms a conspicuous object in our second view, commands a good view of the flower garden and man sion, and, in a clear day, of the surrounding country.
An old flower garden has been turned into a rosary, in which it is contemplated to carry pillar roses on arches carry pila surrounding walks -Journal of Horticular

## Modern Blasting, Agents

In a paper on this subject recently read by Mr. Noble before the Society of Arts, the author thus explains the reasoning which led to firing slow explosives by local detonation : "When a hammer strikes a very thin layer of nitro-glycerin on an anvil, the blow produces a strong compression of the liquid, which liberates heat and raises its temperature to the point at which it detonates. But only that part which actually receives the blow explodes. If, howe ${ }_{\text {ver, }}$ the hammer is very heavy, and the blow strong, the explosion is no longer confined to the part which receives the direct shock, and the whole goes off. A local detonation, owing to the immense tension of its gas, must be very similar in action to a strong blow, and will thus compress the explosive liquid which surrounds it, causing it to detonate at will and to propagate the explosion throughout the whole mass by the same means. Whether that theory be correct or not, it led to a result which affords considerable facilities for the utilization of modern explosives. It enables us, with or without confinement, to turn a
a solid or liquid substance of very harmless appearance in stantaneously into gas which occupies the same or nearly
the same bulk, but has an expanding tendency which, for nitro-glycerin gas, must come near a pressure of 500 tuns per square inch."

## Bicycle Riding

This is a sport confined to a select few in this country but in England it is extensively practised, with great satis faction by the riders. Some of them give their experience in the English Mechanic as follows• L. Striffler, Secretary of
if wet, as you cannot get any speed, and it is no comfort to yourself, and the incessant jolting has a tendency to loose your spokes. When going through a country town with macadamized roads, it is glorious to slip through at railway speed and astonish the natives; but whenever I come to a piece of ground which is paved with sets or rubble stones, let me get off and take pity on my good steed.
B. Travis says: "I have been a rider for six years on a wooden machine, and now on a spider-wheeled one. I am only about 5 feet 2 inches, and I ride a 45 -inch wheel, with 5 inch cranks. With it I can and do ride up inclines much easier than with my old


## KNEBWORTH HOUSE, ENGLAND.

Zephyr Bicycle Club, Moston, says: "I have had a roadster made to order, with a 51 -inch driver and it only weighs 30 lbs., and is plenty strong enough. I have discarded the brake as a nuisance, a danger, and extra weight. The best brake is your feet on the pedals, holding back; and if the hill is so steep that it overcomes you, then you may depend it is not safe to ride down, but get off and walk. Always lean well back when descending a hill, and incline forward when ascending, or when riding against a head wind. When
and swift; yet with
e well in hand."
ine railway the your paper scmething said about a one line railway, the running of a bicycle having inspired the remarks. Now, there is no analogy in the matter, for an en gine or train would not keep erect on one line of rails only unless it was perfectly balanced, and remained so. A man could not run a bicycle even under those conditions. It re quires a continual side movement of the front wheel to re
easier than with my old ma
chine; yet they are each the same weight ( 50 lbs.) This attribute to the rider being able to apply his power be cause he sits over the wheel Every rider who sits much be hind his driving wheel knows that in driving up hill his arms have to counteract the push of is feet, whereas push down wards on the treadle require ery little pull on the handle to keep the wheel right. Th arge wheel machines ar worked with the forepart of with the hollow of the foot, a the small-wheeled ones were That is also a greatadvantage the leg not having to traverse o great a distance, one is en abled to ride more gracefully, and with greater ease. Som machines are without brakes, the necessity of which depend on the inclines they have to un down. I live in a hill istrict, and often on a Satur day afternoon trip 1 have to I consider it highly dangerous o attempt a run down some o hem, unless you have a brake you can depend on and the you can depend on, and the he run down will be splendid brake, you can leep
 store the balance that is alway being lost; for if the wheels were put in a straight line, and fastened, there is no rider could ride it, for he would quickly lose his equilibrium-he could not restore it, and down he must come.
"I have also seen remark and suggestions about multi plying wheels, so that one turn of the crank will make two turns or more of the wheel Now, it won't do. The same effect can be got by shortening the crank; but then, who ha the strong legs required to drive them? Bicycles as made at present are very good, and very simple also; any additio of gearing will only impai them. Now, I do not expect that any rider will be able to propel himself through the air on any bicycle much over mile in three minutes-for that is 20 miles an hour-the air it self being the great retarder I would rather face an incline than a strong wind, it being impossible to go with any speed in the face of a stiff breeze.

A New Cement.
A French chemist is said to have succeeded in preparing a ng fast, $\mid$ mineral compound, which is said to be superior to hydrauli keep urith fast fear of a spill if you happen to come against a stone. Of course, the use of the step is an absolute necessity with our present sized machines, as far as mounting is concerned. I prefer vaulting off from the treadle, as it saves feeling about with your foot for the step, and perhaps catching your toe in the front wheel spoke. If you are riding through a town, if the same be paved and wet, be very careful about turning, as the mud which accumulates in towns seems to acquire a greasy consistence, and seems to completely lubricate the road; and if you turn sharply, your wheel runs away sideways, and you find yourself on the ground. I think it is wise to walk through towns if they are paved, and especial-





GARDENS AT KNEBWORTH, ENGLAND. lime for uniting stone and resisting the action of water. It becomes as hard as stone, is unchangeable by the air, and is proof against the action of acids. It is made by mixing to gether 19 lbs sulphur and 42 lbs . pulverized stoneware and glass; this mixture is exposed to a gentle heat, which melts the sulphur, and then the mass is stirred until it become thoroughly homogeneous, when it is run into molds and al lowed to cool. It melts at about $248^{\circ} \mathrm{Fah}$., and may be re employed without loss of any of its qualities, whenever desirable to change the form of an apparatus, by melting a gentle heat, and operating as with asphalte. At $230^{\circ} \mathrm{Fah}$ it becomes as hard as stone, and preserves its solidity in boil ing water

## the song of steam.

TThe following fine poem, which Blackwood's Magazine has pronounced to be the best lyric of the century, is by George
Ky.
Harness me down with your iron bands, Be sure of your curb and rein,
For I scorn the strength of your puny hands
How I laughed as I lay concea
For many a countless hour,
At the childish boasts of human might
And the pride of human power
When I saw an army upon the land,
A navy upon the seas,
Creeping along, a snail-like band,
Or waiting a wayward breeze
When I saw the peasant reel
With the toil that he faintly bore,
As he turned at the tardy wheel, Or toiled at the weary car!
When I measured the panting co The flight of the carrier dove, Or the lines of impatient love, could but think how the world As these were outstripped afar When I should be bound to the rushing keel Or chained to the flying car.
Ha! ha! ha! they found me at last,
They invited me forth at length, And I rushed to my throne with a thunder blast, And laughed in my iron strength. On! then ye saw a wondrous chang On the earth and ocean wide, Nor wait for wind nor tide.
Hurrah! hurrah! the waters o'er
The mountains steep decline; The world! the world is to my powerThe rivers the sun hath earliest bles Or those where his beams decline, The giant streams of the queenly west, Or the Orient floods divine.
ocean pales wherever I sweep To hear my strength rejoice, And monsters of the briny deep Cower trembling at my voice. I carry the wealth and ore of earth
The thought of God-like mind; The wind lags after my going forth The lightning is left behind.
In the darksome depths of the fathomless mine, My tireless arms doth play, bring earth's glittering jewels up From the hidden caves below, And I make the fountain's granite cup With a crystal gush o'erflow.
I blow the bellows, I forge the steel, In all the shops of trade;
hammer the ore and turn the wheel Where my arms of strength are made; I manage the furnace, the mill, the mint, nd all my doings 1 put in On every Saturday eve.
I've no muscles to weary, no breath to decay, No bones to be laid on the shelf, No bones to be laid on the shelf,
And soon I intend you may go and play While I manage the world myself. But harness me down with your iron bands, Be sure of your curb and rein, For I scorn the strength of your puny hands
As the tempest scorns the chain.

## Great Eastern Rallway Company's New station, London.

The terminus of the Great Eastern Railway Company a Liverpool street, if not partaking altogether of the palatial will be unmistakably a great improvement upon many of the Loxdon termini, and will be one of the largest; the area com prised within the retaining walls-this being a low level sta tion-is more than ten acres in extent, and is some 2,000 fee in its entire length. The general character of the design is gothic, broadly treated in the several elevations.
The area occupied by the various lines of platform is cov ered by a roof in four spans, the two central ones being 109 feet each, and the side spans 46 feet and 44 feet The whol width covered in is 314 feet
The roof trusses are principally comprised of wrough Iron with ornamental details of cast iron, and the effect is oxtremoly pleasing. The columns are double in the center, and have also to act as down pipes for the conveyance of water from the roof. The covering is chiefly glass, with a small proportion of boarding and slates. The length of the soof over the main line on the east side is 730 feet, and that over the local platforms 450 feet long and 76 feet above plat form level. The platforms are arranged so that the advan mages of the end-on system, as at Charing Cross, as well a those of the sidelong, as at King's Cross, are retained The main line platforms are 1,000 feet long and 32 feet in width, while the local platforms are 550 feet in length, and vary in width from 10 feet to 21 feet. Lamp rooms are pro vided below the platform, connected with each by a subway and hydraulic lift

The arrangements for traversing carriages across and along the main line, and the whole of the turntables, eleven in number, are worked by hydraulic power
Communication is also obtained with the Metropolitan sys nom by a junction with the railways, besides subways from the platforms under Liverpool street for passengers. The whole of the signaling and multifarious working of the points is connected at Primrose street, into one box, which
contains more than 100 levers for the purpose of interlock ing and other arrangements.
The whole of the works have been designed by Mr. Edward Wilson, C. E., the company's engineer, and executed by the well known firm of Messrs. Lucas Brothers.-The Engineer.

