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

## COMBINATION ICE AND FREEZING HOUSE.

 We recently illustrated a novel plan for manufacturing ice (see page 54 . Vol. XXXI.) during the winter season, which could be practised by any person owning a suitable house for the preservation of the ice. The main features of the process consisted in filling canvas tanks, supported in frames of wood or metal, with water, and allowing them to remain in a shed or freezing house until their contents were thorougkly frozen. A simple arrangement, whereby the tanks were afterwards submitted to warming by steam, allowed the ice to be readily removed in neatly shaped blocks, ready for storing.Tre invention which we now present is a freezing house in which the above ope ration is carried on, placed above an ice house, so that the manufacture of the ice can be carried on in the upper story and the frozen blucks lowered at once into the receptacle be neath. Above the ice house which may be of the form which may be of the form shown and of any suitable construction, are erected standards for the support o roof and side awnings. At A is a large water tank which is filled from a well or hydrant, and from which the water is elevated to a regulating cis tern, B, by means of the pump C. By slightly raising the gate of this cistern, the wate is allowed to pass in a thin sheet to the inclined conva coolin plane, $D$, exposed to th, where it xpld the action of the cold air which freely blows through the open sides of the shelter. When the water has flowed to the bottom of the first plane it is caught by a second plane, E , which con ducts it to leaders, F, by which it is distributed to which it is distributed to th freezing tanks, $G$, which con sist of canvas receptacle placed in frames, as above de scribed.

When these tanks are fro zen solid, a fite is made under the boiler, H , the steam from which passes through a flexi ble tube to the box, I. It is merely necessary to place the box over each tank for a mo ment to insure the loosenin of the ice, when the block may be at once removed and low ered into the ice house by means of the winch shown.
Combined ice and freezing houses may thus be construct ed of various sizes and produc tive capacities, ranging from 10 tuns, suitable for private houses, to 200 tuns, suitable houses, to 200 tuns, suitabl for butchers and 1,000 tuns and over for commercial purposes. By their use ice can be produced in any desired quantities in locations where none is to be obtained from ponds or rivers, and in latitudes where rivers never freeze over, the only care necessary being to store the ice, when made, before a change of weather can affect it. The plan, we are informed, can be used with advantage as far south as Northern Alabama. In a more southerly loca. tion, the number of cooling planes can be ircreased. Freezing will be accomplished mostrapidly when the canvas roof and walls are removed and the uncoveredtanks are free to radiate their heat.
The quantity of ice produced during a winter north of Baltimore is estimated at not less than two tuns for each freezing tank twenty eight inches squareby ten inches deep, and the cost, we are assured, need not esceed fifty cents per tun. Two men are sufficient to fill a 1,000 tun ice house, and smaller houses of from one to two hundred tuns need not require the labor of more help than is srdinarily employed about the premises.
Patented July 14, 1874. For furtber particulars as to buildings, apparatus, and patent rightr, address the inventors, Mersrs. Newsham, Haines \& Henson, 108 Pacific street, Newark, N. J.

Protecting Cast iron Pipes.
The water from mines frequently contains enough acid to attack cast iron pipes, destroying them in a short time. Oil colors and varnishes offer but a limited resistance, and the process of enameling employed in Oberschlesia, says $M$. Englehardt, of Ibbenburen, although permanent and effec tive, is expensive. Cement is cheaper, and is not acted upoa by these waters, and the only question to be settled was whether it would adhere to the smooth iron with sufficient firmness.
Two similar pieces of rolled iron were taken, and one of them painted over five times with a very thin cement, so that the coating was 015 or 020 of an inch thick. Both
is put on and allowed to dry; when hard, it is moistened and a second coating applied, and so on four or five times. The operation cannot be conducted so well in very hot weather, as the cement dries too quickly; nor must the pipes be ex posed to frost during the operation or afterward. This unfortunate sensitiveness to cold may, perhaps, yet be over come by intervening some semi-elastic material bet ween the iron and cement.

Measuring Distances by Sound.
inaje Boulenge, of the Belgian army, has recently de vised an instrument for the above purpose, which he calls a battle telemeter, and which ap pears to give remarkably ac urate results. The appara tus consists of a glaes tube having graduations along its length representing distances measured. The tube is closed at its extremities. and is filled with liquid in which is a metallic traveler, formed of two disks united by a central rod. The dianeter of the disks is a little less than that of the ube, so that when the latter is vertical the traveler will descend with a slow and uniform motion. A brass covering protects the glass, and has a slit through which thescale and traveler can be seen. Knowing the velocity of sound and that of the traveler, it is asy to construct the distance scale.
In operation, the edge of one disk is brought to the 0 mark; and the instiument being held horizontally, the lash of the cannon, for example, is noted; at that instant the telemeter is turned to a vertical position, and so held, the traveler, of course, descending mean while, until the sound is heard, when it is again brought bor:zon al. The position of the traveler denotes the distance to be read on the scale.
It is stated that, during the course of official experiments at the Belgian Artilley School, the instrument, in estimating distances of 3,200 gards, did not make over 21 yards of error, a quantity cerainly ingignificant when oth causes of irregularition in firing are taken into consideration.
The force of the wind is said to lave but little effect in impairing its accuracy, and he error due to tempera ure may be corrected by using, as the fluid, a mixture of alco-

FRickZING HOUSE.
pieces were suspended near together in that part of the shaft where the water had attacked the signal cable most violently, and were left there four months. On takivg them out the unprotected iron fas found to be reduced to out, the original thickness; the other, in which a hole had been bored to suspend it, had suffered the same corrosion at the exposed portion; the cement covering was dark brown, but perfectly hard and unattacked by the acid. The cement was broken off, and the surface of the iron exhibited the dark blue color and luster that it had on leaving the rolls.
As this coating adhered so well to the smooth rolled iron, to which it cannot cling as tigh ly as to the rougher surface of cast iron, tha experiment was continued on a larger scale A 24 inch discharge pipe in the Oeghausen shaft was protected on the inside with coment. The coating remained unchanged for two years, while the pump was in constant operation. At the beginning of last winter the pump was stopped; and the pipe being no longer under water, the cement was so much injured by the frost that it scaled off Siveral other experiments were made with similar results. The pipes shou d be new, or, if old, well cleaned from rust before applying the cement, which is mixed as thin as is possible without injury to its tenacity. The pipe is moist ened before the cement is applied, a thin coating of cement

## ol and water in proper proportions.

## ave of Mex

It is said that the cave of Cacahuamilpa is the largest cave in the world. Several persons, who bave visited the Mammoth Cave of Kentucky and that of Cacahuamilpa in Mexico, pronounce the latter the larger. A volcanic moun tain with an extinct crater covers this .cave. It is not described in guide books or books of travel. It bas, in fact, never been adequately described. Mr. Porter C. Bliss has twice examined and explored it, the last time in February of the present year. Six hundred persons constituted the last exploring party; they were provided with Bergal lights and scientific appliances. After reaching a level at perbaps 51 feet depth, they proceeded $3 \frac{8}{4}$ miles into the interior. The roof was so high-a succession of halls-that rockets often exploded before striking it. Labyrinthine passages leave the main hall in every direction. Stalagmites and stalactiles are abundant. Below this cave, at a great depth, are two other immense caves. from each of which ispues a branch of a great river, uniting here. These two rivers enter some five miles distant at the other side of the mountain, fow parallel, and issue at last together. Vast quantities of bats are the most numerous inhabitants of these caverns.

# surntifir fimmitam. 

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gain from the application of condensers to STEAM ENGINES.
In the early days of the steam engine, very low pressure was ordinarily employed for engines with condensers, while, on the contrary, what was considered a very high pressure was adopted for engines that exbausted into the atmosphere Hence arose the terms high and low pressure engines, the former being engines with, and the latter without, condensers. At present, a high pressure of steam is ordinarily carried in both kinds of engines, so that the terms do not describe the two varieties as well as formerly. Many engin eers prefer to class engines as condensing and non-condensing rather than as high and low pressure; and we recommend this classification to our readers, as the more correct of the two. One who regards economy puts in a non-condensing engine, if he has plenty of water in the locality; and many old non-condensing engines are being fitted with condensers under the more enlightened engineering practice of the pres ent time. Many more steam users would doubtless make the change, if they realized the gain that would probably result; and though this cannot be predicted exactly, for any given case, it can generally be estimated with tolerable accuracy.
It may be fairly assumed that a non-condensing engine has, on an average, at least two pounds per square inch back pressure on the piston. Some have much more than this and first class engines have less; battwo pounds can be considered a fair example of ordinary practice. By the applica tion of a condenser, it might be expected that there would be a negative pressure of ten pounds per square inch on the back of the piston, so that the piston pressure would be increased by twelve pounds. In this assumption, an allowance is made for the power required to work the air pump and the engine is supposed to be at seventy-five horse power For an engine smaller than this, it would be better to allow an increase in the positive pressure of not more than ten pounds per square inch. As the condenser, by decreasing he back pressure on the piston, adds just as much to the positive pressure, it is plain that a lower pressure of steam can be used, or what is better, the steam may be cut off at an earlier point of the stroke. The gain in either case can $b$ approximately calculated. If the gain in positive pressure produced by the reduction in back pressure ba multiplied by one hundred, and divided by the mean effective pressure on the piston, it will give the per centage of gain in pressure due to the condenser.
Thus, if the mean effective pressure on the piston is thirty pounds per square inch, the gain in pressure will be 100
times 12 , or 1,200 , divided by 30 , which is 40 per cent. Now suppose that before the condenser was attached, the steam was cut off in the cylinder at half stroke; under the new conditions the required mean effective pressure can be obtained with a lower boiler pressure than before. Before the condenser was in use, it would be necessary to maintain a pressure in the boiler of about 58 pounds per square inch by gage, to give a mean effective pressure of 30 pounds on the piston; while with an increase of 12 pounds in the effective preasure, by the application of the condenser, a boiler pressure of about 39 pounds would suffice. As the weight of steam per cubic foot at 58 pounds pressure is 017481 pounds, and only $0 \cdot 132$ pounds at 39 pounds pressure, there would be a saving of about 245 per cent in the amount of steam required to run the engine. Instead of reducing the steam pressure after atiaching a condenser to an engine, it would be better to maintain the same pressure in the boiler, and cut off the steam at an earlier part of the stroke. In the case under consideration, the increase in 12 pounds of the effective pressure would permit of closing the steam port a little before the completion of one third of the stroke; and supposing that the clearance space in the cylinder amounts to five per cent of the capacity of the cylinder, the quantities of steam required per stroke, before and after the use of the condenser, would be in the ratio of 550 to 363 , so that there would be a saving of 34 per cent.
The example given represents a case in ordinary practice. By varyfng the data, of course a greater or less amount of eaving would result; but with an engine in good condition, it is generally safe to estimate that a saving from 20 to 25 per cent of the amount of steam used, and, consequently, of the consumption of coal, will be realized by the application of a condenser. Indeed, it is not unusual for manufacturers to guarantee this amount of saving, in converting a non-condensing into a condensing engine. Those of our readers who think of having their engines changed in this manner can generally, by consulting a reliable engineer and giving him full details, obtain a pretty correct estimate of the advantage that will probably be derived. Matters of this kind are strictly professional, requiring so much experience and technical knowledge for their proper considera tion, that nothing but general hints can be given in a popular article.
It occasionally happens that no saving, or one of very small amount, is effected by the use of a condenser. This almost invariably indicates that there are leaks about the engine, which are so much increased by the reduction of back pres ure as to balance the increase in effective pressure due to this reduction. Of course, all calculations of probable gain are rendered useless by the introduction of this element. The question of leaks is purely a matter of fact, and is not subject to calculations until experimental data have been obtained. This should be remembered by users of bear power, and we repeat the statement, frequently given before sufficiently often to enable leaks and derangements to be discovered and remedied. This is efpecially important in cases where the vacuum in the condenser may magnify leak cases where the vacuum in the condenser may magnify
that were trifling when the engine was non-condensing.