## THE IRISH-AMERICAN RIFLE CONTEST

The international contest, between the American team o six of our best known crack shots and an equal number of skilled Irish riflemen, has resulted in a victory for the Americans, gained by 38 points. Three ranges, respectively of 800 , 900 , and 1,000 yards, were fired over, fifteen shots at each distance being allowed to each competitor. The targets were six feet in hight by twelve feet in breadth, and were divided off, with a center six by six feet, ins1de of which a bull's eye three feet square was painted. A shot, by striking the bull's eye, counted four, on the center, three, and, if hitting outside the latter, two. From this it will be seen that sixty was the highest aggregate possible for any set of fifteen shots, one hundred and eighty for any competitor's entire score of forty-five shots, and one thousand and eighty for the shots of the whole team. Out of the last mentioned total, the Americans made 967, and the Irish 929. The annexed diagrams show the best shooting at each range.
Fig. 1 was made by Mr. Pollock, of the Irish team, at 800 yards, and counted 59, every shot, with one exception, striking the bull's eye. Fig. 2 is Colonel Bodine's (American team) target, which also counted 59. Fig. 3 is Mr. James Wilson's (Irish team) target, which indicates 55.

|  |  |  |
| :---: | :---: | :---: |

Fig. 1.-4-4-4-4-4-4-4-3-4-4-4-4-4-4-4-50.


Fig. 2.-4-4-4-4-4-4-4-4-4-3-4-4-4-4-4-59.

great heat, its tenacity is impaired or destroyed. Whiting is simply chalk freed from impurities, and reduced to a fine powder, and, is also known under the names of Paris and Spanish white,though the latter is really a white earth found in Spain.
There is a great difference in whitewash brushes; and the beauty of the work, as well as the ease of performing it, depends very much on a good brush, making it well worth while to pay the difference between a good one and a cheap one. For the inexperienced, it is more difficult to lay on tints evenly than pure white.
For those who have not had experience in using or dissolving glue, it is well to say that the dry glue should be spread in a broad flat basin, like a shallow milk pan, and cold water enough poured on it to fairly cover it; then let it lie over night, or for a day, when, if the water be not all absorbed in the swelling glue, the excess should be poured off, when fresh water will be added, in which you boil the glue, to be mixed with whiting.-D. S.C., in the Maryland Farmer.

Centennial Notes.
A definite project for a huge hotel, to accommodate five thousand of the people who will flock to Philadelphia during the Centennial, has been agreed upon. A number of citizens have taken steps to erect a gigantic wooden building, ten stories in hight and containing a thousand double-bedded rooms. It is proposed to complete the work in five months, an undertaking, the magnitude of which will be realized when it is considered that there will be thirty miles of wal to plaster. The structure will be about four times as large in capacity as the Continental Hotel in Philadel large

A correspondent, Mr. John L. Geissler, of West Ches ter, Pa., writes us that he has invented a remarkable clock, which, with a single pair of hands, indicates si multaneously, on one dial ten feet in diameter, the time not only of the place where located, but of the principal cities of the world. He has offered to place the clock on the wall of the Centennial structure for $\$ 500$, this being the actual cost of its construction ; and he says such a timepiece would doubtless meet with much approbation from foreign visitors, as it would en able them to learn their home time to a fraction of minute. While it probably might be of interest for the average Briton to note the fact that 2 in the afternoon at Philadelphia corresponds to about the hour at which he would begin his daily onslaught on underdone joints and Bass' ale, we fear that the Italians, who count up to twenty-four o'clock and mark their dials accordingly and the Chinese, the hands of whose timepieces travel backwards, would not gain much useful information from Mr. Geissler's huge clock. How ever, the idea is a good one, because the Centennial should certainly have a timepiece connected electrically with clocks in all the principal cities in the United States, so that, at 12 o'clock Centennial time on the momentous 4th of July, the entire country might join in unanimous cele bration. Mr. Geissler offers a curious clock for a smal cost, and the Centennial authorities would perhaps do well in adopting his suggestion.
It is proposed by the managers of the Centennial to appoint an electrician who shall have the supervision and direction of the electrical department. This is very important and responsible position, and should be filled by no person save one whose talents and qua lifications are of the highest order.
We notice that the Telegrapher suggests the name of Mr. David Brooks, in which nomination we hear tily concur. Mr. Brooks has had valuable experience in the foreign expositions, is a thorough expert in al matters electrical, and enjoys a wide acquaintance among the electricians and telegraphic engineers of Europe. We trust that the Centennial managers will see the wisdom of appointing Mr. Brooks.
It is difficult to appreciate fully the magnificent marksman ship which these scores prove, especially with regard to the long ranges, at which the Americans qained largely. One housand yards is equal to about eleven avenue blocks in his city, including the widths of the streets; and hitting a three-feet square target at that distance amounts to about the same as (if the buildings were out of the way) standing t Trinity church and sending a ball into a window of the Scientific American office. The bull's eye would appea f about the same size as a dot half an inch square held at a distance of some three yards from the eye.

## To Kalsomine a Wall

Buy the best bleached glue if the walls are to be white or some light tint (if dark, it is immaterial, so the glue is clean), and use it in the proportion of a quarter of a pound of glue to eight pounds of whiting. Soak the glue over night in the morning pour off the water, as the glue simply swells while soaking. Add fresh water, put it in a tin pail, and set that in a kettle of boiling water. When dissolved, stir into it the whiting, adding enough water to make it, after mixing, of the same consistence as common whitewash. It may be tinted to any color desired, and is applied with a white wash brush. If the color is rubbed smooth in a little water first, and then mixed with the wash, it will be more oven If the walls have been previously whitewashed, scrape away all that will come off, and wash with a solution of
white vitriol, two ounces in a pail of water. The vitriol will be decomposed, forming zinc white,and plaster of Paris, to which the kalsomining easily adheres. It is important to disselve the glue in a hot water bath; for if scorched by too

## 姦ectut ${ }^{2}$ mmericat and forcigy zatents.

## Improved Spring Bed Bottom.

Joseph Fowler, New York city.-Springs are attached to the bedtead and to the cross bars by means of the contracted coils of pring downward. The head of a rivet rests on the lower contracted coil of the spring. The bed is suspended on the springs in this man aer, and the bolts or rivets form a substantial connection. The devices improve another invention, patented to same inventor Jan uary $26,1875$.

## Improved Shirt.

John C. Dunham, Buffalo, N. Y.-This invention consist of a shir ront detached from the body, except at the top and for a oertain distance downward, sufficiently to keep it in place, by which the ront is preserved smoother and neater. The inventicn also con ers to diminish the breadth of the connection with the yoke, by which wrinkling of the front is prevented when the arms ar raised.

Improved Toy Gun.
Whiam H. Martin, Mobile, Ala.-This invention consists of a lonitudinal slotted barrel, with ball or arrow propelling slide piece orking freely therein by means of springs attached to a cushioned collar at the muzzle of the barrel. The hook or arrow shaped rear and slide piece.

## Improved siliding Gate.

John P. MoMurray, Oregon, Mo.-The gate rests outside of the sate post, so that it may be readily moved longitudinally about one balf its length, and then it may be swung round on a bracket nally, and may be elevated to swing clear of snow in the winter season

Improved Fastening for Hats. Clinton R. Blackwood, New York city.-This spring fastener is made in one piece, and hastened to the inside of the hat with thread leaving the ends to hang down, so as to bear upon the back part of the head.

## Improved Water Wheel.

Oliver J. Bollinger, York, Pa.-Secondary guides are arranged in the outer ends of the water passages to divide them into two chan nels narrower than the throat, so that any objects floating in the
water, too large for passing through the throass, will be arrested at the outside of the case, where they can be easily reached for re moval. The gates are placed at or near the inner end and narrow sure on account of the smallest area being opposed to the water, 8 that they offer the least resistance to the moving of them in open ing and closing. The gates are attached to a ring, which has radia arms and a hub surrounding the shaft, to strengtben it agains lateral strains; and it is connected by the rods which inciine towara
the shaft with the running block on the shaft, and other mechanism the shaft with the running
for opening and closing.

Improved Combined Table and Desk.
Thomas W. Moore, Plainfield, N. J.-This invention consists of
table having a suitable inclosed space with pigeon holes, the top. The top is made of two parts, and hinged at the point where the slope of the desk begins. One side of the frame is lower than where the top is hinged. On this low part a piece is hinged to swin up on the top and hold the table top level when a table is required and close the space beneath. The table top has a piece at each end which overlaps the end of the frame, and

## Improved Bottle Stopper

Gustave J. Crikelair, Green Bay, Wis.-There is a band around the neck of the bottle, which carries a little clevis. This clevis is pivoted to the band, so that it may work up and down, and a ben lever is attached to the jaws of the clevis by the fulcrum pin. This
lever curves up over the top of the bottle, and is attached to the stopper, which last has a flange around it, which incloses a packing. A spring is fastened to the lever, the upper end of which bears with a constant pressure against a lug, which is fastened between the
jaws of the clevis. When a person takes hold of the bottle, he bears with his thumb on the lower end of the Jever, which action raises the stopper, and allows the contents to flow out when the raises the stopper, and ahows the cone an eye on the under side
bottle is tipped. A hook is attached to
the lever, and hooks under the clevis to hold the stopper down.

## Improved Child's Carriage

F. Herman Jury, New York city.-The rim of the wheel is shaped so that, while it widens out at the top to the edges, the bottom wil be sufficiently thick to afford the requisite thiekness for firmly holding the spokes which screw into it. The hub is cast with an inner annular chamber, to dispense with unnecessary metal, and
the ends, which are contracted to the size of the box, are screw-
threaded, and the box is screwed in, making a tight hub. The axles are short pieces of round metal screwed into the ends of a hollow middle tubular portion, to make the middle portions stronger
for a given quantity of metal by increasing the size. The body is for a given quantity of metal by increasing the size. The body is
jointed to fold together ; and by a spring top for holding up the jointed to fold together; and by a spring top for holding up the
top, and the braces arranged inside, the top can be raised and lowered easily by the person inside.

## mproved Gar Coupling

Benjamin S. Kearney, Franklinton, N. C.-This invention relates to an improved automatic car coupling, that may be readily used foring mouth, vertically slidind $1 t$ consist rear piece, that couple and oontrol, by suitable levers, the link with ball-shaped heads.
improved Potato and seed Planter
William H. Whitman, Scranton, Pa.-In the slot of a pitman are placed springs, which rest against a crank, and the effect of which
is to cause the pitman to stand still for a little time at the end of is to cause the pitman to stand still for a little time at the end of
each movement. The other end of the pitman is pivoted to a frame, each movement. The other end of the pitman is pivoted to a frame,
which slides upon a block, in which is formed a hole of sufficiont which slides upon a block, in which is formed a hole of sufficient
size to receive enough seed for a hill, and which is placed directly beneath the hopper. Plates are so arranged that as the frame moves forward one plate will uncover the upper end of the pocket to allow the seed to drop into said pocket. As the frame moves to the rear-
ward, the plate will cover the upper end of said pocket, and another ward, the plate will cover the upper end of said pocket, and another
plate will uncover its lower end, allowing the seed to drop to the plate will uncover its lower end, allowing the seed to drop to the
ground. The plate is made with a short edge, so that, when the maohine is used for planting potatoes, it may cut off a piece of potato be cut more than once and small potatoes will not be out at all When the machine is used for planting seeds, the upper plate serves simply as a cut-off. The hopper is made in three parts, so
that the two upper parts may rock upon each other, and upon the that the two upper parts may rock upon each other, and upon the
stationary lower part to keep the seed from clogging by the advance stationary lower p
of the machine.

## Improved Cultivator

Albert Dart, Rockville, Conn.-A rear wheel gages the cut of two
ront meld boards. Adjustable bars carrythe two rear mold boards. ront meld boards. Adjustable bars carry the two rear mold boards. These bars are spread apart by a cam operated by means of a lever. bars, and supports the bars and mold boards as they are spread or expanded by the cams or forced inward by the pressure of the
earth thereon. The wheel is supported by the spring, which is atearth thereon. The wheel is supported by the spring, which is attached to the under side of the beam.

Improved Mirror
Allen Huber, Berlin, Can.-This consists in covering the baek of the mirror with varnish or waterproof material, and with a coat of gypsum, plaster of Paris, or equivalent material. The advantages the silver will be protected from injury, and the wooden back board or other back and the wedging of the plate will be dispensed with.

Improved Pneumatic Dispatch Apparatus. Olney B. Dowd, New York city.-Two pipes join the local stations with the central station, with a circuit of the impelling fluid, preback through the other, and worked by pressure in a reservoir at the central station. It is designed to make the apparatus useful for hotels, offices, and private houses by a special circuit to each, the nected, so as to allow of the return of the fluid, and having the apparatus for introducing the carrier to be returned to the central office.

## improved Varlable Exhaust.

William F. Leseur and Charles Michel, College Point, N. Y.-The invention consists in supporting a cone plug upon a vertical sorew stem arranged to project up through the mouth of the exhaust pipe of a locomotive engine. The ohief advantage of this arrangement
is economy of space and unobstructed passage for escape of steam, it having been the practice heretofore to support and adjust the plugs of exhayst nozzles hy means of rods arranged exteriorly

David L Hoffman and Parker M. Shoemate, Aullville, Mo.-Thi eparated into two longitudinal parts.

Improved Row Gage for Plows.
William Edwin Stanley, Montezuma, Ga.-This is a row gage at achment to plows for marking off rows to guide the plowman
traight. A socket for receiving the end of the marking rod is traight. A socket for receiving the end of the marking rod i
mounted on a support which revolves to shift it from side to side a he plow reverses. Said support has a hollow axle, through which cord, having a weight attached io it, extends to the end of the socket next to said support, and is secured thereto to return the
marker to the normal position after it escapes from obstructions causing it to swing back on a pivot, as a means of preventing it rom breaking. The revolving support for the socket is supported on standards, some of which are attached so as to form guides to eep the suspended weight from swinging about.
Improved Station for Submarine Telegraphs. Robert F. Bradley, Moffettsville, S. C.-This invention relates nimproved system of telegraph stations in mid-ocean, by whic messages can be sen final any point of the ocean, along the line of ene cable, to the terminal points, and vice versa, so that communiished. The invention consists of a hollow sectional column with base plate attached by ball and socket joint, which column is low ered into the water and anchored rigidly to the ground. The branch
cable is coupled to the main cable, and carried along the column to cable is coupled to the main cable, and carried along the column to the surface of the water, to be there
instruments on board of the vessels.

## Improved Letter and Picture Block.

Daniel Birmeli, Greenville, N. J.-This invention consists of a dif erent shapea end point or projection to each letter block, so that icture blocks, having notches corresponding to the letters of th ame of the picture, to aid the child in selecting the letters for nam ing the picture and identifying them therewith.

Improved Life Preserv
Adolph Traub, New York city.-This life preserver is constructed of a front and rear part, connected together by straps or suspenders, supported by the shoulders, having movable wings or fins at-
tached thereto, the whole being made double or bag-like and filled tached thereto, the whole being made double or bag-like and filled with roasted cork.
Improved Transom for Doors.
John Berndt, Denver, Col. Ter.-This invention relates to certain improvements in transoms for doors; and it consists in a transom sash
that is made to slide into a casing above by means of a branched cord noving over pulleys, one of the branches of which cord is attache to the sash for the purpose of raising it, and the other attached to a suspended detent or locking bar which prevents the raising of the
sash except by the cord upon the inside of the house, the cord being sash except by the cord upon the inside of the house, the cord being
fastened below by a self-closing cam lever, and so arranged at its fastened below by a self-closing cam lever, and so arranged at its
branched ends as to raise the sash and lift the locking bar at the branched
same time.

Improved Hay and Cotton Press.
John L. De Witt, Gardner, Ml.-The invention relates to mean Whereby the operators on a hay or cotton press may be enabled to time. It consists in making the same piece, grooved on both sides, act successively as a follower and platen, and in holding the platen by a band-operated slide so that it may be pushed out with the tied and pressed bale.

Improved Clothes Wringer
Leander Becker, York, Pa.-This invention relates to certain mprovements in wringers; and it consists in the combination with the body of a washing machine, and the adjustable bearings of one
of the wringer rolls of a lever, and an adjustable vertical rod atof the wringer rolls of a lever, and an adjustable vertical rod at supply the pressure for the wringer rolls, the said pressure being egulated at will.

Improved Washing Machine.
Leander Becker, York, Pa.-This invention relates to certain improvements in washing machines; and it consists in two levers piv-
oted to the outer casing and having notched extensions and pendant egments. To the top of the levers is pivoted an aro-shaped set o ubbers, which are attached at the bottom by a connecting rod with the lever extensions and segments is. another adjustable and detach able set of rubbers which correspond to the flrst in construction, and between which and the first set the clothes are contained.

Improved Paper Machine.
Chas. L. Crum, Winchester, Va.-The object of this invention is to etter adapt the Fourdrinier paper machine to making heavy paner he combination with the ordinary belt of wire cloth which carries he pulp, of a second upper endless belt of wire cloth passing around rollers, and an upper suction box resting upon the upper surfa.
the second belt and just above the web formed from the pulp.

## Improved Bale Tie

H. K. Du Bose and E. W. Charles, Jr., Camden, S. C.-The inven on has particular reference to flexible ties by which hay, ootton, sists in a tongueless buckle and a fastener having two cross slot ut obliquely toward each other.

Improved Spring Seat for Horse Rakes, etc. Amos W. Coates, Alliance, $O$.-The object of this invention is to adapt the supporting spring of a chair seat in a horse rake, harvester
or other analogous implement to the different weights of different drivers, and, while preserving its elasticity, render the said spring removing the driver from the most convenithout bearing down and removing the driver from the most convenient position for operat-
ing his hand levers. It consists in the combination with the ordinary inclined band spring, of an auxiliary spring attached to the base frame and connected with the main spring near the sear by means of a stud which is rigidly fixed to the main spring, the said
auxiliary spring being sloted at its connection with the stud, auxiliary spring being slotted at its connection with the stud, so
that it does not act at all until the main spring is borne down sumf that it does not act at all until the main spring is borne down sumf-
ciently low to cause its stud to rest in the lower part of the slot. Improved Coffee Pot.
Sumner P. Webber, Charlotte, Mich.-This invention consists of a to an annular finer strainer, arranged below the spout at the inside of the pot, the detachable strainer being supported at some distance at the bottom of the pot and retained by springs at the top, a bail serving to lift it out of the pot.