## IMPRACTICABLE INVENTORS.

' It is one thing to construct a machine on paper, but a very different affair to make it go," remarked a friend to us recently, as he ruefully regarded a roll of elaborate drawings, which represented the fruitless labor of a year or so of his earlier life. "If friction and gravity were only out of the way, what a great inventor I should be!" and with this sen entious observation, the plans were reconsigned to their dusty shelf.
It certainly does seem an extremely difficult matter to convince mankind in general that the same operation, when it is plainly impracticable by simple means, through its vari ance with some natural law, is just as impossible with the most elaborate combination of machinery. Moreover, as a corollary to the above proposition, and as a general rule, if wo set about a piece of work wrongly and make errors through negligence, through forgetfulness, or through ignorance) in its course, losing sight of the piffalls in our road while regarding only the brightness of the goal, it is equally certain that the grand result we seek will not be reached. This neglect of detail, impracticability of design, in brief ppears to be one of the commonest difficulties in which inventors are prone to involve themselves; and the reason is hat they become so completely imbued with the single rand idea that they fail to see anything of apparently minor importance, utterly oblivious of the fact that perfect parts alone constitute a perfect whole.
It is related that Brunel, the great English engineer, was onstantly visited by inventors desirous of submitting their designs to his expert judgment. Although frequently wast ing time of the utmost value, in the examination of imprac ticable schemes, he would patiently listen to the description nd then point out the fallacies in the chimerical projects. An enthusiastic individual came to him one day with a plan for sweeping chimneys; it would totally obviate the cruel mployment of the small boys who were sent up the flues was simply a broom-a mere broom-which, worked from "Excellent," gravely said Brunel, "but me how the rope is to be got to the top."

Why, nothing is more simple," replied the sanguine inventor, " of course a boy will go up with it first."
At another time, the same celebrated engineer was inter upted in his labors by an Irish gentleman, who was burn rupted in his labors by an Irish gentleman, who was burn-
ing to tell him all about a portable hood, which was to be
stowed away under an open carriage in fine weather, ready for immediate use in case of a storm.

Bat you cannot stow away auch an enormous thing as that in so small a space," objected Brunel.
"Certainly not," ejaculated the unabashed inventor, "it's not that that I mean to do. It's at home the thing is to be left when the weather is fine; of course it won't be wanted, hen, you know.
It is this looking only at results, more especially when coupled with ignorance, not merely of principles but of what others have already proved useless, that has led many an inventor to despair, oft-times to ruin
A simple incident in point came to our notice recently in the course of our weekly stroll through the American Insti tute Fair: Among the entries for exhibition was that of a rotary engine, which in due time was brought to the building by its constructor; and the inventor, with the aid of the proper officials, proceeded to set it up. The inventor-an old man whose dress and general appearance betokened a hard struggle with the world in days past-grew quite gar rulous over his pet, and told how he had worked upon it for years, how he had spent every cent to get it built, and how he had now brought it from the far West to show the East ern people what it could do. Then the blood would crimson his cheeks and his eyes glisten, while he would stop and gaze fondly on the insensate metal. When the placing of the machine was completed, the throttle was opened. Two turns were made, then another slow one, and then everything stopped. A second trial did no better. It was the first prac tical test, and the machine had never before existed excep on paper. Then the inventor, with trembling fingers, moved a wheel here, a nut there; for some time he worked, bat in the end he threw down his tools, and sinking despairingly into a seat, buried his face in his hands, and great tears stole slowly down his wrinkled cheeks. He saw that his treach rous fondling could never be made to run, and yet for three days he returned again and again to its side, wistfully gaz ng at it as if he hoped to gain some inspiration which would fter all, set everything right. But none came; none could come, for the very principle of the machine had long ago been exploded. Finally, heart-broken with disappointment the old man started alone for his far-off home-not alto gether penniless, however, for before he left his worthless ngine was purchased from him at a good price by one upon whose labors in the same path fortune had abundantly smiled. Then others contributed their mites, and a suff cient sum was collected to enable the man to pay his passage home, without touching the little capital derived from the sale of his machine. That was a genuine and a noble charity, and, while the names of the generous givers are known to but few, the deed is one which an all-wise Provi dence will not allow to pass unrewarded

## RAILROAD EMPLOYEES AND THEIR PAY

It seems to us that the course taken by the managing powers of our public conveyances, relative to the paymen of their employees, is far from the wisest that could be dopted. The plan appears to be not to encourage a feeling f common interest, or to impress upon the employee that so ong as he studies the benefit of his employers his own wil not be neglected, but rather to create a species of antagonism between the parties, in which any over reaching of one by the other is considered legitimate. Upon our city omnibus and car lines, it is perfectly well known that the pay of the employess is far below that to which their arduous labor would seem justly to entitle them. As a consequence, the positions are filled principally, not by a respectable and relia. ble class of men, but by persons either unfit for any business, or by those whose characters prevent their obtaining ther employment, or by unfortunates whom reverses of fortune have driven to accept any means of support, however slender. It would be unreasonable to suppose that the maority of such individuals would or could refrain from pecuation, and hence the "knocking down" system, as it is ermed, has been carried on, year after year, until it has assumed such proportions that the street conveyance owners have at length become alarmed; and inventors of ingenious contrivances, which force stage drivers and conductors to bo bonest, are reaping a harvest. Natural honesty, then, is at discount, and machine integrity rules the hour. As a mere matter of money, it would appear that it costs less to employ scamp, plus a punch or a fare box, than to encoure ge upight service by the payment of a fair salary. The same policy is extended, on railroads and steamboats, to positions in which experience, judgment, forethought, and akill are all required. The traveling community, for its personal safery, is directly interested in the latter, and it seems to us a shortsighted policy on the part of the managers of our steam conveyances, whether carriers of passengers or freight, to pay only the lowest minimum of wages to their mployees.
The average riilroad car conductor is paid about as misorably, proportionately, as his brother of the street conveynce ; and where the latter carries a bell punch to support his moral rectitude, the former is looked after by means of the uplex ticket systom. And yet, with inexplicable inconsistency, a great corporation will commit to the fidelity of that individual, whom it tacitly admits it cannot trust with a few dollars, the care ard management not only of valuable property, but the safey of human lives.
Not content with carrying out these peculiar notions as regards those on whom they depend for their money, several of the railroad companies are now manifesting a disposition to extend their demoralizing system, or a modification of it
that any checks on the honesty of these men are proposed, for of course none such are necessary; but it seems to us that a perpetual tinkering with their hardly earned salaries, and a series of onslaughts thereon with a view of reducing their wages down'to those of an ordinary day laborer, areabout as well calculated to drive all good and reliable men out of the trade, and replace them with incompetent persons, as any plan which could be well devised. If the project has worked to this effect with one class of men, there is no rea son why it will not act similarly as regards another; and we tell the railroad companies thus plainly that no investment is so poor a one as that in cheap skilled labor in any form.
No mechanic in any branch of trade has to face such responsibilities as the locomotive engineer. In none are such qualities of judgment, coolness, skill, and heroism, even, required. Few professions are more arduous or more physically exacting; none exist in which strong mental power is more certainly needed; and to suppose that men uniting in themselves all these conditions, and who, besides, have learned to discipline their faculties, with that unerring accuracy which every one on whose shoulders the weight of the existence of others falls must sooner or later attain, can be got to work for a pittance, or can be replaced by mechan ics gathered at random from shops and founderies, is crimi nally foolish.

We notice that a meeting of engineers, from a large number of railroads, recently took place in this city, in order to protest against the proposed reduction of their wages, contemplated on many principal lines. The session was an orderly and decorous one, and the protest, embodied in the resolutions, earnest and emphatic. The men are clearly in the right, and, besides having their own excellent organization, they will find themselves amply sapported by the traveling public; for when it comes to making us ride in trains managed by men whose ignorance or incapacity may put abrupt ends to our mortal careers at any moment, because of the niggardly arrangements of our railroad managers, it is time for the public to protest.

IMPROVISED APPARATUS FOR STEAM BOILER TRIALS
In the course of his professional work, the engineer sometimes finds himself confronted with practical problems which only an exceptionally extended experience, or a remarkably ingenious mind, can satisfactorily solve. The marine engineer, who has charge of the machinery of a steam vessel on a long voyage, is often driven to adopt most singular expedients when a breakdown at sea makes important repairs necessary; and he sometimes succeeds, hundreds of miles from the shop, with but the few tools usuaily carried on shipboard, and with the ship rolling and pitching so violently that it is with difficulty that his men can keep their feet, in doing work which would be considered decidedly formidable even on land, where a stable footing and all needed appliances make the task a comparatively easy one. Such instances of difficulty seldom occur on shore; but in the course of his practice, everyengineer occasionally finds exercise for his ingenuity, and for the application of such knowledge or experience as he may have acquired, in similar but usually less important matters; and he is always pleased to learn from the experience of others how to proceed, and what success to anticipate, in any specific case. The following will perhaps prove interesting and useful to others who may find themselves situated as was recently our occasional contribu tor, Professor Thurston, the Director of the new Mechanical La boratory of the Stevens Institute of Technology.
It had become necessary to determine very carefully the evaporative power of a set of steam boilers. A large amount of money and important interests were involved, both directly and indirectly, in the case, and it was essential that the total amount of heat evolved from the fuel should be precisely ascertained. It was equally important that it should be learned how that heat was distributed. It was necessary to determine the temperature of the escaping gases in the chimney, and the percentage of water primed over with the steam. To determine the first point, it seemed necessary to use a pyrometer; but none had been provided, and there was not sufficient time to obtain one by sending to New York or Philadelphia, the nearest cities in which they were probably obtainable. The only reliable pieces of apparatus at hand which could be used in improvising a pyrometer were a very good platform scale and one of those excellent thermometers which were made some years ago by the Novelty Iron Works. A careful search in the scrap beap brought to light a conveniently shaped mass of iron, which, being weighed, was found to balance the scale at preeisely sixty pounds. This was placed in the flue at the point where it was desired to measure the temperature of the products of combustion. A small tub was placed on the scale, and into it was carefully weighed fifty pounds of water. After a time, when the iron had remained in the Hue long enough to have attained fully the temperature of the gases flowing past it, it was suddenly removed and immersed in the vessel of water, and the increase of lemperature of the latter was very carefully observed. The estima tion of the initial temperature of the heated iron, and that of the furnace gases, was then an easy matter. In one ex ample, the water rose in temperature from $65^{\circ}$ to $119^{\circ} \mathrm{Fah}$. a range of $54^{\circ}$. Fifty pounds of water raised $50^{\circ}$ in tem perature had, consequently, received from the iron $50 \times 54$ $=2,700$ units of heat. This having bean communicated in
60 pounds of iron, each pound of metal had paited with 60 pounds of iron, each pound of metal had pated with in the Scientific American recently by Mr. R. H Buel, is $0 \cdot 113$, or, very closely, one ninth. Each thermal unit ab. stracted from a pound of the iron, therefore, reduced its
temperature nine degrees, and its total loss of tenperature
must have been $9 \times 45=405^{\circ}$. The final temperature being $119^{\circ}$, the temperature before reduction was $119^{\circ}+405^{\circ}=524^{\circ}$ and this was the temperature of the flue. In another in stance, the water was heated by the pyrometer ball from $63^{\circ}$ to $122^{\circ}$ Fah. The temperature of the flue was in this case $(122-63) \times 50 \times 9$
$122=564^{\circ}$. With a good thermometer and urate scales, the results thus obtained are probably more reliable, at high temperatures, than those usually obtained by he common pyrometer
The determination of the proportion of water contained in he steam leaving a boiler is often, as in the case here considered, a matter of vital importance. It often happens that a pound of water takes from the fuel hardly a tenth as much heat as a pound of steam, and at least one instance has been given by our contributor in which more water left the boiler unevaporated than was actually made into steam. It is seen at a glance that, where the faed water only is measured, the most worthless of boilers may appear to com pete successfully with the best; and the greater the amount of priming or foaming, the better is the apparent result Makers of peculiar forms of boilers have actually guaranteed an evaporation (!) of nineteen pounds of steam, from cold water, per pound of coal, a performance to which the best boilers ever yet made do not approximate, and one half o which amount is never fairly obtained, except with heated feed water. The guaranty has apparently been fulfilled, becacse the guaranteed boilers carried over (by priming) weight of water excesding that of the steam by which it was transported. Every intelligent engineer would recognize in such a guaranty an evidence of inefficiency, rather than of conomical steaming.
The first successful attempt to determine, with precision the quality of steam made, and to obtain a trustworthy measure of the value of competing steam boilers, was probably that made by Professor Thurston at the exhibition of the Ameri can Institute in 1871, when conducting, for a committee of judges of which he was chairman, a trial of five competing steam boilers, which had been entered by as many different makers. In that instance, all of the steam made by each boiler was condensed in a surface condenser, and the total quantity of heat transferred carefully and accurately measured. At a subsequent trial, a neat form of apparatus, invented by Mr. Leicester Allen, was used for this purpose with quite satisfactory results. In the case about to be described, it was impossible to condense all of the steam. The Allen calorimeter was not to be had, as there was but one in the country, and taat was the property of the American Institate, and could not be promptly obtained.
An ordinary oil barrel was obtained and mounted upon the platform of the scale. Precisely two hundred pounds of water was weighed into it. A three quarter inch gas pipe was tapped into the main steam pipe, and fitted with a stop valve. From a short piece of pipe projecting from the valve, a piece of rubber hose, some twenty fest long, led to the barrel, its extremity being lashed to a wooden pole for convenience of handling. The temperature of the water in the barrel was carefully determined, and an additional weight, indicating ten pounds, was placed on the pan of the scale. The valve was then opened, and steam was allowed to blow through the hose until it was warmed up, and condensation in the pipe was thus prevented. When the hose seemed as well cleared of water as it could be, the extremity was plunged into the barrel, and the issuing steam was condensed until the rising of the scale beam proved that ten pounds of steam had been added to the two hundred pounds of water originally placed in the barrel. The water was then thoroughly stirred with the thermometer, and the temperature noted. The following are the data obtained in one

Weight of water, 200 pounds; weight of steam, 10 pounds riginal temperature of the water, $62^{\circ}$; final tem perature of the water, $115^{\circ}$ Fah ; preseure of steam per square inch by gage, 75 pounds. Steam at 75 pounds pressure has a tem perature of $320^{\circ} \mathrm{Fah}$, and to raise it from $0^{\circ} \mathrm{Fah}$. to $320^{\circ}$, and to evaporate it at the latter temperature and the given pressure, requires $1,178 \cdot 6^{\circ}+\left[0 \cdot 305\left(320^{\circ}-212^{\circ}\right)\right]=1,211 \cdot 5$ units of heat. Each pound of steam, therefore, communi cated to the water which condensed it, in this example, $1,211 \cdot 5$ $-115=1,096 \cdot 5$ thermal units. Each pound of water suspended in the steam, and primed over into the condensing water, transferred only $320^{\circ}-115=205$ units of heat. The total heat transferred was $(115-62) \times 200=10,600$ thermal units. Then the product of the number of pounds of steam condensed multiplied into $1,096 \cdot 5$, plus the product of the number of pounds of water multiplied into 205 , will be equal to the whole sum, 10,600 . A simple algebraic equation will give the proportion of priming
Let $\mathbf{W}=$ the total weight of steam condensed, together with the suspended water; then $X$ may be taken to represent the weight of pure steam, and W -X will be the weight of water carried over with it. Let the total amount of heat transferred be called $U$, the heat transferred by a pound of steam, H , the heat transferred by a pound of water, $h$. Then
$\mathrm{HX}+(\mathrm{W}-\mathrm{X}) h=\mathrm{J}$; or, $\mathrm{X}=\frac{\frac{\mathrm{U}}{\frac{h}{4}}-\mathrm{W}}{\frac{h}{h}-1}$
In the example above given, $X=\frac{10 \frac{6}{2} \frac{60}{5}-10}{1 \frac{096}{2} \frac{6}{5}-1}=9.59$ pounds
steam, and $10-950=0.41$ pounds of water suspended in he steam. The primiag, therefore, amounts to 41 per cent. Now, suppose 100,003 pounds of water to have been appar$200^{\circ}$ evapated, under similar conditions, from feed wate $200^{\circ}$ Fah., by 10,000 pounds of coal. Of this quantity,

95,900 pounds would have been steam, and 4,100 pounds would have been water. But each pound of steam requires or its evaporation under the assumed conditions 1,211.5$00=1,011 \cdot 5$ thermal units, while each pound of water takes up but $320-200=120$ unite of beat.
$95,900 \times 1,211 \cdot 5=116,182,850$
$4,100 \times 120=$

## Total heat from fuel, $\quad 116,674,850$

per pound coal, 11,6675 thermal units.
Engineers are accustomed to reduce results obtained on such ests to evaporation from $212^{\circ}$, at atmospheric pressure. The mount of heat required to convert one pound of water into an at atmospheric pressure, when already at the boilin oint, is well known to be 9666 thermal units. Hence, $\frac{11 \frac{667}{96} \cdot \frac{5}{6}}{96}$ 12.07 pounds of water, per pound of coal, represents th rormance of the apparatua
In another example, with steam at 50 pounds, the water was raised from $70^{\circ}$ to $118^{\circ}$, and he obtained $X=\frac{9600-10}{T_{1} \frac{4}{4} 06}$ $=8.07$ pounds steam, and the priming amounted to 193 per ent. In this case, had the steam been perfectly dry, and he evaporation equal to 12 pounds of water per pound of coal, the occurrence of priming to the extent just calculated, while causing an apparent increase of the evaporation to 14.31 pour d, would cave reaily produced a very serious loss of clliciency, and even great pecuniary losses, by causing accijents which so common'y acise from serious priming.
It is eridenily extremely important, therefore, in all trials of the cooome ${ }^{3}$ ptr ormarice of steam boilers, to determine carefully not ouly the quantity of water entering as feed, but also the quality of the et am leaving the boiler. This ne. c seity, which was first fxemolified in 1871, and which has become a usallatac of trials at the exhibitions of the American Insti $u$ e, is bscoming well understood. At the approcising $x$ xioit on of the Franklin Institute, at Philadelphia, coapitirg noilers will be compared as to quality of steam, as well as to a pparent, but fictitious, evaporative capacity.
Where expensive and elaborate apparatus cannot be afforded, the simple apparatus above described will often be found quite satisfactory.

## SCIENTIFIC AND PRACTICAL INFORMATION.

## NGINEERING IN PERU

The Pacasmayo railroad has just been finished from the Pacific to La Vina, a distance of 75 miles. The eastern ermination is 3,469 feet above the ocean. Leaving Pacasmayo at 8 A . M., one can now reach Cajamarca-the famous city of the Incas-at 8 P. M. Tae most wonderful part of the road is the great iron mole, which is to extend 2,190 feet into the ocean. There will be 146 bays, exch 15 feet; 101 are completed. There is to be a bead over 90 feet wide by 300 long. The bottom of the Pacifichere is mingled sand stone, conglomerate, and limestones, so hard that three turns on thetop of the iron pile, with ste-l-pointed drill, makes very little headway. The tide rises four feet; and the pre vailing wind is S. W. Mr. Meiggs builds the road for \$' $^{\prime}$ 000,000.

## KAURI GUM

Professor M. M. P. Muir shows, as a result of his experi ments on the Kauri gum of Australia, that it is a mixture of resins and true gum, classable among the gum-resins, as shown by distillation. One half of its weight consists of water and a heavy oil. The residue solidifies to a brittle, transparent, solid mass.

## ANGE OF TORPEDOES.

From recent experiments conducted by an English Torpe. do Committee against theiron hulk Oberon, with the view of ascertaining the maximum distance within which the engines of an enemy's vessel might be rendered useless, if not the ship herself destroyed, by the explosion of a submarine torpedo, it appears that the hull of an ironclad is practically safe from danger at a range of 100 feet from a 500 pound charge of gun cotton, exploded in 48 feet of water, but that her engines are liable to derangement at that distance.

## MPROVEMENT OF THE MISSISSIPPI.

Tho Commissioners, appointed by the President to report upon the best plan of improving the mouth of the Missis sippi river, recently sailed from New York for Europe,where they purpose to examine the Deltas of the Danube, Rhine, and other rivers. The party consists of W. Milner Roberts, General Alexander, Gəneral Wright, General T. S. Sickels (of the Union Pacific Railroad), Professor Mitchell, Mr.II. W. Whitcomb, and General Coombs. They return in November.
action of chromic acid on textile materials.
In the presence of oxidizable substances, cbiomic acid oses a portion of its oxygen and passes to the state of green serquioxide. With other substances, especially wool and silk, M. Ja $\subset q$ aelin finde that it gives a bright yellow color, whence he concludes that the acid may be advantageously used to detect vegetable fibers from those of animal derivation in mixed stuffs, the former not yielding the yellow color. Caromic acid is also a good test to show the presence of cochineal in att'fisially colored wine.
engraving on copper.
M. de la Grye repor:s a dew process in the above named art which connjsts in first cov ring the plate with a thin coating of adber-xt silatr, which is in turn covered with colored varnish. The linte are thea deame with a sharp point, after the fashion ot using a diumond for stone engraving, and parchluride of iton. erchluride of iton.

## We publish herewith portable engine.

We publish herewith an engraving of a portable engine (constructed by Messrs. Montel and ${ }_{i}$ Vendome, of Paris, France), which has several novel features. It is mounted on two wheels only, with springe, and can be readily drawn by horses, shafts being attached to the springs. When at the place where its services are required, the wheels are readily taken off, and the machine allowed to rest on its two dily taken off, and the machine allowed to rest on its two
bed plates, in which are holes for securing it to a foundation, bed plates, in
if necessary.
if necessary.:
The boiler is cylindrical in form and tubular. The fire box, which is wholly within the shell of the boiler, can be removed; the shafts are then attached to move the engine from place to place. An efficient superheater is placed at the perheater is placed arer of the boiler, the upper part of the boiler, the
cy linder of the engine is cylinder of the engine is
steam jacketed, and the cut. off is controlled by the gorernor. The feed water is heated by an appliance with the shell of the boiler.
Non-combustible Wood. The English Admiralty have recently made some quite satisfactory experiments at Plymouth, upon a wood rendered uninflam. mable by treatment with a solution of sodium tung. state. The results prove that wood thus prēpared is very much less inflammable than ordinary wood; chips and shavings made of it , though, of course, capable though, of course, capable
of being destroyed by fire, cannot be themselves inflamed, and cannot, of course, communicate fire to masses of wood thus prepared; so that framework made of this wood resists flame perfectly, at least when not exposed for a long when not exposed
time to a fierce fire. These time to a fierce fire.
advantages, however, are advantages, however, are
diminished by the consider. able first cost of prepara. tion, as well as by the increased weight of the wood after treatment.

## IMPROVEMENT IN CABLE TELEGRAPHY.

My chief object in writing the present paper* is to make known an important improvement I have made in the use of the induction coil in cable signaling. The great disadvantage in the use of the induction coil is the so called magnetic retardation experienced by the cable current in passing through the primary wire. This magnetic retardation is caused by self-induction in the primary wire; any change in the current passing through the wire tends to produce a current in the opposite direction to such a change, and in this way rapid changes are, as it were, clogged, the effect being very similar to an increase in the length of the cable, fo that magnetic retardation seems a very appropriate name for expressing the effect.

I have, however, been able not only to oliminate this magnetic retardation, but to cause the self.induced currents, which are its cause, to aid in the formation of signals.
The method is briefly as follows: The primary and secondary wires of an induction coil form two alternate branches of a Wheatstone's bridge; say A and B, Fig. 2, are these branches. The otker branches are simple resistance, which may be made to produce balance when a constant current when a constant current
is flowing. $\neq$ is the galis flowing. A is the gal-
vanometer or other revanometer or other re-
ceiving instrument. The current entering at $C$ divides between the resis tance and the primary wire. The increase of the current through the primary wire, A, not only induces a current in $B$, the secondary wire, in the direction shown by the direction shown by the
lower arrow, but also lower arrow, but also
causes a self-induced cur causes a self-induced cur-
rent to flow in the direc-
 tion of the upper arrow; again, the increase of the current through B not only causes an induced current in A, in the direction of the upper arrow, but also causes a self-induced current to flow in the direction of the lower arrow. During the decrease of the cable current, the direction of the induced

* Paper read before the British Association, at Belfast, Ireland, by G. Winter.
currents is reversed, It is this reversal of the induced currents during the decrease of the cable current which gives value to the induction coil in cable signaling. Now the selfinduced currents, which, in my plan, aid the formation of signals, are the very cause of magnetic retardation in the ordinary way of using the induction coil.
One great advantage in the use of the induction coil, over the condenser plan, is the much greater safety the cable is


MONTEL AND VENDOME'S PORTABLE ENGINE. Builder.
compression, which admits of looseness, especially after being subjected to very hot fires. A much better article is sulphur. If this be melted and poured in around the staple instead of lead, it makes a much more durable job. Besides, it is often more easy to procure sulphur than lead, as every store keeps it that deals in general variety.-American