## Improved Steering Propeller.

Wilhelm F. Zoehe, Brooklyn, N.Y.-This invention consists in the pplied to actuating lever rods, which rods are by hand power and guided pieces, transmitting the power al:ernately, by intermediate gear wheels, to the shaft of the screw. The screw is secured
to a supporting frame sliding in vertical direction for viedding to to a supporting frame sliding in vertical direction for yielding to
obstructions, and is also employed for steering the boat by connecting the screw frame, by a governing arm and wheel, ropes, and pul-

Improved Water Wheel
Isaac Mallery, Dryden, N. Y.-This wheel has two sets of buckets of chutes. The revolving gate is provided with a series of opening The water may be admitted to only the lower tier of buckets in the wheel through two or four openings; or by moving the gate farther, two or four chute openings are uncovered for the uppe tier of buckets, so that water may be admitted through two, four
ix, or eight openings, successively, according to the amount of ix, or eight op

Improved Farm Gate
Wellington H. Pratt, Prattsville, Mich.--Devices are provided in onnection with thisgate, whereby it is supported without sagging moderate depth of snow without obstruction, and, when opened will remain in any position in which it may be placed.
Improved Berry Cup.

Dewitt W. Kniffin, Marlborough, N. Y.-This is a berry cup made of wood veneering, having a bottom of two thicknesses fastened together with the grain of the wood at right angles, one part hav-
ing tenons which pass through slots and hold the bottom to the ing ten
body.

Improved Lathe Rest
James E. F. Leland, Baltimore, Md.-This invention relates to athes for turning irregular forms, and consists of a spring rest fo
upporting the article being turned. The spring is given a certain mount of tension to force the rest forward toward the article while the rest will adjust itself to the irregularities.

Improved Motor.
Jacob G. Peterson, Morganton, N. C.-By this device, a power is applied to one shaft by two springs separately wound when the
same could not be used with one spring on account of the difficulty ame could not be used with one spring on ach corn Sheller.
Frelinghuyson H. Hunter, Heltonville, Ind.-This corn shelle has a ribbed surface, over which the ears are drawn by hand $t$ ree them of the kernels. The invention relates to a chaff box, bars of the sheller.

Improved Felly Plate.
James Y. Sitton, Due West, S. C.-The feature of this invention up to embrace the sides of the tyre, thus holding th, ame in proper position on the felly

Improved Stone-Extracting Tool.
Nathan R. Cheadle, Delta, Ohio.-This is a method of removin
stones in well-boring by first cutting under them, and then dislodg ng them with a drop.

Improved Fence Post.
Eugene Powell, Delaware, Ohio.-This consists of a post with
braced stool seated in the ground, in connection with an additional braced stool seated in the ground, in connection with an additiona
stool attached at right angles thereto, in the direction of the fence stool attached at right angles thereto, in the direction of the fence, enarface of the post.

## Improved Fly Net.

Luther B. Lee and George W. Lee, Ridgewood, N. Y.-The object this invention is to pre ance. The cross bars are made of cord, and are quilted or stitched through the longitudinal bars a sufficient number of times to pre vent the said cross bars from slipping through the said longitudina
bars. The end parts of the cross bars are stitched upon a sewin machine for a few inches.

Improved Printers, Galley.
Henry H. McWilliams, Sacramento, Cal.-On the bed plate is a raised bar. The same hollow bar is turned in the same manne across the end of the plate. On the inner edge of a slotted movable
plate is a square hollow bar, made by turning over the edge, so tha thissquare bar and the triangular bar on the other plate are of the same hight, and form a channel in which the type are contained and held. This bar is moved on the plate and the channel increased o diminished in width by means of slides and eccentrics and levers
By moans of these eccentrics the movable plate is moved up, and By moans of these eccentrics the m
the bar is made to compress the type

## Apparatus for Carbureting and Purifying Gas and

 Air.Leander E. Fish, Washington, D. C.-This invention relates to certain improvements in apparatus for carbureting and purifying ai and gases. It consists of a vessel having on the bottom thereof a
detachable tank for containing oil for carbureting. Communicat ing with said tank is a pipe for introducing the oil, a gage pipe for regulating the amount of the same, and a perforated inlet pipe
through which the air or gas is forced into the oil. Just gbove the through which the air or gas is forced into the oil. Just gbove the
oil tank is a detachable cover with distributing openings for the oil tank is a detachable cover with distributing openings for th
carbureted gas in its upward passage, and above said cover are carbureted gas in its upward passage, and above said cover are
located purifying pans with bottoms of perforated sheet metal or located purifying pans with bottoms of perforated sheet metal or
wire gauze. The top of the outer vessel is provided with an annula trough of water in which the detachable cover is located with a water-sealed connection, the said cover being provided with a pres sure regulator and an outlet pipe for the gas.

Improved Ventilation of Railway Tunnels, ete. Joseph Dixon, New York city.-This improvement is more partieularly designed for underground railways, tunnels, etc, in cities where openings to the external air cannot be had without interfe-
rence with the surface traffic of the street, or without purchasing rence with the surface traffic of the street, or without purchasing
adjoining lands and using the same for ventilating shafts. It is pro adjoining lands and using the same for ventilating shafts. It is pro-
posed to divide the tunnels into sections of a mile, to place midway of these sections a suitable fan blower, connected by suction pipes, extending right and left into the tunnel, and to place partitions, by tion pipes, said partitions occupying the entire space crosswise of
tider of the tunnel; penaing the arrival of a train, said partitions to remain closed. The doors may be opened by an approaching train, and closed again immediately after the train has passed, by the train
itself operating suitable mechanism placed alongside the track. By itself operating suitable mechanism placed alongside the track. By
thus dividing the tunnel into sections, and placing the ventilating apparatus midway outside the tunnel, the fan withdraws the apparatus midway outside the tunnel, the fan withdraws the
foul air from, say, half a mile of tunnel on the left hand side, and at the same time, and by the same operation, it also acts in like
manner on the length of tunnel on the right hand side, and dismanner on the length of tunnel on the right hand side, and dis-
charges the foul air from both sections through a pipe of suitable charges the oposir from both sections through a pipe of suibable
size on the opposite side of the fan to the surface of the earth, and size on the opposite side of the fan to the surface of the earth, and

Improved Steam Engine for Rock Drills.
James Brandon, New York city.-Grooves in the steam chest are so arranged in connection with the grooves in the valve piston that,
when the slide valve is just over the steam ports, the small piston when the slide valve is just over the steam ports, the small piston in the steam chest and the groove in the valve piston will be just closed at the same time the groove of the steam chest passage will
be just opening. The steam passing will have full pressure until th be just opening. The steam passing will have full pressure until the
piston closes the passage by its own movement. Consequently the valre piston will still have the expansion of the steam to earry it

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ford, Pa, will be sent free for Two Dollars, with terms to Barry Capping Machine for Canning Establish For Sale, or to tet on Royalty-Canada Patent
(or Hanging Eave Troughs and conductor Pipes. Ad dress J. P. Abbott, Cleveleland, ohio
2 H.P. Engine for Sale. J.H.S., 158 South St.,N.Y Wanted a party to manufacture or , lease "Be--
dell's Patent Rapid Transit screw Wrench., Geo. P. Rowell \&\& ©., Advertising Agents, 41
Park Row, New York. Their business has grown to be something enormous. Every paper in the country is on
flic at their onice, and it is no uncommon thing for them filc at their onfice, and it it no uncommon thing for them
to receive $a$ mall of fiften or twenty bushels of newspaTo receive a mallo of fifteen or twe
pers.-[Norwalk (Conn.) Gazette.]
Wanted a Machinist who can act part of the time
as Draughtsman. Address A. B. C. Dexter, Jersey City,
 A. C. Tully \& Co., 55 Dey St., New York. Wanted-2d. hand Engine and Boiler, 60 to 8
horse tower. 85 ft. 3 in . shafting, and Rolling Machine horse power. 150 ft. 3 in. Shafting. and Rolling Machine
for tapering Springs. Must be in good condition. $\Delta d-1$ dress, with price, Ballard, Fast \& Co., Canton, Ohio.
Foot Lathes-Wm. E. Lewis, Cleveland, Ohio. $\underset{6 \mathrm{H} . \mathrm{P} ., \text { in good running order and complete. Send full }}{\text { Wanted }}$ description, make, how
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Second Hand Stean Engines, Pumps, and Iron-
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every descripton, apply to Reynolds \& Co, 145 East st., every descripton, a
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tabie Bath Co., 156 South st., New York City. Reynolds \& Co., 145 East St., New Haven, Conn.,
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burgh, Pa.
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dillug rock, sawing stone, and unning emery wheees,
diso File-cutting Machines. C. Vo. Nos St., N.Y. Pipe and Bolt Threeading Machines. Prices from
880 upwards. Address Empire Manufacturing Company, ${ }_{48}^{88 \text { upwards. Street, New York }}$
For best Bolt Cutter, at greatly reduced prices,
address H. B. Brown \& Co., 2s Whiney Avenue, New
American Metaline Co., 61 Warren St., N.Y. City. Grindstones, 2,000 tuns stock. Mitchell,Phila.,Pa.
Smail Tools and Gear Wheels for Models. Lis The "Scientific Amerncan" Office, Ne $=\mathrm{m}$ York, is

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Sinning Rings of a a
ville Spining Rerior Quality-WhitingsAll Fruit-can Tools, Ferracute W k's, Bridgton,N. J. For best Presses, Dies, and Fruit Can Tools, Biss

* Willame, cor. of Plymouth and Jay, Brooklyn, N. Y . For Solid Emery Whels and Machinery, send
che Union Stone Co., Boston, Mass., for circular. Hydraulic Presses and Jacks, new and seond
oand. Latnes and Machncry for Pollsting and Bulting
Metals. For $13,15,16$ and 18 inch Swing Engine Lathes, Single, Double and Triple Tenoning Machines
superior construction. Martin Buck, Lebanon, N. H.