## NEW INSTRUMENT FOR ESTIMATING UREA.

Dr. W. J. Ruesell, F.R.S. and Mr. S. H. West publish the following in the Journal of the Chemical Society:
We find it most advanta geous to use a solution of hypobromite, prepared by dissolving 3.5 ounces of common solid caustic soda in 15 cubic inches of water, and adding 1.5 cubic inches of bromine. This mixture gives a rapid and complete decomposition of the urea.
The form of the apparatus is shown in the accompanying engraving. A tube, A, about 9 inches long, is narrowed 2 inches from the closed end, and a bulb, B, holding about 0.75 cubic inch, blown on it. The upper part of the tube contains about 1.5 cubic inches, This is fitted, by means of an india rubber cork, into a small elliptic tin trough, C D , about 3 inches long, Dtanding upon three legs. In standing upon three legs. In
using the apparatus a $0 \cdot 3 \mathrm{cu}$ bic inch pipette is filled with bic inch pipette is filled with
the urine, and the liquid is allowed to flow into the bulb of this tube. Wateris add ed, thus washing down the urine which adheres to the sides of the tube, and filling the bulb up to the top of the constriction. A glass rod, with a piece of india rubber with a piece of india rubber tubing about half an inch

long drawn over the end of it, is then introduced, so that the india rubber plugs up the constriction. The hypobromite solution is then poured into the upper part of the tube until it is full, rents which accompany magnetic storms. In the way in and the trough is afterwards half filled with ordinary wa| which cables are usually worked at present, the sending end | and |
| :--- | :--- | :--- |
| ter. |  | of the cable is either connected directly or through a A graduated tube, $F$, is filled with water, the thumb amall battery to earth, while the other end is insulated by placed on the open end, and the tube then inverted in the the condenser. In this way the cable is, at the receiving $\left\lvert\, \begin{aligned} & \text { placed on the open end, and the tube then inverted in the } \\ & \text { tross rod is then pulled out, and the gradua. }\end{aligned}\right.$ end, submitted to the greatest strain possible. On some lines, however, the cable is kept completely insulated between two condensers, one at each end. It is not difficult io show that at each end of an insulated conductor, the electric strain (if we may so call it) between the conductor and the earth, produced by earth currents, would be just half that which would be produced at an insulated end when the oth er end is joined to earth. When using the induction coil, or my modification of it, as a receiving apparatus instead of the condenser, the cable is joined to earth at each end through a moderate resistance, and is therefore nearly in its safest possible state.

## Isaac Craig Buckhout.

Mr. Isaac Craig Buckhout, chief engineer of the New York and Harlem Railroad, and chief of the Board of Engineers of the Fourth Avenue Improvement, died at his sesidence in White Plains, N. A., September 27, in the forty-fourth year of his age. Among his principal engineering work were the Grand Central depot, and that portion of the Un derground Railway system of this city extending along Fourth avenue from the Grand Central Depot, at 42nd stree to Harlem river, $4 \frac{1}{2}$ miles, now nearly completed. To his ar duous labors in connection with this great work is attributed the illness which has unfortunately resulted in his prema ture decease.

## Two Wrinkles

Very often a screw hole gets so worn that the screw will not stay in. Where glue is handy, the regular carpenter makes the hole larger and glues in a large plug, making a nest for an entirely new hole. But this is not always the case, and people without tools, and in an emergency, often have to fix the thing at once. Generally leather is used, but this is so hard that it does not hold well. The best of all things is to cut narrow strips of cork, and fill the hole completely. Then force the screw in. This will make as tight a job as f driven into an entirely new hole.
Another hint of a similar character may be useful. One often desires to put a staple into a block of stone. The hole But unless the hole is made with the bottom larger than the top, the lead will in time work out, if there is muct jar or side strain on the iron. Besides, the lead itself is liable to some
ted tube slipped over the mouth of the bulb tube.
The reaction commencesimmediately, and a torrent of gas rises into the measuring tube. To prevent any of the gas being forcel out by the reaction, the upper part of the bulb tube is slightly narrowed, so that the gas is directed to the center of the tube. With the strength of hypobromite solation which we suggest, the reaction is complete in the cold in about ten or fifteen minutes; but in order to expedite it, the bulb is slightly warmed. This causes the mixing to take place more rapidly, and the reaction is then complete in five minutes. The reaction will be rapid and complete only when there is considerable excess of the hy pobromite present. After the reaction the liquid should still have the characteristic color of the $h$ ypobromite solution.
The measuring tube is graduated so that the amount of gas read off expresses at once what may be called the percentage amount of urea in the urine experimented upon,

that is, the number of grains in 6 cubic inch. es, 0.3 cubic inch be ing the quantity of urine taken in each case.

Three tenths of a cubic inch of a 2 per centsuandard solution of urea gave, without correction: $225,2 \cdot 22$, $2 \cdot 22,223,2 \cdot 215,225$, 2.22, 2215,2 22, $2 \cdot 226$, 2 215, $2225, \quad 2225$, 222 , showing a mean of $2 \cdot 225$ cub c inches. en off the whole of its nitrogen, we ought to have obtained 2.232 cubic inches. Even under these circumstances the difference between these two numbers represents only 0001078 of a grain of urea. And even this error may be obviated by taking 2.225 cubic inches, as the basis for the graduation of the measuring tube,instead of 2.24 . The presence of sugar in the urine does not affect the reaction

The tat PACIFIC OCEAN TELEGRAPH aced in stas advices from the Tuscarora and the party en aitable rurveying the bed of the Pacific ocean, to find a Japan, along the shores of the Kurile Islands and of some of the Aleutian group, and thence across the Kamchatka of the Aleutian group, and thence across the Kamchatka
Sea. "For 1,000 miles from Yokohama," says a corrrespondent of the Tribune, from which journal we take the illustra tive diagram, " the depths ranged from 300 to 2,270 fathoms. The greatest slope within the distance is from lat. $40^{\circ} 01^{\prime}$ N., long. $142^{\circ} 57^{\prime}$ E., to lat. $41^{\circ} 09^{\prime}$ N., long. $144^{\circ} 01^{\prime}$ E., being 161 feet to the mile. From lat. $47^{\circ} 44^{\prime}$ N., long. $154^{\circ} 15^{\prime}$ E., the depth gradually increased to 3,754 fathoms at position lat. $50^{=} 19^{\prime}$, long. $159^{\circ} 39^{\prime}$, a distance of 260 miles, giving a slope of about 60 feet. Just before entering the Aleutian group, a most remarkable depression was ascertained. It was in lat. $52^{\circ} 06^{\prime} \mathrm{N}$. , long. $171^{\circ} 15^{\prime} \mathrm{E}$., and its depth was 4,037 fathoms ( 24,222 feet), while the preceding and succeeding casts, each only 29 miles ceeding casts, each only 29 miles distant from this one, were in
2,460 fathoms ( 14,760 feet) of water, which gave a slope of 326 feet to a mile, the greatest as yet found by us since our departure from San Francisco. From the position of this great depth to one about three miles from the island of Atchka, lat. $51^{\circ} 58^{\prime}$ N., long. $174^{\circ} 31^{\prime}$ E., a distance of 125 miles, the water shoaled to 332 fathoms, being at the rate of 187 feet to a mile, and from that position to Tanaga Island the depth ranged from 200 to 1,800 fathoms, with but one heavy slope of 250 feet between lat. $51^{\circ} 08^{\prime} \mathrm{N}$., long. $178^{\circ} 35^{\prime} \mathrm{W}$., and lat. $51^{\circ} 28^{\prime} \mathrm{N}$., long. $177^{\circ}$ $57^{\prime} \mathrm{W}$. This is nearly as much as the greatest slope found between Honolulu and Yokohama. This route thus far is not impracticable, so far as the plateau goes.
Ooze similar to that previously found, and grayish black sand, gravel, and lumps of lava, were found along the Kurile Islands, and grayish black sand, gravel, and sponge in the Aleutian group. After sighting the Agatton island, the line was run skirting along the shores to the island of Tan. aga. From this point it will be run to the northward, to the island of Ounalaska. The deductions from aerial tempera. tures in connection with currents, corroborate previous ob servations upon the latter. In lat. $51^{\circ} 39^{\prime} \mathrm{N}$., the counter current which sets to the southward and westward along the shores of Kamchatka and the Kurile Islands, extends to long. $164^{\circ} \mathrm{E}$., with a surface temperature of $42^{\circ}$ Fah., from which point to long. $174^{\circ} \mathrm{E}$., in the same latitude, there is the Kamchatka current, which is a branch of the Japan stream, setting up through Behring's Straits. This stream has a surface temperature in this latitude of from $46^{\circ}$ to $47^{\circ}$ Fah."
As will be seen by the sectional view of the ocean bed, the course is along a range of submarine mountains, which (in the Kurile and Aleutian Islands) occasionally rise above the surface of the water. The ocean currents are very numerous, and their temperatures vary widely.
The Tuscarora completed this course, and put into Glory of Russia Bay, Tanaga, one of
the aleutian chain of islands.
During the summer months, which are supposed by the natives to be a delightful season of the year, the islands are continually vailed in obscurity by fogs; and, in approaching them, cautiously feeling the way, there is a danger presented by strong, treacherous currents, as well as lack of confidence as to their positions. During the nine winter months, or from September to June, the winds are extremely violent. " After having waited patiently for nearly three days for a sufficiently clear day that would permit us, at even a ship's length, to see land, we, on the 19th, were fortunate in sighting the island of Tanaga in the morning, and at 6 P. M. an choring safely in 10 fathoms of water in Glory of Russia Bay, which is proposed as an intermediate station for the cable. At an eleration of 2,650 feet, but a short diatance back from the beach, upon the mountain side, is a glacier of considerable extent, which was visited by several of our officers. The short stay prevented any measurements of its rate of movement. The soil is spongy, owing to continued dampness, and of course destitute of trees or bushes, and in babited solely by fowls of the air. There is here a
fingal cave,
with its basaltic columns, which is scientifically interesting. But, taking everything into consideration, ahould this place be selected as an intermediate station, the operator whose headquarters it will be is not likely to regard it as a paradise. Although the practicability of the no:thern route is beyond dispute, the labor, uncertainty of success, and dangers involved, in even the passage of a steamer over the route just sounded by us, cause me to apprehend no small difficulty in an attempt to lay down a subnarine cable.
Then consider the exertion of dredging for a broken cable in waters either clouded in a fog or beneath a gale, conpared with those to be experienced on the southern route. Again, there is the submarine valley of over 4,000 fathoms depth just to the southward of the Aleutian Islands, through which the cable will have to pass. In laying the cable bere, at least six and a half or seven miles of it will be suspended
from the stern of the vessel, the weight of which the cable may be of insufficient strength to sustain, even if at the time the most favorable weather prevails. To sum it all up, the most obvious advantages in favor of the northern route are the smaller amount of cable required, and its being mostly within our own possessions.
We arrived at Ounalaski on July 29 ; everything most satisfactory to date, as far as the accomplishment of our work is concerned. A line will next be run back to Tanaga island outside, or to the southward of the islands; then from here
ings have tanks into which the water is forced by hand or steam power; and some of them have machines like those of Whitehurst, which are set in action every time water is drawn and shut off in the lower stories
In 1796, Montgolfier, whose connection with the invention of balloons is well known, contrived an automatic machine for performing continually the work that Whitehurst's machine had done when controlled by hand. The Montgolfier ram, as at first constructed, is shown in Fig. 1; and Fig. 2 represents another form of the machine, embodying the same principles, and somewhat easier to build. The two figures are lettered alike, so that a descrip. tion of the action of one will apply to the other. Water from a source higher than the ram flows through the pipe, $A$, and the discharge valve, $B$, being open, runs to waste. Some resistance being offered to its parsage through the waste outlet, the water closes the valve, B;and its motion in this direction being suddenly arrested, it has sufficient force to open the valves, D D, and rise some distance in the delivery pipe, F. When the force is expended, the valve, B, again opens,
to where we left off last fall, and then to San Francisco, where the work will be completed."

## THE HYDRAULIC RAM.

Many of our readers, on shutting the cock in a water pipe where there was considerable pressure, must have observed that the sudden arrest of the motion of the water caused a shock, socatimes producing sound and jarring the pipe.