## \%

R. W. J. will find a formula for proportion ing safety valves on p. 363, vol. 29.-J. F. can blue
steel by the method described on p. 123, vol. 31.J. S. will find that bronzing on iron is described on p. 283, vol. 31 .
(1) J. A. M. asks : Can I magnetize cast iron? A. Yes, temporarily, by enclosing
wire helix traversed by an electric current.
(2) S. L. asks:1. Do you think that a young Trish retriever could be broken of the habit of
running away when a gun is discharged? A. Tak your dog to a pigeon or shooting match, and gradually approach the shooters with your pet, and
encourage him. Most dogs can be broken of gun hyness in this way, but some of them can neve be cured. 2. Please give me the name of some
handbook on training dogs for the field. A. The best book ever published on the sporting dog is
"The Dog," by Mayhew, Dinks, and Hutchinson; t is published by Orange Judd \& Co., 245 Broadway, N. Y.
(3) W. C. asks: Is a building, having lightning rod which is formed of a copper pipe or
tube laid flat on the roof and fastened with small strips of zinc to the roof and walls of the building, perfectly safe during a storm? A. The
above method of attachment of the rod to the above method of attachment of the rod to the
building is correct. But the main thing pertainin to the use of a lightning rod is to have the rod properly connected with the earth. The bottom of the rod, in the earth, must be greatly enlarged, either by baving the rod extended underground for
long distance, or by connecting the rod with iro water pipes or iron drain pipes in the ground, or by placing the bottom of the rod in contact with a large mass of charcoal, which may be laid in a trench. No building is safe if the rod is merely
stuck down a few feet into the dry earth. This is stuck down a few feet into the dry earth. This is
the common plan, but it is unsafe. Safety can the common plan, but it is unsafe. Safety can
only be secured by having an extensive mass of only be secured by having an extensive mass of
good conducting material at the bottom of the od, in the earth.
(4) T. S. and others ask: How is transfer or indelible paper made, for marking clothing?
A. The paper is probably saturated with a solution A. The paper is probably saturated with a solution
of bichromate of potash, logwood, and a little carbonized sirup.
(5) D.G. S. asks: Will a cosmorama lens of 36 inches focus do for the object glass of a tele-
scope which I think of constructing, combined with an eyepiece of $1 / 2$ inch focus? A. A common lens will not do at all for the object glass of a telescope, as it gives too defective an image. You
must consider that the image has to be enlarged by the eyepiece, which will enlarge all defects also. For a telescopic objective, it is imperatively neces-
sary to have an achromatic lens made of a crown glass bi-convex lens, and a correcting plano convex lens of flint glass.
How can I obtain
Pour diluted sulphuric acid hydrogen? A Pour diluted sulphuric acid
or on sulphuret of antimony
(6) A. B. says: I made a magnetic needle out of a rat-tail file; and while polishing it upon moving bodies upon it. Having no point ready, I stuck it upon a sharp pointed lead pencil and held it in front of one of the emery wheels. It in-
stantly began to revolve at about 200 to 250 revolutions per minute, running from right to left. I thought it was the current of air striking it, and
held the needle on the other side of the wheel. It held the needle on the other side of the wheel. It
instantly checked its motion, and started in the opposite direction. In this position, the air would
strike it in the reverse of the first position. To fur ther prove it I held it opposite the wheel on the
other end of the shaft; and to my surprise it other end of the shaft; and to my surprise it
stopped and started revolving in the same direction. It was not produced by air currents. Held
between the two wheels, it also revolved between the two wheels, it also revolved. To
further prove is, I placed it upon a pin and cork, putting it in an iron pan so that all currents of air would strike the bottom of the pan: and it still revolved, but at reduced speed. I came to this con-
clusion : Each wheel has a north and south pole, and the north pole of one wheel is opposite to south of the other. It may be that, when in mo-
tion, one wheel forms a north pole and the other a south. The wheels have iron arms filled with
wood segments, and are covered with leather and
emery. Please explain the cause. A. Probably
the wheels contain some residual magnetism, and one side is positively and the other negatively polarized. If the wheels are made of cast iron, this
might readily be the case.
(7) C. C. P. asks : 1. Will leather scraps, ground down nearly to a powder, be of value as a ertilizer? A. Yes. 2. Are freshly ground bone
(8) J. C. asks: I have a piece of penuin moss agate which I would like to cut up in smal pieces. How can I do this? A. Agates are cut by means of a small copper disk on a lathe, fed with neans of a grindstone of a hard reddish sindstone, soft wood, moistened and imbued with a fine pow der of hard red tripoli.
(9) W. S. \& S. say: We wish to make a siphon and draw the water from a well $5: 3$ feet dee with 75 feet fall. Can we form a vacuum and
tart the water running? A. The water could not start the water running? A. The water could not
be induced to rise out of the well without other be induced to rise out of the well without othe
aid than the mere pressure of the atmosphere.
(10) H. B. B. asks : Is there any cement aint that would answer for lining a cistern to con ain vinegar, that would not be destroyed by the acter are sometimes coated with melted rosin. Is the refuse of the blacksmith's forge and fur nace beneficial to fruit trees? A. It has been r
commended for this purpose. Give it a trial.
(11) J. M. T. asks: Can you give me a process for cleansing the dark color from steel blades after cutting
this purpose.
(12) F. N. asks: 1. How can I fix colors on aoutchonc or on gutta percha? A. Caoutchouc is probably lettered with rubber solution while it is stretchea, the coloring matter immediately dust d over it, and the whole allowed to dry. 2. Ho he edges? A. By means of a caoutchouc solution naphtha.
(13) P. B. asks : I have a portrait that is be ing destroyed by cracking and scaling off of the hose who profess to know, to the picture's bein varnished before the paint was perfectly dry. Is there any remedy for it? A. W
anything except revarnishing.
(14) J. S. asks: Will the residue of su huric acid and carbonate of soda, or marble
dust, after having been used in the manufacture of soda water, be of value for manure? How should it be prepared? A. The excess of sulphuric acid can be completely neutralized by limestone,
and the dried residue used as gypsum. Or caland the dried residue used as gypsum. Or cal-
cined bones can be employed, and a mixture of he sulphate and acid phosphate of lime produce
(15) A. B. G. asks: I want to color glass fo antern slides. How shall I proceed, so as to show any or all the colors of the spectrum in the screen ?
A. The aniline colors are mostly used for this purpose on a surface prepared with albumen or som ite shades of fineness and, for this purpose, are $r$ markably soft and rich in tone. See p. 390, vol. 30 .
(16) J. C. G. asks: What is the reason that irst? A. The crop multiplies itself by scattering ts own seed in the fall. This, in the spring, take he last year's growth which has decartion of which now acts as manure.
What is a good work on
(17) J. W. K. asks: Can artesian wells
(17) J. W. K. asks: Can artesian wells
bored here, in Eastern Virginia? A. Yes. 1. How can I mount pictures? A. You do not state whether the pictures were on canvas or
paper, also whether they are oil paintings, prints, or photographs. 2. What preparation is used to obviate the necessity of glass? A. Varnish is used
for thispurpose. 3. What is the origin of the word for thispurpose. 3. What is the origin of the word
"remontant," and its meaning? A. It is a French word. Le remontant=the belt strap or belly ban of harness.
(18) R K. says: I have a fine hop vine; but hem with so as not to injure the vine? A. Place under the vine a dish eontaining a small quantity of ignited charcoal: throw upon the coals a quan tity of sulphur, and. if necessary, move the dis so that the ascending vapor may temporarily su
round each twig and leaf. This is the most effec
(19) M A. B asks: What is the rule for cal culating the variation in an aneroid barometer caused by high or low temperature? A. The only a slight one for temperature, detected experiment ally thus: Observe carefully its indication at any moment in the extcrnal air; remove it immediate Iy before a fire, and heat it until the thermometer
on the dial shall reach $100^{\circ}$; then notice the variation of the hand; this variation, divided by the number of degrees through which the thermometer has moved, will give you the correction, wheth er in defect or excess, io be applied for each de .
(20) W. B. asks: 1. What metal is least 1 i ng iron? A. Copper or iron. 2. Is there any me tal or substance that will not tin, and yet will stand the heat of the iron and be not liable to
break? A. We do not know of any such metal.
(21) G. M. G. says: 1. I am making ink composed of nut galls, gum senegal, sulphate of iron, first applied, it is a pale purple and slowly turn intensely black. What can I use to make it black when first applied ? A. Replace the ammonia and
alcohol by a little alum. This we think would
make a decided improvement. The addition of logwood to the ink would have the effect of ren dering it black when first used, but such ink is much more liable to fade and corrode the pens. 2. Can you give me a cheaper and a better recipe
than the above? A. Take 1 oz. extract of log wood; pour over it 2 quarts boiling water, and when; pour over it 2 quarts, boiling water, and chromate of potassa. This is an excellent blu black ink, docs not fade, and, as it contains no for about 25 ceely from the pen. It can be made is to contain any of this ink, it must be thoroughl cleansed, as ordinary iron ink decompo
(22) D. W. U. says : I wish to know how to the fairs as uring 4 and 5 inches in circumference. $A$. The fruit may be preserved in many ways. One of the simplest methods is that of immersion in some so lution of strong antiseptic properties, such as sali cylic acid. To retain the natural color of the fruit for any length of time, however, is something photographs of your mammoth fruit as soon a
(23) C. M. asks: 1. What effect will dis colving blue stone in water, in which iron is to be
cased, have? A. First polish the meta and then place it in a sand bath until the desired color is obtained, then plunge into water. The ad hity orv to 1 triol to the in mersed in to what preparation is the that when put on casehardened work,will give it the fin glossy appearance that the fine English guns have A. Try the following varnish as a lacquer : Gum
sandarac 8 ozs., pounded mastic 2 ozs., clear tur pentine $21 / 2$ ozs., pounded glass 4 ozs., pure alcoho Mix and dissolve.
(24) J. H. M. asks: What will absorb the ammonia, generated by the urine, etc., of horses
in a stable? A. Sprinkle the floor and stalls with dry clay, which has a powerfully absorbent action uponammoniacal vapors.
(25) W. H. P. asks: What acid is in rhu barb? Can it be extracted and concentrated, and
how? A. The juice of the rhubarb contains ox alic, citric, and male of the rhubarb contains ox siderable quantity. We hardly think the plant ca be utilized for lemonade, because of its characte stic purgative properties. The most objectiona great part by chloride of calcium
(26) H. J. E. asks: Do all kinds of iron crys How is good mortar made? A. The lime ought to be pure, completely free from carbonic acid,
and in the state of a very fine powder; the sand hould be free from clay, partly in thestate of fin and and partly gravel; the water should be pur nd, if previously saturated with lime, so muc the better. The best proportions are tbree par of quicklime recently slaked, and as little wate as possible. There should always be enough wa ter added at first; if water is added after slaking has begun, it will be chilled and themortar lumpy The addition of burnt bones improves mortar b in drying.
Is the casting of small brass or iron articles mooth and without flaws considered as one of the
lost arts? A. It is not; at present it is by有 What is civilization? A. Civilization mainl onsists in intellectual development, culture, an
(27) J. C. H. asks: How can I make th hardest alloy that melts below a red
Melt together 2 lbs. copper and 1 lb . tin.
(28) W.H. Jr. says: I have separated iodine romiodide of potassium by passing chlorine ga made by the action of sulphuric acid upon calciun chloride. I now find that the solution of iodin one ions be of ham chloriae. How the iodine be separated from it? A. It may be
separated by distillation over a slow fire; but the separated by distillation over a slow fire; but the
(29) C. S. R. asks: What composition can be molded, either under pressure or otherwise,
have a hard, smooth surface, and not be brittle nor liable to warp? A. Many metallic alloys, we
think, would answer your purpose. See p. 11, ol. 31.
(30) S. E. M. asks : 1 . Will the common gold fish spawn in a tank that holds 30 gallons water? A See pp. 36, 102, vol. 30, and p. 29, vol. 22. 2. What ind of plants will grow best on the bottom of the lakes and streams.
(31) R. B. R. asks: Suppose a suitable tur bine wheel to be driven by a certain fixed quantity tcam, the apparatus being so arranged as to us the same water over and over again, such a quantity of water to be supplied only as will mak expausively : would such a motor be economical A. It would be much more economical to use the steam in a well designed steam engine.
(32) F. H. B. asks: 1. Will good plumbago used in the cylinder of a new engine, be of ser vice to prevent cutting? A. A true bore of cylin
der and well fitted rings are the best preventives. It ought not to be necessary to use plumbago in new cylinder. 2. Is there anything in the mixture that makes some more liable to cut than others? A. Care is necessary in mixing the iron, to produ
(33) W. asks: If I have a steam yacht for
my own pleasure on the Mississipoi river, would I have to get a license for her, and would I need licensed engineer and pilot? A. Yes.
(34) T. S. W. says: A firm recently ordered a machine for making ice, and secured onc of the
following dimeusions: Boiler 4 feet 6 inches $x$ feet diameter, with 8 two inch iron flues; cylinder
$4 \times 12$ inches.
Directions for use 4x12 inches. Directions for use: Raisisc stecem to
50 Ibs., and run the machine at 1200 revolutions. 50 Ibs., and run the machine at 120 revolutions.
Good wood was first used, and afterward coal and osin; but after a few revolutions stcam woul
run down to 30 lbs., which was not sulficient un down to 30 lbs., which was not sulficicnt t
drive the machine.
Reporting that the boiler was not large enough, or there was not sufficient heating surfacee, they reecived two iron blocks to be
put, one in each end of cylinder, so as to reduce put, one in each end of cylinder, so as to reduce
the stroke to 8 inches, and a new crank to suit the stroke to 8 inches, and a new crank to suit
this stroke, with a coil of lead pipe to be placed in water tank t through which to exhaust. The exThe makers of the machine claimed that the boiler was large ennugh, yet sent the extra pieces, the wastinge in of which would make exerrything work
all right. Please to give your opinion. A. The oiler was too small.
(35) W. M. J. says: J. R. W. (vol. 32, No.
24, June 12) must have something wrong in the 24 , June 12) must have something wrong in the
setting of his boiler or with his engine. I thiuk it is in the valve; for it is certain that he should run his $8 \times 16$ engiae and do all it could possibly do
on from 3 to 1 cord of wood. It is certain that a good return tubular boiler will save at least half the fuel used by a two flue boiler. A. We would
be glad to receive some facts in corroboration of (36) J. C. G. says: I am 19 years of age.
my occupation is that of a stationary cngine My occupation is that of a stationary engine
driver. I have a good Englisi education, and am considered very good in mathematics. Mechani-
cal engineering is the only business I care for or
think machine shop to learn the trade ; butt owing to de pression in business, , have not succeeded. Would
it be best for me to enter a shop or a scientific school? Will I be prepared to superintend the construction and designing of engines by such knowledre as I I could gain in such a school? A. It
is very desirable to get such
fodvantages as are afforded by the eorurse of a good school of mechanical engineering, such as the Stevens Institute, Ho-
boken, N. J., the Massachusetts Institute of Technology, Boston, Mass., or Cornell University, Ithaca, N. Y. When one graduates from such a school, he has learned how to study, and has also
acquired a great deal of practical experience, in accuired a great deal of practical experience, in
addition to a knowledge of the fundamental prinaddition to a knowledge of the fundamental prin-
ciples and methods of the engineering profession.
(37) D. L. B. asks: 1. Would a soiid iron bar sink in the ocean in the deepest part, or would it
floatat a depth where the amount of water, displaced by the bar, would be equal in weight with the bar? A. It would diloat under the conditions
stated. 2. At what depth would the water be of stated. 2. At what depth would the water be of
such a density? A. We cannot tell you, as experiments have not been sufficiently extended.
(38) E. F. M. asks: Can rubber belts be renewed A. No.
boards go in, or where they come out? A . Where they go in.
what glue
What glue is best for cementing leather belt
ends together? ends together? A. Use marine glue,
percha dissolved in bisulphide of carbon. Can brass in small quantities be meltedin an iron ladale in a common blacksmith's forge? A.
It will be better to use a crucible made of clay or It will be better to use a crucible made of clay or
plumbago. plumbaro.
How are
How are plaster of Paris molds made? A.They
are cast over the pattern (39) Z. W. B. says: 1 . I have a small steam engine How mand that cuts off at half stroke. How can I change it to make it cut off at $3 /$
stroke? The valve is a plain slide valve. $A$. You
must lengthenit and incresse the trave. must lengthenit and increase the travel. . . Is a
$3 / 4$ circular safety valve large enough for a return 34 circular safety valve large enough for a return
tubular boiler $24 \times 36$ inches with fifteen $23 /$ inch tubular boiler $24 \times 33$ inches with fifteen $23 \%$ inch
tubes 36 inches 1 long, and a heatings surface of 45
(40) H. D. \&
(40) H. D. \& Co. say : 1. We are running a