Indeed, the water pipes in houses have often been burst by suaddenly shutting off the water from a basin, and plumbers frequently provide against this accident by attaching an air vessel to the pipe, near each cock, so that the force of the

blow may not be suddenly arrested. Whitehurst, an Englishman, contrived a machine, in 1772, for raising water by utilizing its momentum when the discharge was suddenly

stopped. Machines on a similar principle are constructed today, for use in cities where the pressure in the mains is deficient. For instance, there are many buildings in the lower part of New York in which the pressure in the mains will not raise the water to the upper stories. Most of these build.
and the former operation is repeated. It will be observed that, when the valve, $B$, closes, the air in $C$ and $E$ is compressed by the force of the water. When the force is expended, the air in C expands again, and presses back the water in the pipe, A, so that the valve, B, can more readily open, and the air in $E$ also expands, forcing the water up the delivery pipe, F. Thus the air in C tends to make the valve, B, open more quickly than it otherwise would, after the water has exerted its force in the pipe, $F$, and the air in E makes the delivery more regular and continuous. The air in these vessels is liable to diminish in quantity, since water absorbs it under pressure. The entering water brings some air along with it, to make up the deficiency ; but as this supply is frequently insufficient, a small air valve, $G$, opening inwards, is fitted, which admits air into the ram, whenever the pressure in the vessels falls below that of the atmosphere. A simpler and cheaper form of ram is shown in Fig. 4, which is the kind generally built by pump makers. It will be sean that it hea no air vessel for aiding the opening of the waste valve, $B$, and no valve for supplying any deficiency of air in the chamber, E. It is frequently fourd

necessary, for the successful operation of this form of ram, to make a small hole in the pipe, A, so that air will be drawn in by the running water. It would be easy to render these rams more efficient by the addition of a casting that would chavge them into machines of the kind represented in Fig. 2, as will be rendered plain by an inspection of Figs. 2 and 3. The air valve, G, Figs. 1 and 2, is so low down that if the ram should become submerged it would admit water. An improved ram, patented a few years ago in France, has the air valve elevated to a considerable distance so as to orercome this difficulty.
The hydraulic ram, or, rather, a modification of it, is also employed to draw water from lower points. This form of the machine is sketched in Fig. 4. The pipe, A, leads to a source of supply higher than the ram, and connects with the place which is to be drained. The distance from the end of the pipe, $A$, to the valve, $D$, must not be greater than the hight to which water will rise in a vacuum-that is to say, 34 feet,-and for successful working; it should not exceed 26 feet. The action of the machine is as follows: The valve, C, being open, water flows through the pipe, A, and is discharged at F . When sufficient velocity is acquired, the valve, C, closes; and the water continuing to flow through F, a vacuum is formed behind it, so that water is drawn through the pipe, $B$, and valve, $D$, and discharged at $F$. Then the valve, C, again opens, and the same cycle of operations is repeated. $E$ is an air chamber, aiding the continuity of discharge, as in the former cases.
The hydraulic ram finds various applications in industrial pursuits. It is largely employed for raising water into dwelling houses and farm yards. It was used at the Mont Cenis tunnel, working under a head of 85 feet, to compress air to five atmospheres for the purposes of ventilation and power. It will work under extremely low heads, and will raise water to almost any desired hight, and, when properly proportioned, is reasonably efficient. The efficiency is not, however, a matter of great importance in many cases. For instance, a man may have a spring on a hillside, at consider-
able distance from his hoves, which is at a much higher ele vation. The expense of pumping this water by steam power might be very great. But with the hydraulic ram, whose first cost is very slight, the on'y considerable outlay will be for the delivery pipe; and it the connections are properly made, no further expense need be incurred.
In setting a ram, if it is in a locality where the water in it would be frozen in winter if it were exposed, it should be carefully covered and protected; and the same precautions should be observed with the pipes.
To produce the best effect, the length of the pipe from the source of supply to the ram should be from 25 to 50 feet, for ordinary cases, with heads of from 8 to 15 feet; and in general, it may be stated that the length of pipe should be about 3 times the head. The hight to which the water is lifted should not exceed 15 times the head from the source of supply to the ram. If the delivery pipe is ve y long, the head required, to overcome the friction, shou'd be estimatsd at so much additional head. Tae diameter of the receiving pipe is ordinarily made from 2 to 3 times that of the de'iv ery pipe. For the best effect, $t^{\prime}$ ie diams:er of the receiv'ug pipe should be about $\frac{1}{10}$ of the $b-8 j$ from the coarce of supply to the tank; but very mush smaller dimensians are commonly adopted.
Large rams, under favorable circums'ances, give an eficiency of from 60 to 70 per c3at of the power of the water but small machines, under ordinay conditions, only utiliza from 40 to 50 per cent. An example to i lustrate these principles is appended. A hydraulic ram, working under a head of 10 feet, delivers 5 U . S. gallors of water per minute to a hight, including the friction of the pipe, of 100 fret, and ${ }^{\circ} 100$ gallons run to waste in the same time. What is the efficiency of the ram? A gallon of water weighs $8 \cdot 34$ pounds, so that the useful work of the ram is the raising of 41.7 pounds 100 feet high in a minute, or it is 4,170 foot pounds. The total work that could be realized from the water (105 gallons falling 10 feet in a minute) would be the raising of 8757 pounds 10 feet high in a minute, or 8,757 foot pounds. Hence the per centage of efficiency (which is found by multiplying the actual work by 100 , and dividing the product by the total work of which the water is capable) is $476+$
A correspondent asks to what hight he can raise water with a ram, with a head of six feet, allowing $\frac{9}{10}$ of the water to run to waste? Assuming that the ram has an efficiency of 45 per cent, to find the hight of delivery: Multiply the head by the efficiency, and divide by the proportion of water raised. Thus: Head, 6, multiplied by efficiency, $0 \cdot 45$, gives a total of $2 \cdot 7$. Divide this by proportion of water raised, $0 \cdot 1$, and the hight in feet to which the water will be raised is 27 .
Those of our readers who are using hydraulic rams may Those of our readers who are using hydraulic rams may
easily determine data by which they can calculate the efficiency. If any do so, we shall be pleased to receive the results of their calculations. As many prefer to work examples by algebra, the analytical expressions for the preceding rules are given below. Let $\mathrm{h}=$ hight above source of supply to which water is raised; $\mathrm{H}=$ hight of top of source of supply above waste outlet; $L=$ length of pipe from source of supply of ram to waste outlet, in feet; $D=$ diameter of pipe, in feet; $W=$ pounds of water flowing per minute; $\mathrm{w}=$ pounds of water lifted per minute. Let $\mathrm{E}=$ per centage of efficiency, $L=$ about $3 \mathrm{H}, \mathrm{D}=\frac{\mathrm{H}}{10}$, and h not more than 15 H ; and for best effect, $\mathrm{E}=$ from 60 to 70, under most favorable circumstances, from 40 to 50 , ordinarily. Then $=100 \times w \times h$.

## $\mathbf{W} \times \mathrm{H}$

## Corrcizumbute.

## $T o$ the Editor of the Scientiji: American

As foreshadowed in your last, Commissioner Leggett has resigned, and Mr. Thasher has been appointed in his place. This having made vacant the Assistant Commissionership, General Ellis Spear, of the Board of Examiner in Chief, has been appointed to this position, and his place is to be filled by the promotion of Major Hopkins, who now occupies the position of Examiner in Interference cases. It was rumored that Commissioner Leggett's son-in-law, Mr. Seymour, was to be appointed Examiner of Interferences, but I
believe it has finally been decided to have a competitive ex believe it has finally been
amination for this office.
The number of patents issued for the last three months has somewhat fallen off, the whole number, including reissues and designs, being 3,229, against 3,344 for the corresponding term of last year. If the dssigns and reissues are omitted, the numbers are, for the last tbras mon'h $-2,819$,and for the same months last year 3,06L. Tha number of parants issued during 1813 was 1,610 , and or the nue tachis of

Whole, over the monthly avereg of tup precing yfar.
Congress at its last session, althousb reducing tue. army at large, did not reduce the sig oal servi ${ }^{\prime}$, , bu' permitied it to retain its full complement of 450 men , and, to give strady employment te this force, provided for the construstion of telegraph lines on our western frontiess utder the dirscion of the Chief Signal Officer. One of these liaes bigins at Dennison, in Texas, and ends at Brownsvile, in the same
State, connecting a string of military posts with the civilized world. Tha total length of this line is $1,2 a 0$ miles, and it crosses the famous "Staked Plaia" for hundreds of miles. The plain is utterly destitute of timber and water, and passes through the heart of the country which is now the seat of Indian hostilivies, from which it will be seen that the difficulties to bs ovarcome by the builders are of no ordinary magnitude.

Another line, ordered to be built under the same auspices, starts at Prescott, Arizona Territory, and extends through Camp Verde to Camp Apache in the same territory, a distance of about two hundred milcs, connecting with the line built by the War Dapartment last year from Prescott to San Diego, which has been since transferred to the Signal Diego,
Office.

Besides these lines, the Signal Officer has a line from the office in this city to Cape Hatteras, and another to Sandy Hook, Long Branch, and Barnegat, N. J. ; and the latter is being extended to Cape May. By this means a continuous line will run from Cape May to Sandy Hook, and the cautionary signals are to be so arranged that a vessel passing within sight of the coast can always have notice of an approaching storm in time to run into the nearest harbor. A signal sta tion has recently been established on Thatcher's Island, off Cape Ann, Mass., connected by a cable with the mainland, one and a half miles distant. Further extensions of the service are contemplated as soon as Congress can be induced to make the necessary appropciations, and it is proable that the entire Atlantic and lak $\Rightarrow$ coasts of the United States will soon be protected by the telegraph, and in constant communication with this city.
A commission has been appointed by the commandant of the navy yard to examine and test a new system of caulking boiler seams, the invention of Mr. James Connery, chief of the boiler department of the Baldwin Locomotive Works,to whom letters patent were granted therefor on May 12, last. The invention consists simply in using a caulking tool having a convex end, which produces a smooth concave indentation in the edge of the overlapping plate, and avoids the danger, almost inseparable from the old fashioned tool, of making a groove or cut in the under plate, whereby its strength is much weakened, and a starting point formed which will readily rend upon any unusual pressure being brought to W
Washington, D. C.
Occasional.

## Lunar Acceleration: Its Cause,

To the Editor of the Scientific American:
As has been the case with other theorists and their theories, so with me and mine. Few scientists have hitherto admitted the retrograde motion of the sun in space, and one, or two have even had courage enough to say : '‘It is not true," and so also with other of my theories. I make all objectors and objertions welcome of course. Candid, honest exchange and interchange of opinion is what this world needs; and it seems to me that this is as powerful and potent a way as any to reach the truth. My objoct in writing this article is not only to show your readers the fact that lunar acceleration is not of increased motion in the moon, as some eminent scientists have supposed, and that it is owing to in creased velocity in the sun; but also to present a fresh, un-
deniably demonstrative proof of solar retrograde motion. And as the subject, even to scientific men and great think ers, is not so easily grasped and comprehended as many are apt to suppose, I will, with your permission and indulgence, thus simplify and explain it in as short and concise a manner as I can.
Seated in imagination at the zenith, and looking down upon our solar system, we see it all in action as we see a working machine. And when we look upon the vast area of the solar orbit, and behold thesun, as it were, slowly tracing
his retrograde way all round the ecliptic, on the border or his retrograde way all round the ecliptic, on the border or
periphery of his orbit, and liken it to a vast and by far the largest wheel in the celestial machine: and when we look upon the orbit of each planet, being likewise respectively a wheel, a wheel having its center in the sun, and the planet sitting on its (the wheel's) periphery: and when we remember that the motion of the great wheel is retrograde, and that of all the smaller wheels direct, and that every smaller wheel is carried gradually retrogressively by virtue of the motion of the largest one: I say, when we see and remember all this of our greatsolar planet-wheeled system, we cannot but see that every second, minute, or degree of space retrograded by the sun must yield correspondent phenomena to or upon every other wheel or planet. And so also the motion of one planet or satellite around another must yield its phenomenon. Thus premised, I now proceed to show, from real astronomical data and discovery, that increased and increasing velocity of the sun is certainly the origin and all of so-called lunar acceleration.
To begin: The data which astronomical writers give regarding the motion of precession is substantially as follows The stars appear to move directly (annually) about $501^{\prime \prime}$, or about $1^{\circ}$ in $71 \frac{1}{3}$ years; and the equinoctial points, of course recede that much in the same time. This recession of the equinoxes, versus precession of the stars, is owing. to the retrograde motion of the sun; and from the said motion comes, likewise, recession of eclipses; for eclipses, when we take them in cycles, do recede round the ecliptic as the equinoxes do, and at the same exact rate too. At such a rate of motion, the sun would require some 25800 years to move round the ecliptic or to complete his orbit ; and if his rate of motion wasever the same, there would be no acceleration, so called in lunar motion. It is because this motion of the su is ever on the increase that the phenomenon alluded to

As proof of theincrease of solar motion, the writers alluded oo tell us that precession is constantly increasing at such rate as amounts to 218 years less every $90^{\circ}$ or quarter revo ution, and say that, owing to the said increase, precession will complete a revolution in about 24.992 years, instead of the number of years above given. This increase, I claim, is the increase exactly of solar motion. And now I am
going to show, not only that it produces lunar acceleration,
but also that its result is in absolute accordance with the discovery and deduction of some of the most profound astrono. mers who ever lived.
Halley and some other eminent astronomers found, when comparing the present time of eclipses with that given by the most celebrated of ancient Egyptian and Chaldean as tronomers, that, to make both agree, it is necessary to allow a lunar acceleration per century of about 11 seconds. Thus, then, we have the amount of lunar acceleration per century, as set forth, and no doubt perfectly correctly, by the wisest and most able of past astronomers. See how our theory works hand to hand in the matter, and proves them correct. The increase of solar motion is equal to 218 years less every quarter or $90^{\circ}$ of the orbit. The whole will be run in 24,992 years, thus: For the first quarter, 6,575 years; for the second or present quarter, 6,357 years; for the third, 6,139 years ; for the fourth, 5,921 years; in all, 24,992 years. Taking the mathematical amount of increase, or the 218 years, out of the past 6,575 years, we find that it is almost $1^{\circ}$ for every $30^{\circ}, 2^{\circ}$ in 60 , and $3^{\circ}$ in $90^{\circ}$, or about $\frac{1}{30}$ of the whole. We have therefore three degrees of solar retrograde advance, and of course three degrees of so-called lunar acceleration, since a point of time seven hundred years beyond the birth of Adam, and of $51^{\prime} 26^{\prime \prime}$ since the birth of Christ. Now as the earth in her diurnal motion moves through the whole $360^{\circ}$ in 24 hours, through $90^{\circ}$ in six hours, $3^{\circ}$ in twelve hours, and through $51^{\prime} 26^{\prime \prime}$ in 3 minutes and 26 seconds; it follows that since the year 1 (Cbristian era) the moon has accelerated the earth about three minutes and twenty six seconds, versus the earth's retardation,which is equal to $51^{\prime} 26^{\prime \prime}$ since the birth of Christ. Need I tell your readers that three minutes and twenty-six seconds, of lunar acceleration since the birth of Christ, is equal to 11 seconds per century? That is just what it is. Consequently the phenomenon of lunar acceleration is not of the moon, nor in the moon, but of the sun. It is not an acceleration of the lunar motion, but clearly and positively acceleration in the sun.
Thus wise, accurate, and profound astronomy and despised rejected theory meet, kiss, and fall into one. Yet, strange to say, the present learned astronomic world cannot see it. It must, though, no doubt, soon. John Hepburn. Gloucester, N. J.

## The Sczaroch.

To the Editor of the Scientific American:
The idea of making a projectile contain a part of the powder charge, and thus causing two explosions of the charge nstead of one, originated with Mr. James Rose, of the Ashford Railway Worke, in England, in the year 1854. Drawings were made and submitted by him to several prominent English engineers, and to at least one government, in that year. There are several engineers in this city to whom I have, during the last five or six years, shown sketches o

## such projectiles.

279 West 12th atreet, New York city.
Joshua Rose.

## tevens Institute of Technology.

The Stevens Institute of Technology has commenced its third college year with a new class of over fifty in number -double the number that it was originally proposed to admit as a maximum. The large space necessarily devoted to its laboratories, workshops, and drawing rooms compels his restriction of numbers. The aim must consequently be to educate a limited number of young men of more than verage ability, keeping the standard so high that the quali ty of educated material given to the engineering profession by that college may compensate for the comparatively small number of its graduates.
The indications are that the authorities will soon be com pelled to raise both the requirements prescribed for candidates for admission and the charges for tuition.
No student of good habits, of intelligence and high general character, and capable of taking a high position in this class has ever yet beendenied instruction because of poverty,and it is not probable that this generous policy of the trustees of Mr. Stevens' noble bequest will be changed.
The museum, the mechanical laboratory, the collections in the department of engineering and other cabinets, are continually receiving important additions, principally from our most successful and most intelligent manufacturers. Such contributions are of most practical value, and must aid the Faculty in their work in a very important degree.
The Saw Premium at the Cincinnati Exhibition.
The prize offered for the best circular saw at the Cincinati fair, $\$ 100$ in gold, was awarded to Messrs. Emerson, Ford, \& Co., of Beaver Falls, Pa. There were nine contest ants,and the work done by each saw was remarkable for ex cellence and rapidity. A Cincinnati contemporary says that Mesers. Emerson \& Co.'s solid tooth saw, " when it struck he test log, showed its real metal. It took in the situation most beautifully, making the sparks fly gaily at every en ranceinto the tough poplar, but was steady and kept right down to actual work all the time, making sixteen good boards, $10 \times 20$, in two minutes and forty-four seconds, on $3 \frac{1}{1}$ inchesfeed, and coming out cool as a cucumber. The oak log was then placed upon the carriage, and the saw proved that its appetite had merely been sharpened by the poplar It cut;welve oak boards, $12 \times 15$, in one minute and forty-
three seconds, all No 1 . lumber. This is the crowning feat three seconds, all No 1 . lumber. This is the crowning feat of the test so far."
Mesers. Emerson, Ford, \& Co. were also awarded the ser medal for the best saw exhibited.

German Silver for Casting.-Coppor, 50 lbs. ; zinc, 20

## PRACTICAL MECHANISM.

## by Joshta rose. <br> LATHE WORE.

The centers of a lathe should be turned both to an equal taper, a gage being used for the purpose. The running center should be tempered to a blue and the standing center to a brown color. If the holes in the headstock or tailstock of the lathe into which the centers fit are out of true, as is some times the case, a center punch mark should be made upon the
diameter of the exposed part of the center, and another upon the end face of the spindle, and the center always placed so that the two "center pops" are opposite to each other; thus the centers will run true whether the tap holes into which they fit are true or not.
After the centers are hardened, care should be taken to properly clean their taper parts so that there may be no dirt or grit upon them to cause them to run out of true. If the running center is removed from the headstock, as is sometimes necessary in boring and for other purposes, the hole into which the center fits should be plugged with a piece of waste or rag to prevent it from becoming filled, or partly so, with shavings.
Plain work that is not easy to handle may be marked off for the center punch by a pair of compass callipers, and light work as follows: Place upon a planed surface a pair of paral. lel strips or pieces, one being under one end, the other under the other end, of the work; then set the point of the scribing block scriber as near the center of the work as the eye can determine, and draw a line across the end of the work; then turn the latter upside down and mark another line across its end; the work must then be turned a quarter revolution, so that the next line marked by the scriber will be at about rignt angles to the two lines already drawn, which being done and the line drawn, the work must again be turned upside down and the final line drawn, when the end of the work will be marked as shown in Fig. R, an illustration

of an end view of a piece of round iron so scribed, in which case the center of the small square formed by the lines around the center of the work will be the center of the latter. It is obvious, however, that, if the scriber be placed at the center of the iron, only two such lines will be visible, the point of their intersection being, in that case, the center of the work.

The centers of all lathe work should be cleared at the extreme central part, so that such part will not revolve against the points of the lathe centers, which would cause the work to run out of true after running a short time in the lathe.
Such clearance is best accomplished by drilling a small hole in the central partiof the work centers; it may, however, be done by using a center punch of a more acute taper than is the lathe center, or by cutting out the centers by means of a square center, as will be hereafter described. The drilling is, however, the preferable plan, being the lea cause the centers of the work to wear out of true.

If, however, the work requires to run very true, as in the case of recentering work which has once been turned, the square center must be employed to cut the center of the work true to its circumference. A square center is a center fitted to the latbe in the same manner as the common center, but having four flat sides ground upon its conical point, all four sides meeting at the point, and having sharp edges as shown in Fig. S, $a$ a being two of the flat sides referred to:

the taper of these sides should be more acute than is the taper of the lathe center, so that the center cut in the work by the squarecenter shall not bear upon the point of the lathe center, and cause it to run, in time, out of true. The square center should be hardened to a straw color, and may then be used to simply countersink centers which have been centerdrilled, in which case it is put into the center hole of the head of the lathe and revolved at a high speed by the lathe) while the work is forced up to it by winding cut the back center, the work being between the two centers. To center work very truly, it is employed as follows: The square center is put in the tailstock spindle of the lathe, in the same way as the ordinary center is placed, the wark having a dog or driver placed on it, as if the intention vere to turn the work; it must then be placed in the lathe between the centers. A piece of iron or steel, having a hollow or flat end (as, for instance, the butt end of a tool) must thon be fastened in the tool post of the lathe; then the lathe nay be started and the tool end wound against the end of the work (close to the square center) until it touches it and sorces it to run truly, in which position the tool end is left, vhile the square center is fed up and into the work until the latter is true, when the operation will be completed. Before any turning is done to the diameter of any lathe work which runs batween the centers, the ends of such work shouldibe made true; because
quite true, the center gradually moves over to the lowest
side, as explained by Fig. 41, $a$ being a sectiou of the work, $B$ the dead or standing cen ter of the lathe, $C$, the high, and $D$, the low, part of the end of the work; to the latter the center gradually moves. All work which requires to be turned at both ends (and hence must be turned or placed end for end in the lathe) should be roughed out (that is, cut down to nearly the required size) all over before any part of it is finished, or, when turned end for end in the lathe, the part first turned up will run out of true with the part last turned up, though the lathe centers may be correct y placed. This may be caused by the centers of the work moving a little as they come to their bearings on the lath centers, or in consequence of breaking the skin of the work for nearly all work alters in form as its outside skin is re moved, especially work in cast iron.
Lathe work requiring to be very finely finished and highly polished should be cut as smoothly as it can be by the tool, so as to leave as little as possible for the file to do, because a file used on lathe work cuts the softer parts of the meta more rapidly than it does the harder parts, and hence makes que work out of true. The file should therefore only be re
quired to take off the fine marks left by the tool, and should quired to take off the fine marks left by the tool, and should
be a dead smooth, used with chalk, applied in the same manner as already described for vise work. The emery cloth or paper should be moved rapidly back and forth so that the emery marks cross each other, which will remove the file marks quickly. Use finer emery paper as the finishing progresses, and conclude with the most worn of the finest emery used, moving it along the work very slowly and pressing it very lightly. The grades of emery paper hould be the same as those given for vise work; and a finish and polish so fine may be given that it cannot be discerned whether the work was finished end wise or in the direction of its circumference. For finishing the faces of lathe work (in which case a file cannot be employed), the tool marks may be taken out by using grain emery applied with oil to the end of a wooden lever, fastening a tool or piece of iron in the tool post as a fulcrum for the lever. In this case, however, the the work towards the periphery and vice versa, so that the emery marks cross each other; then when the tool marks are erased, emery paper (of finer and finer grade, as the finishing progresses) may be used, concluding as before with the most worn of the finest emery paper used and moving it slowly. The reason of the necessity of keeping the lever moving and the emery marks crossed is that, if the lever or emery cloth is kept in one position or nearly so, it will cut rings in the work; and wherever there may be a hollow sp 4 or sand hole in the metal, the emery will accumulate and cut a groove in the work; erpecially is this the case in work of cast iron or brass. It is not possible, however, under any circumstances, to finish work so finely in the lathe as may be done by hand in the vise.