400 horse power engine at 75 lbs. pressure. City 400 horse power engine at 75 lbs . pressure. City
water is very expensive, and artesian is very hard. Is it feasible for us to condense our steam, or a large part of it, by currents of air? Has ayy,
trivance of that sort ever been perfected? Trivance of that sort ever been perfected? A.
There have been a nuber of plans proposed for
condensing steam without the use of water, but condensing steam without the use of water, but
we do not know of any that are in practical operation. There is, of course, no dificiculty in arrang-
ing such a device, if itis made large enough. 2 . Is ing such a device, if itis made large enough. 2. Is
it of any use to try to clear hard water by raising its temperature under pressure above $2120^{\circ}$ before entering the boiler, thus reducing the boilier scale?
A. 'This treatment removes some of the inpurites, and is generally found to be of great advantage. (41) W. H. H. asks: I do the street sprinkling in our city, and force salt water 1,200 feet
through a 4 inch pipe up a rise of 75 feet. $I$ use a $t$ inch stam pump, and 6 inch wate. ry cysinder a
with 12 inches stroke. I require 60 gallons a minwith 12 inches stroke. I require 60 gallons a min-
ute ; my pipe has $\check{5}$ elbows. I hire stean and take ute; my pipe has 5 e elbows. I hire steun and take
it 200 feet thrinugh a w well protected pive. A disdo the above work, and it is arreed to leave the question to you? A. It would be necessary to
make a test, in order to settle this question. From the data sent, we could only make a guess. (42) L. S. asks: Who was the first inventor
of the locomotive? A. The first locomotive was built by a Frenchman named Cugno
How long a picee is used in testing rope? A long. has a mud drum, by blowing out at drum ; the
mud would not all come out unless I took the
drum head off. Much mud has also settled between the bottom flues, around the drum. We
the
have inserted rods through the drum have inserted rods through the drum, and also
hrough plurs in smoke nuch good. We have also tried a strong stream of water, but to no elfect. Can you give some good
advice? A. Try the plan of hauling the fire at advice? A. Try the plan of hauling the fire at
night, and letting the water remain in the boiler night, and lettiny the water remain in the boiler
until it is quite cool. That may soften the mud, (43) H. A. A. says: I am using an engin which throws out much fire. What is the best ca
oprevent this? A. You can purchase a spark a rester similiar to those used on locomotives. Fre-
to quently y apicee of wire coloth, placedod over. the
of the smoke stack, will remedy the trouble.
(44) C. E. B. says: In a boiler (say a rec
tangular one) filled partly with water ard partly with steam, is the same pressure exerted on th bottom as at the top? If not, is the pressure
greater on the top or on the bottom? What is the proportional difference, and would the propor
tion vary with the temperatw tortion, if any, would the pressures vary as the temperaure, and in what pro
port volume of the steam and water might be respec tively changed? A. At the top of the boiler you
have the pressure of the steam: at the bottom the pressure of the steam, increased by the weight of
the water and the steam. Suppose, for example, the weight of water in a boiler is such asto bring tom of the boiler. If, now, steam is raised in the boiler untilits pressure is 40 lbs . per square inch, he pressise per square inch at the top of the boier is 40 lbs., and at the bottom 41 lbs.
(45) T. G. W. asks: What is superheating steam? What temperature and other conditions
vill produce superheated steam? A. Superheate team is steam having a higher temperature than is due to the pressure. To superheat it, it is only
necessary to let it pass through heated pipes 0 vessels having a high temperature, and in this this
vest
(46) C. C. says: I enclose you some facts in regard to our engine: Cylinder is $14 \times 20$, steam indicator shows 23 lbs. mean pressure, exhausts into a feed heater. Power is $451 / 2$ horse. Running at co lbs. boiler pressure (vacuum gage showing 24
lbs.) , revolutions 120, cut-off at $1 / 8$ stroke, showing 9 bs. mean pressure, and 9 lbs. menn vacuum, she hows stcam 35 horse power, and vacuum 17 , to
tal 52 horse power. The engine (high pressure) tal 2 horse power. The engine (high pressure) has
been changed to a condensing, and the indicator ardsand other particulars were taken before the
alteration and after respectively duced 33,000 lbs. a month by the change. The wo was about the same; if there were any difference, it was more in the last case. Coal used was slack or
fine soft coal in both cases. A. This is a very good inne soft coal in both cases. A. This isa very good
illustration of the gain from condensers, and will, doubtless, be interesting to all steam users. W send us obliged to our correspondent if he wou change, the original cost of the engine, and the cost of attaching the condenser
(47) O. C. M. asks: How can I make a mold or zinc castings, so as not to have airholes in
them? I want to make a small engine, $212 \times \mathrm{x} 4$ inch es stroke, of zinc. A. Use a brass mold made
(48) C. W. S. says: We have a railroad locomotive that we are using to run a sawmill with;
her dimensions are: Two cylinders 10x16, running her dimensions are: Two cylinders 10x10, running
at 120 revolutions per minute at 12 revoutions per minute. Boiler has 120 cop-
per tubes 8 feet longx11/s inches diameter ; fire box is 3 feet deep, 3 feet wide, 26 inches long, open on on bottom. Wishing to burn sawd 1st, we constructed a firebrick fireplace underneath and
opening up into the firebox of boiler. The fireplace is built of firebrick something after the form of tanners' ovens. It is 7 feet long, 51
inches wide, and 3 feet deep. We have not dratt enough to take the'heat through the flues; our The fireplace makes a quantity of smoke which is very black and seems to clog in the firebox. We
connot cannot make enough steam, but we can make heat
enough in the fireplace, if we could draw it through the flues. Do you think a blower would
answer? A. A blower or stam jet would proba answer? A. A blower or steam jet would proba-
bly be of some service. For dimensions, it would be best for you to addressa manufacturer.
(49) M. A. O. says: I wish to make a vess for household use, and in its construction I will
have to use a piece of brass or copper, 2 inches square, in a vessel to hold 1 quart. Would there be any fear from corrosion if the vessel was not
cleaned properly every time it was in use? It is cleaned properly every time it was in use? It is
to be used for milk, vinegar, etc. Would copper be better than brass? A. Both copper and brass
(50) C. P V as
 quired for a canera obscura, to take a picture 8
inches
Thure at a distance of $1 / 4$ of a mile? The distance at which a piecture is to be taken and
its size do not depend on the size of the lens, hut on its focal length, which is determined by its curthe focal length of lens must be at least 12 inches If the scene is so far ofl that there are too many objects in the picture of 8 inches square, and the detais are too small,you must take a lens of longer focus, whic is mocal length; it will also make
portion to it portion to its focal length; it will also make a large
picture if needed, but a small one just as well. As a larger lens admits so ore light, it will require less time to make the picture than a small lens, which of course admits less light. In any case it is well or use a diaphragm placed about 2 inches in front of the lens; this makes the picture sharper, but protracts the time necessary for taking it. penin
not reduce the size, even if you make the opening
(51) W. D. M. asks: Is there any one man Who can turn 80,100 or or 140 feet of 2 or $21 / 2 \mathrm{inch}$
hafting on any machine in one day of 10 hours . Yes, with a special tool.
(52) J. B. P. asks: What are the objections o the following plan for running street cars? Use all the available space in the bottom, sides, and
op of car as a reservoir for compressed air,which op of car as a reservoir for compressed air,which
is to be supplied to the cars at street crossings from a pipe or air main, laid along the tank and be
neath the surface. The pipe is to connect with eath the surfac. Yhe ph and the pressure kept up with air pumps run by stationary steam en gines or other power. The car driver could con-
neet and reeeveve his supply while passengers were nect and reeeleve his supply while passengers were
ehanging at street crossings. With a sufficient ca changing at street crossings. With a sufficient cal
pacity and pressure to start with, the car would un severalsquares without being replenished, an
night draw another car. The air main should b of a sufficienteapaity to wod friction in tha b of air, and to supply the cars quickly. ould hardy form an opinion without having more data. We believe the difficulties of this form of motive power have been with the arrangement for compressing the air, and its cooling effect whe used in the engine. A great many inventors have
turned their attention to this subject, but so far we have not
plete sucesss.
(53) C. P. L. asks: Please give me a recipe Helt together in an iron vessel equal parts of common pitch and gutta percha.
(54) C. G. asks: How can I make large lumps out of small bits of sal ammoniac? A.
Dissolve in water, and allow to crystalize slowly y evaporation.
How can I make cheap liquid manure for young plants on poor ground? A. Fill a large barre
with old rotten manure fill with water, allow to stand one week, and draw off as required.
How can I magnetize knife blades on a Ton Thumb telegraph apparatus? A. While the current is passing, place the midale of the knife on
one of the poles of the magnet (taking care not to et it touch the other pole) and gradually move the blade along from the middle towards one end ore the same pole in the same direction.
(55) E. E. says: I have a cistern which leaks nd brickwork. Can I put on new cement the old, and make the cistern tight, or must I remove the old before putting on the new? How
would it do to cement on the outside of the cisern? Would it stop the water from coming through? A. Remove all water from it and get it as dry as possible ; then put on a good coat of
Portland cement in clean sharp sand, and give it time to set before you put water into it. After it becomes hard, let the water into it, and you ough then to have a tight cistern.
(56) C. W.S. asks: Is it practicable to make na use a light carriage on common roads, prohorse power engine and boiler be made (of iron steel, or other metal) sufficiently strong, light, du pel a light carriage to carry one or two persons common roads? A. We believe there are no seri ous difficulties in the way of designing such a machine. steam road rollers, traction engines, and work more economically than it can be accom plished by animal power
(57) E. N. B. asks: Will you tell me how fast to run a $1 / 4$ inch twist drill to drill iron? A.A
(58) C. S. F. says: During the late spring we planted some tomato and radish seed. The
seeds were placed in two cups with a solution of chloride of lime. The water in the tomato cup roze solid, while the radish seed did not freeze tu Why did not the radish freeze? A. It was due to a difference in the amount of cooling in the two vessels, dependent upon some undetected difference the surroundings of the two vessels, the thic ness of the glasses, or some similar cause,
What is the address of the Stevens In
Technolog and is it a frec university? 4 . boken, N. J. It is free only to poor students wh have distinguished themselves for great merit. 1. What can I use to gum pressed leaves and flowers into an herbarium, so as not to curl and stain
the pages. or discolor the flowers or leaves? the pages. or discolor the flowers or leaves? A.
Try pure gum arabic. 2 . Whatcan I put on leaves Try pure gum arabic. 2. Whatcan $I$ put on leaves
or flowers to make them retain their color when flowers to make them
pressed? A. Copal varnish.
(59) M. T. J. asks: What is the best com-
(60) N. F. B. says: We have recently heard it asserted by one of our manufacturers that it
was more profitable, or fully as much so, to pump fresh water into boilers for the purpose of making steam as it is to allow the hot condensation water
to be returned to the boilers. He contends that water once made into steam loses in a measure it and that fully as much or more fuel is required than if allowed to run off and fresh water is used. We have our pipes so arranged that the steam, which is used for heating purposes, passes from
the boilers, and the condenstion water retuns the boilers, and the condensation water returns
directly back again without contact with the air, vitality of the water (if lost) be restored by pump ing air in with it, or allowing the water to be exposed to the air before going again into the boiler?
A. We think that your present arrangement will answer as well as any other. It is true that water which contains no air acts differently when heated
from the water ordinarily used in boilers, but we from the water ordinarily used in boilers, but $w$
ific heat is much different. Besides, it is exceedngly doubtful whether your condensed water is
entirely free from air. The United States Conn mission on steam boiler explosions intend to make
some experiments on airless water, if they do not some experiments on airless water, if they do no
ake up the time till cold weather in gettingready take up the time till cold
as they did last season.
(6!) C. L. K. asks: Water in shallow vessels put into a cellar will prevent vegetables from reezing. I have seen ice freeze to two inches
thick in one night, and potatoes remain unfrozen by the side of the vessel in which the water was. 4. It is true that water in melting gives out a large mount of latent heat ; but the question is wheth re, under the circumstances mentioned, the pcta
oes might still have remained unfrozen, the wa toes might still ter being absent.
(62) D. H. S. asks : How can I cleanse a wel which has become foul, the water being impreg if possible, and have it cleaned out. Then pump much water from it as you can every day for yet good, keep exhausting the water until thor oughly washed out, and the water becomes pure.
(63) B. \& G. H. ask : How can we make a rost-proof house? A. The outside wall may be inches thick and the inside wall 4 inches. the
walls tied together with iron anchors or with brick viths. Sawdust is sometimes used for filling; an sometimes the air alone, when unventilated, is
considered a sufficient non-conductor of caloric considered a
without filling.
(61) K. K. K. says: I have a number of fish globes and aquaria. I use well water drawn with
an iron pump. Occasionally I notice that the wa ter in some particular aquarium or globe has in others treated in the same way. What is th cause, and how can this beautiful effect be with ertainty obtained? A. The clear water is fre Iltered well water be suitable to replenish aqua ria? A. No. 3. What is a good cement for aqua ia? A. Put an egg-cup-ful of oil and 4 ozs. tar
to 1 lb . rosin: melt over a gentle fire. Pour the ement in a heated state, but not boiling hot, int the angles. The cement will be firm in a few min ates.
ure clay and a fine-grained clear sand or calcine flints, mixed with crushed pottery, made into a
paste, in which state it is molded, dried slowly in he air, and then in a kiln until of the hardness of
(65) S. A. S. asks: What will make a good ux for brass? I am melting up a good deal of
old scrap and sometimes use glass for a flux, but old scrap and sometimes use glass for a flux, but
it makes the brass too hard. A. Glass is a good (66) J. W. asks: Can a small achromatic ens one inch in diameter be used to correct large one of crown glass, say from 6 to used to correct one more than twice as large of rown glass by placing it half way in the tube, and
(67) R. L. asks: 1. Ihave good lenses for inch achromatic astrononical telescope. The Huch object lens is of $42 / 2$ inches focus, and the Huyghenian eyepieces are of $3 / 4$ to $\frac{1}{5}$ inch focand
How long should the main 3 inch tube be, and how long should the sliding focus tube be? A The main tube should be 40 inches, and the ocus tubes or 10 inches long. 2. What is the best man silver is the best material for the sliding tube,
and wood for the large tube. Paper, well varnished, is also good. 3. Where should the dia shragm, if any, be placed? A. One diaphragm eye picce, between the lenses. Another diaphragm should be placed in front (outside) of the 3 inch lens, iu case the image is not sharp; and it is well to have several of them, and
(68) J. S. asks: 1. How are chilled iron rolls used for rolling in paper mills, made? A. The
are chilled in the mold. 2. How are they turned and what is the shape of the tool? A. We have heard that a wrought iron tool is made, of ordi it in a chill.
(69) H. L. A. C. asks: How is it that the moons of Jupiter can be so plainly distinguished they are invisible to the naked eye? A. You do not see in an ordinary looking glass the moons of
Jupiter, but the planet itself is made visible ral times by the repeated reflection of the upper and under surfaces of the glass. For proof : First bligue reflection, and the supposed moons will go further apart. Secondly, let the mirror be nearl sition of the nen lay it horizontall, and the plane of reflection. Thirdly, watch the of the moons in the mirror every night; and if you place it in the same position, they will neve change their positions as the real moons do Fourthly, compare the position of the supposed moons seen in the telescorpe,and you will find the very different. Fifthly, look at Venus or Mars, or even a bright button, in the same way, by help of moons as you suppose Jupiter does, and in exacty the same position. Sixthly, take mirrors of different kinds of glass, and each mirror will show
different positions and different numbers of moons: with some mirrors, you may see six and even more moons near to Venus.
(70) J. B. N. and others.-The potato is a Sir Walter Raleigh introduced it there, after his
(71) W. \& R. ask: What is a good and chea
ointment or varnish to prevert rust on polishe ointment or varnish to prevent rust on polishe iron and steel exposed to dampness, or to a se known a procoss whieh faciiitates the union of cessity of pouring the iron very obt and in large quantities, as now generally done, to the frequent injury of the steel? A. Dry the mold and cast
endways.
(72) J. H. W. says: A drop of turpentine n a grain of cblorate of potash, with the addition of a drop of strong sulphuric acid, produces im by the mixture of any solids? A. Sugar may be ade to replace the turpentine in this experiment but there is nothing that will replace the oil of $\mathbf{v}$, and this is not a pleasant substance to handle.

1. Ganot's "Physics" states: "For physiologica or ehemical effects, the wires on the bobbins (of a magneto-electrical machine) should be fine, and
each from 500 to 600 yards long. For physical ef ects, on the contrary, they should be thick, and only from 25 to 35 yards in length." I want to produce the longest spark; which arrangement ther portions of the machine being similar, will accomplish my object? A. The fiue wire will pro duce a current of the highest tension, and conse-
quently the longest spark. 2. Can I increase the quently the longest spark. 2. Can I increase the above machines (constricted for medicinal pur poses) through an induction coil, or would such an arrangement only add to the resistance? A. It is gifte that the inducing current in a ruhm current referred to in the quantity; and as the not possess this essential attribute, it is useless $f$ his purpose.
2. Does mercury evaporate ? A. Yes. 2. Whic
would be more durable as a valve seal, subjec only to climatic changes of temperature, mercur or glycerin, the seal being in a position difficult o access for adjustment or inspection? A.Although both have objectionable features, the mercur I wish to construct a small but powerful battery to be placed in a position difficult of access, but arranged with cord and pulley in such a way that can lift the electrodes out of solution when no in use, and produce strong electric action immediately on replacing them. Under such conditions, wish to The battery will not beused be most ave or six times in a day, and then for only a few seconds. What form would best answer the purpose? A. Arrange a number of large plates of lic and carbon alternately, and connect for quan ity, that is, all the zincs together to form on ole, and all the carbons to form the other. Place olution consisting of one part by weight of bit hromate of potash in ten parts of hot water aud five parts of oil of vitriol. The plates are readily rranged so as to be lifted together out of the solu