TURNING ECCENTRICs.
If an eccentric has a hub or boss on one side only of its bore (as in the case of those for engines having link motions, where it is desirable to keep the eccentries as close together as possible in order to avoid offset either in the bodies or double eyes of the eccentric rods), the first operation to be performed in turning it up is to chuck it with the hub side towards the face plate of the lathe, setting it true with its outside diameter (irrespective of the hole and hub running out of true), and to then face up the outside face. It must next be chucked so that the face already turned will be clamped against the face plate, setting the eccentric true to bore the hole out, and clamping balance weights on the face plate, opposite to the overhanging part of the eccentric. The hole, the face of the hub, the hub itself (if it is circular), and the face of the eccentric must be roughed out before any of them are finished, when, the whole of them may be finished, to the requisite sizes and thicknesses. The eccentric must then be turned about and held to the chuckplate by a plate or plates clamping the hub or boss only, the diameter of the eccentric being set true to the lines marked to set it by; then the diameter of the eccentric may be turned to fit the strap, the latter having been taken apart for that purpose. The
reason for turning the strap before the eccentric is turned reason for turning the strap before the eccentric is turned
is (as may be inferred by the above) that the strap can be fitted to the eccentric while the latter is in the lathe, whereas the eccentric cannot be got into the strap while the strap is in the lathe. The strap should have a piece of thin sheet tin placed between the joint of the two halves before it is turned out, which tin should be taken out when the turning is completed, and the strap bolted together again. The size for the eccentric will then be from crown to crown of each half of the strap.
The object of inserting the tin is to make each balf of the eccentric bed well upon the crown, and to prevent it from bearing too hard upon the points, as all straps do if the joint is not kept a little apart during the boring process. If the eccentric is already turned, an allowance may be made for the thickness of the sheet tin between the strap joint by points when aring same tin bence the the size for the points
strap.
Ecce

Eccentrics having a proportionally large amount of throw upon them are sometimes difficult to hold firmly, while their outside diameters are being turned to fit the strap, because the hub which is bolted against the face plate is sa far
from the center of the work that, when the tool is cutting
on the side of the eccentric opposite to the hub, the force of the cut is at a considerable leverage to the plates clamping the eccentrics; and the latter are, in consequence, very apt to move if a heavy cut is taken by the tool. Such an eccentric however, usually has open spaces in its throw, which spaces are placed there to lighten it ; the method of chucking may, under such circumstances, be varied as follows: The outside diameter of the eccentric may be gripped by the dog chuck, if the dogs of the chuck project far enough out to each it (otherwise the dogs may grip the hub of the eccenric), while the hole is bored and the plain face of the eccen ric turned. The eccentric must then be reversed in the athe, and the hub and the face on that side must be turned. Then the plain face of the eccentric must be bolted to the face plate by plates placed across the spaces which are made to lighten the eccentric, and by a plate acioss the face of the hub. The eccentric being set true to the lines may then be urned on its outside diameter to fit the strap; to facilitate which fitting, thin parallel strips may be placed between the face plate and the plain face of the eccentric at this last chucking. It will be observed that, in either method of chucking, the outside diameter of the eccentric (that is to say, the part on which the strap fits) is turned with the face which was turned at the same chucking at which the hole was bored, clamped to the face plate. In cases where a number of eccentrics having the same size of bore and the same amount of throw are turned, there may be fitted to the face plate of the lathe a disk of sufficient diameter to fit the hole of the eccentric, said disk baing fastened to the face plate at the required distance from the center of the lathe to ive the necessary amount of throw to the eccentric. The best method of fastening such a disk to the face plate is to provide it with a plain pin turned true with the disk, and let it fit a hole (bored in the face plate to receive it) sufficiently tightly to be just able to be taken in and out by the hand, the pin being provided with a screw at the end so that it can be screwed tight, by a nut, to the face plate. The last chucking of the eccentric is then performed by placing the hole of the eccentric on the disk, which will ensure the cor rectness of the throw without the aid of any lines on the eccentric which may be set as true as the diameter of the casting will permit, and then turned to fit the strap. A similar disk, used in the same manner, may be employed on cranks, to ensure exactness in their throw.

## New spectroscope.

The instrument is the invention of Professor A. K. Eaton, of Brooklyn, N. Y., and is by himself named "a directvision spectroscope." It consists of a thick plate of glass with parallel sides, united to one of the faces of an ordinary bisulphide of carbon prism, or a prism of dense flint glass According to the amount of dispersion desired, the light is made to euter either on the end of the glass plate, or on the opposite face of the bisulphide prism. The results obtained from this instrument are as follows: The dispersion of this compound prism is nearly four times greater than that of the ordinary $60^{\circ}$ prism. The mean emergent ray is practi cally parallel to the incident ray. It does not deflect the ray from its original path. Many Fraunhofer lines are visible by this prism with the naked eye, while with the ob. serving telescope all the prominent lines are clearly reversed, without the use of the slit or collimeter, by merely throwing a strong beam of light by means of a mirror.
When the usual appliances of slit- collimeter and telescope are employed, it widely resolves the D line, and shows the nickel line between these two lines-a result claimed as the best obtained by a four prism instrument of Brownas the
ing.
It is
It is stated that a simple bisulphide prism in this instru ment gives a dispersion of $40^{\circ}$ between the B and G lines; at a distance of 10 feet from the screen, enabling 100 dark lines to be counted.
It is evident, therefore, that this prism promises to become a most valuable instrument for projection in the lecture room, while either solar, electric, or oxyhydrogen illumination may be employed, having the great advantage of sim plicity of adjustment, since it avoids the necessity of turn ing the lantern after the slit has been focussed on the screen

## The Louse a Substitute for the Compass.

The Great Dismal Swamp is partly in North Carolina and partly in Virginia. It is 40 miles long and 15 to 20 miles wide. Professor Webster, at the late meeting of the American Association, told the story of a party that divided in the swamp, one portion of the party having no compass. The latter portion of the party was lost, and after long wandering found their way out by a singular expedient. They made use of the insect for which fine tooth combs were invented. Putting the insect on a flat piece of wood, and leaving it to its own devices, it invariably began to move in a certain direction. This direction was followed out by the party, and they were thus led out to the northward. It is supposed that this instinctive movement of the insect is due to its seeking the way toward the greatest light.
Extension of Underground Railways in London.At the enormous cost of $\$ 12,500,000$, the Metropolitan Inner Circle Railway Company is busily engaged in carrying out its plans. In addition to the construction of lines, stations, etc., this company is compelled to make an entirely new street, from Fenchurch street to King William street, and also to widen the streets right and left which branch therebrom. The importance attached to this enterprize may be gathered from the fact that the Metropolitan Board of Works and the corperation of the City of London have subscribed the sum of $\$ 2,500,000$.

## IMPEOVED AIR SPRING FORGE HAMMER.

The ann+xed +ng avioge represent the spring forge hammar of Mr. Hotchkiss, in which air is used as the elastic medium, and the principle of which has already been ap plied, during the past fifteen years, to a wide range of purposia; and it is capable of still further extension. Such hammers can be made of nearly any weight, the heaviest being suited for use on heary forgings, for ore crushing, and similar duty; and small ones are employed for planishing metal surfaces and forging spectacle bows, corkscrews, and other fine work. An ther and a curious use for the invention is its application in a water engine for blowing organ bellowe: the escape holes in the cglinder being usefulin overcaming the dead center, on which the piston would ordinarily remain, causing a tremulous effect on the sounds issuing from the pipes. Five hundred of these hammers, of various sizes, are now doing good work in all parts of the country. The inventor states that a 40 lbs. hammer will draw a three inch bar three feet at one beat.
By the construction, as shown in the engravings, the cyliuder and hammer move in vercical slides; each blow is square, and die work can be forged with the greatest nicety as well as rapidity; the number and force of the blows can be varied at will by the operator, and the maching, it is claimed, requires less power than any other hammer giving the same blow. The air is compressed by the piston, $B$, in the cylinder, A, the fit being airtight, as shown in Fig. 2. The slides, C , keep the cylinder and piston vertical, and the motion of the latter is effected by the rotation of the crank disk, E , driven by belting, and operating the connecting rod, D . The holes, F, in the cylinder, A, allow free ingress of air, thus insuring a perfect cushion at each stroke. G is the anvil, which, being moeach stroke. $G$ is the anvil, which, being mo-
vable, can be readily changed to suit any work vable, can be readily changed to suit any work
for which the machine is used. A guide'pulley, for which the machine is used. A guide'pulley,
operated by the treadle, I, for tightening the belt into action is also provided.
The claims cover the use of an interposed spring cushion of air, rubber, or metal, and an actuating mechanism baving a definite reciprocating motion. A considerable reduction in the expense of these machines has lately been effected by casting the wholeframein one piece, as shown in Fig. 1.
For further particulars, address Messrs. D Frisbie \& Co., maunfacturers of the machine, 26 and 28 Grand street, New Haven, Conn.

## A NEW BOILER COVERING.

A new boiler covering, the construction and mode of application of which is represented in the accompanying en. graving, was patented July 21, 1874, through the Scientific American Patent Agency, by Messrs. Alonzo Irons and Lewis Clayton, of N. W, corner of 13th street and Washington is Clay , Pa , is provided with a number of short studs, B, secured to it by

washers, C , to form an inside fastening and to prevent the sweating of the boiler, when cold, from loosening the cement. To this fabric is applied a non-conducting compound, D , and the whole is supported at a short distance from the boiler. This affords an air space between the casing and boiler, which not only largely aids in retaining the heat in the latter, but also prevents cracking or breaking, as might be the case were the covering placed directly in contactwith the generator, and so subject to the contraction and expan sion of the boiler shell. In practice the wire cloth is first fitted to the boiler, and the non-conducting compound subsequently applied in a plastic state.
For further particulars address the inventors as above.

Soda Hailstones.
On the 9 th of June of this year, a great hailstorm was ex perienced at Elizabeth, N. J ; and of the many hailstones which fell on the occasion, two have so peculiar a history as to deserve especial mention. One of them, when found " appeared to be a mass of ice, but as the ice melted away, there remained a clear crystal of this salt"-meaning the salt referred to in the analysis stated below-" which, in
drying, became pulverulent on the surface, and finally broke


## The Cerman Navy.

The Friedrich der Grosse, which has just been launched is the seventh iron-cased frigate of the German navy, at d the eighth being expected to leave the stocks early next summer, the autumn of 1875 , or, at the very latest, the spring of 1876, will see a rather formidable squadron assembled off the Oldenburg coast. By that time Germany will be mistress of eight iron-cased frigates, carrying 92 guns of the very heaviest caliber (mostly 400 and 500 pounders), and $s=t$ in motion by engines with a total of 48,500 horse power. In addition to these firstclass ships there are three more ironclads of minor proportions, making up togetber 15 heary guns and 5400 horse power. Twelve corvettes (the twelfth will be ready next year), with 168 heavy guns and 18,600 horse power attended by 24 gunboats, mustering 59 guns and 8,850 horse power, complete the fighting array of the youthful but aspiring fleet. Of the corvettes some have 20 , others 10 or 15 guns, 3 of the number carrying only 5 , with engines of above 2000 horse power, being intended to act on the Alabama plan in far-off seas. The names of these peculiar vessels, which will probably be heard of in the next war, whenever that may be, are Ariadne, Louisa, and Freya, the last being yet on the stocks. The whole German navy, including, beside the above, 3 sailing frigates and 3 zailing brigs, already numbers 55 ships, 425 guns, 73,768 already numbers
tuns, and 84,770 horse power. About 4,000 sailors, with 1,000 marines, 500 artillerymen, and officers in proportion, were this year reported in the Blue Books. Next year will wit ness an increase of about 2,000 , in consequence of the new ironclads being equipped for active service.
Europe at this moment has 142 ironclads fit to be placed in line of battle. Of these Eng land owns 38; France, 28; Austria, Russia, Italy, and Turkey, 15 each; Germany, 8 ; Spain, 7 ; Denmark, 3; Greece, 2. The tunnsge of the German ships and the size of their guns are, however, so uncommonly great that, although few in number, they are supposed to be more than a match for any navy, those of England, Russia, and France excepted.

## DOUGH KNEADER AND CUTTER.

Another ingenious device for lightening " woman's labor,"-this time in the kitchen. Our engraving represents an invention which is a dough kneader, a cutter, a scraper, and a rolling pin, all in one,-which abolishes the use, first of the bare fists; second, of an inverted spice box, or whatever else may be the favorite implement for molding cookies, cakes, or crackers; third, of the table knife blade; and, fourth, of the time-honored and cumbrous wooden roller. Besides it saves steps, in having the three last mentioned implements always conveniently at hand, and economizes one's stock of patience in that rather tedious though not to be neglected patience in that rather tedious th.
operation of kneading the dough.
peration in
The device is made of tin, suitably strengthened inside. The forward $U$ shaped portion constitutes the kneader. When this is in use, the palm of one hand is rested on the part, A, the fingers being placed in the curved handle, B, so that a secure hold is thus obtained. To gain greater power, the other hand is applied to the curved upper end, C, the

edge of which portion, sharpened, forms the scraper for gathering the dough or dividing the same, as required. At D is the roller, the shaft of which entrers apertures in the body, and is secured by pins so as to allow of ready detacking. Lastly, the dough cutters, E, of different shapes, are applied by central tu bes to sockets at both sides of the body, and may be used with the latter as a handle, or be removed and used separately.
Patented through the Scientific American Patent Agency April 21, 1874, by Mr. Frank Möckli. For particulars rela tive to sale of the patent, address the present owner of the same, Mr. Valentine Lorra, Galveston, Texas.

A Good Britannia Metal.-Tin, 150 lbs.; copper, $3^{7}$ lbs. antimony, 10 lbs .