Minerals, etc.-Specimens have been re eived from the following correspondents, and examined, with the results stated:
E. B.-It is clay with yellow ocher; it contain -All the specimens are oxide of iron, except N . , whigh is asphalt.-P. D.-They are cubical crystals of iron pyrites.-J. T. W.-Siver was not de ected in the sample forwarded. It would be ne cassary to take a larger sample to subject it to late, with a small pere ter. Not valuable.-F. H. F.-It is wulferite or molybdate of lead, and contains 51 per cent lead 39 per cent molybdic acid.-D. L. - No. 1 is ock containing sand, clay, and oxide of iron. lay.-C. H. W. Jr.-No. 1 is quartz with lay.-C. H. W.Jr.-No. 1 is quartz with carbonate olds a considerable amount of oxide of ion in solution, which on contact with the air is separaed, and gives the iron stains shown on your paper. It is probable that the water is impregnate with matter from a cesspool, as it contains a larg

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific Ambrican ac
knowledges, with much pleasure, the receipt o original papers and contributions upon the follow ing subjects
On the Use of Superphosphates. By T. B. S. By J. S. On Astronomy. By J. R.
On the Potato Bug. By J. C. On a Cold Water Engine. By R. J. W. Alsoinquiries and answers from the following: A. F. K.-N. H. W.-J. C. T.-R. J.-N. F. R.-A. N.

- J. T. B. - R. H. S. - J. F. W.

HINTS TO CORRESPONDENTS. Correspondents whose inquiries fail to appear may conclude that, for or may concluae that, for goo reasons, the Eadtor
declines them. The address of the writer should Enays be given.
Enquiries relating to patents, or to the patenta published here. All such questions, when not be only are given, are thrown into the waste basket, as it would fill half of our paper to print them all, but we generally take pleasure in answering briefly by mail, if the writer's address is given.
Hundreds of inquiries analogous to the following re sent: "Who sells sundials? Where can sal cylic acid be obtained? Where are small printing bottoms?', All such personal inquiries are print od, as will be observed, in the column of " Business
and Personal," which is specially set apart for that purpose, subject to the charge mentioned at formation that colhis. Almost any desired in tained.

## [OFFICIAL.

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poke. June $18,1875$. Broom handle painting machine. June 15, 1875. 4,839.-J. H. Myers, R
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ing docks and pontoons. June 15, 1875.
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4.853.-E. R. Stockwell, Theresa, N. Y., U. S. Slat Iron for carriage top. June 15, 1875 .
4,85.-I. F. Donoghue, Springifid, Mass., U. S. Ant1incrustation battery for bofler. Junc 15, 1875 .
4,855.-W. Griffith, Toronto, Ont. Lever mortise lock. June 15, 1875.
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 shect metal screw-threaded collars. June 15, 1875 . shoe tip. June 15, 1875 . matic chaff carrier. June 15, 1875.
4,860.-D. Lister, Toronto, Ont. Welding process and composition. June 15, 1875 .
$4,861 .-$ L. Brush, Buffalo, N. Y., U. S. Passage ticket. June 15, 1875.
4,862.- E. McMullen, Montreal, P. Q. Manufacturing
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4,863.-W. N. Whiteley, Springfield, O., U. S. Mower
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and reaper. June 15, 1875 .

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relative to the dispusal of the patent for which will be found in the following lines. The idea of the invention to utilize the Jarring and oselllating motion of the cars to agitate dashers in cream receptacles placed below the looring of the vehicles axd between the sets of trucks, as represented in the engraving, in which three boxes are
shown on the car. The dasher is merely suspended by springs in a way that will be readily understood from the


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