THE CULTIVATION OF THE VICTORIA REGIA. The English Garden gives the following description of the cuitivation of the water lily of the Amazons, known as the Victoria $R$ geia: The indoor culture of this $p^{\text {lant }}$ is very simple. Although not naturally an annual, it flowers much better when treated as one, seedlings being raised every winter. These are simply planted out, in the spring, on a mound of ricbly manured compost, the temperature of the surrounding water being kept as near $80^{\circ}$ Fah. as possible, by means of hot water pipes whicb are conducted round the bottom of the tank. In order to keep the water fresh and sweet, some system must be adopted to secure circulation and this may be obtained by, and this may be obtained by having wer constanlly flowing into the tank on one side with an outlet at the other. Some cultivators employ a small over hot wheel, which is turned by the ivflowing water, and at the same time keeps the whole body of the water in constant motion. This appliance is, however, not absolutely necessary, as the inlet and outlet pipes, with a constant supply of frewh water, are all that are requisite to insure succers. There are, however, many situations out of doors in which this plant will not only make a luxuriant growth, but produce flowers during the summer months. It has already flow. ered at several places in En gland, where tanks have been formed to receive the condensed steam from the engines of water works or manufactories, and in favorable situations like these it deserves a fair trial. The main elements of, success consist in having a strong, healthy, well established plant ready for planting out in the latter end of May or beginning of June; and in order to prevent the growth being checked, it would be advieable to have the young specimen planted in a coarse basket of wickerwork, using a rich compost of sandy loam and well rotted lentbed manure. This basket and its contents would not take up much room in a shallow tub or tank in the plant stove, and when the mild weather arrives the plant could be graduaily hardened off; and the basket and its con tents might then be placed in a suitable position in the open air tank. The plant is readily propagated from seed sown during the winter months, or nearly as soon as it is ripe.
The plant is a native of Guiana, where it occurs in the Pa rana river, and in South America, being found abundantly in some of the sheltered tributaries of the Orinoco, and also in those of the Amazon. In its native habitat, the flowers acquire a richer rosy tint than in hothouses, where it is a rarity to see more than one of its delicately perfumed flow ers open at the same time. The leaves of this species are frequently 6 feet, or even more, in diameter, and float on the surface of the water, being supported by a beautiful network of hollow veins. The under surface of the great tablelike expansion is of a rich purple color, the upper surface being deep green. The plant is frequently to be seen in bloom at Kew, Chatsworth, and many other celebrated gar dens in Evgland. We select the excellent engraving of this beautiful exotic from the pages of our cotemporary above mentioned.

The Society for the Promotion of Scientific Industry.
We have received, by the courtesy of Mr. Frank Spence from Manchester, England, the report of this recently instituted body, which has already done good service to the scientific industries by carrying to a successful issue the recent exhibition of devices for the economical consumption of fuel. Some excellent inventions, called forth by this competition, have been illustrated and described in our journal. The society also sent tbirty-four akilled workmen to Vienna as reporters, and their accounts of the Exposition and their criticism of the exhibits are interesting and valuzble. The institution also publishes a journal, intended to keep its members posted as to contemporary events. It numbers many important leaders of the scientific and industrial specialties among its members, and seems to be doing much usefu work.

## Importance of Salts in Food

Mr. Foster has made oome interesting experiments on doge and pigeons, which show that animals suffer and die when inorganic salts are altogether absent from their food, although the other nutritive constituents may be abun lant. In all the animals tried, there was a condition of muscular weakness, tremor, and general exbaustion. In the dog, the muscles of the posterior extremities, from the second week of the experiment onward, gradually assumed a paralytic character, as when the function of the spinal cord is weakened. The activity of the cerebrum was also impaired, as was evident from the bluntness of the senses and apathy of the animal. Later on, increased excitability often appeared; the dogs were terrified at any quick motion; one had a brief attack of madness, but soon crouched down trembling and growling. On being taken out, it ran forward and knocked its head violently against a wall. After the animals had been deprived of salts for some time, the juices of the intestinal canal either lost their digestive power or were not se-
creted in proper quantity, and nutrition was thus interfered with. Death took placa, however, from the alterations in the nervous system, before there had been time for it to occur from inanition. The quantity of salts necessary to life is smaller than is generally supposed, but the exact amount re quired is still to be determined.
These experiments amount practically to a scientific exposure of the unnaturalness and consequent abnormality of the use of sifted wheat flour the principal food of women and
upon those which grow in damp situations. It is sometimes found only here and there in small tufts, but frequently it is in such quantities upon a tree as to appear to fill all the spaces between its branches, and from the lower limbs it hangs in pendent tufts several feet in length, which, as they are swayed by the wind, wave with a certain amount of grace. In localities where it is abundant, its dull gray color and general drooping habit produce a very somber effect. As it grows most luxuriantly in situations which, from being constantly moist, are unhealthy, it is easy to associate it with disease and death, and in some localities it bears the not very cheerful name of coffin fringe. Though popularly called moss, it does not belong to mosses, properly so called, at all, but, strange as it may seem, to the pineapple family, the bromeliacece. Its botanical name is Tillandsia usneoides, and was named in honor of a Russian professor, Tillands. Its specific name means "resembling usnea," a long drooping lichen which hangs from northern trees in a similar manner.

Aside from forming a striking feature in the landscape, says The American Agriculturist, the long moss is of no little economical importance. The central portion, exceedingly tenacious and elastic, has long been employed as a sub. stitute for hair. The plant is
THE VICTORIA REGIA WATER LILY.
children, and of too many men. The inorganic salts are almost absent from this artificial food, the chief material weakness of modern pseudocivilization. Mr. Foster's experiments are contributed to the London Medical Rezord. LONG MOSS.
There is a singular and beautiful parasite, known by the
found in Central and South stitute for hair. The plant is and has been put to 80 many uses by the Spanish American that in some localities it is known as Spanish moss. The primitive method of procuring the fiber is to place the moss in shallow ponds, exposed to the sun, to rot the somewhat fleshy outer covering; it is then taken out and allowed to dry, after whicha moderate beating removes the outer portion, and the fiber is left in a black tangled mass, which, but for its branching character, it would be difficult to distinguish from hair. Northern people, traveling in the South, frequently send home specimens of this moss, and we have seen it suspended from trees growing on lawns in several places during the past summer.

Population of the United States.
The first census of the country was taken in 1790, and decennial censuses have been taken ever since. An estimate has been made for the ten years previous to 1790 , from the data of years $1790,1800,1810$, and 1820 An examination of these years exhibited successively by subtraction two second differences that were nearly equal, so much so as to indicate in general, as the law of their progression, approximately, constant second differences. From the avtrage of these second differences, treated as a second difference for completing the ceries, the population for the year 1780 was estimated at $3,070,000$.
The present and prospective population of the United States is as follows:


Dr. J. C. Cooper, who has made the most careful surveys of the State, says that the geological facts are all against the probability of the existence of any true coal measures in California. In ninety-nine cases out of a hundred, the alleged coal discoveries are of no value whatever. In other countries, the true coal of the carboniferous rock is formed of tree ferns, algæ, and other plants of low organization. None of these remains are found in California, but in their stead are found the remains of coniferous and dicotyledonous trees, or those having double-lobed leaves, the beds in which they are found being classed by geologists as lignites. In some parts of the State, this lignite is found in useful quantities, and may be employed, like peat, for local consumption.

## New Material for Aniline Lake

Professor R. Böttger finds that when an alcoholic solution of any aniline color is mixed with a sufficient quantity of infusorial earth (sometimes called mountain flour, a minutely divided silica), water added, and the mixture placed on fil. ering paper, the liquid will run off clear, while the earth retains all the pigment. Hitherto compounds of alumina only have been used forsuch purposes, to make the so-called lakes (carmine lake, madder lake, etc.) The behavior of the excessively cheap infusorial earth to the aniline colors here described will undoubtedly lead to some practical application.

A REOENT test of the relative strength of oak and Oregon pine, made at San Francisco, with bars each 1 inch square and 3 feet long, showed that the pine was equal to the oak. Both broke under the same weight placed in the middle of Both broke under the sam
each bar, namely 260 lbs.

THE EARLY HISTORY OF WHEELED VEHICLES AND RAIL WAYS.
NUMBR 1.

Nothing, perhaps in the history of human achievement is more interesting and instructing than the opposition offered by cupidity and prejudice to those great mechanical im. provements and inventions which aro the just pride and boast of the nineteenth century. Wo boast that our age is distinguished from all other ages, aod endowed with a special wonder and glory by its material triumphs; that we have compressed the huge globe into a nsigaborhood and brought all its interests within the system of a daily newspaper; that we have caught and hainessed the wild forces of Nature that tear the arteries of the earth and heave volof Nature that tear the arterjes of the earth and heave vol-
canoes; that even magnificent Nature herself has been humcanoes; that even magnificent Nature herself has been hum-
bled to toil all day at our looms and in our factories, withbled to toil all day at our loome and in our factories, with-
out food, without sweat, and without weariness; and made to run on our meanest messages. Yet all this was accomplished in the face of violent opposition.
It may at first sight seem unreasonable and ungrateful that men, while constantly striving to better their condition, should be constantly opposing those who are contributing most to their success. But in truth, it is an hostility which has its origin in the diversities of tamper, of understanding, and of interest which are found in all eocieties, and which will be found so long as the human mind contivues to be drawn in opposite directions by the charm of novelty and the charm of habit. It has been the fate of every man who has ever attempted to enlarge the kno wled ge, or lessen the suf. ferings, or increase the comforts of his rase, to be withetcol by the most unreasonable opposition and well nigh overcome by the most bitter ridicule; and it always must bo ro. No man, not utterly destitute of all candor avd judgm n $n^{\dagger}$, will deny but that, in somre age anterior to the dawn of history, there were fools who opposed the introduction of the alpha bet and the plow with as loud complaints and as bitter in. vectives as our ancestors did that of the stage coach and tbe penny post; as wein our time have opposed railroads and telegraphs, and as fools, in some age yet far in the future, will resist some new invention or some new innovation of which the world has not now the faintest conception.
The workings of this strange species of human obstinacy, an obstinacy which the accumulated experience of nineteen centuries of progress has not been able to cure, is surely deserving of the greatest consideration, as the proper result of a cause lying deep in the innermost recesses of human nature, and which, while tending to degenerate us into bigoted dotards, has saved us from becoming shallow and reckless empirics. It will be our endeavor, therefore, to relate the history of that cruel opposition, meted out so unsparingly to those wonderful inventions now never mentioned without respect and gratitude in any part of the globe.
Of all inventions, the alphabet and printing press alone excepted, those inventions which abridge distance have undoubtedly done the most for the civilization of our species; and with these we propose to begin. To improve the means of locomotion afforded to man by Nature has been the intricate problem which all nations from the earliest down have attempted to solve; but in truth, it is only within the lifetime of the past six generations that anything approaching to a solution has been arrived at. Two hundred years ago there did not exist in all England a single navigable canal, not an inch of railway (as we understand the term), not a public conveyance that would bear comparison with the most lumbering farm wagon that can now be found on the prairies beyond the Mississippi, and not a mile of road which the traveler of today would not consider as imparsable. The accounts that have come down to us of the state
of travel in England under the reign of "Old Rowley, the King," are indeed surprising in the extreme. It was by the highways that both travelers and goods passed from place to place, and those highways appear to have been far worse than the most ruinous roads that can now be found outside of the sheepwalks of Austrslia or the jangles of South Africa. Thorsby has left us accounts of journeys made with a guide along roads that lead "over most prodigious high a guide along roads that lead "steeper "than the roofs of man houses," of rides hills," "steeper ,than the roofs of many houser," of rides
"along the edge of precipicps that grew to that light and "along the edge of precipicps that grew to that light and an inch of ground to set foot upou to al ght from our horses;' and of tramps over highways " full of ice a:d scow, rougher than a ploughed field, yet hard as iron." Hagbush lane, the principal bridle path from Lond on to the north of Eng. land, was worn so deep that the rider's bead was beneath the level of the ground on either side, and so narrow as barely to afford passage for a single lorseman. Indeed, in many parte, being once in it,to turn bark became utterly impossi ble, such was its extreme narrownefs! Nor does this seem to be the exception rather than the rule. John Marriott has
left us a humorous ballad on the "Devonshire Lane," left us a humorous ballad on the "Devonshire Lane," was in a condition quite as ruioous. Even on roads which the Englishmen of that day were accustomed to regard a the best, the ruts were deep, the descents precipitous, and the mud often lay so thick thatall commun!cation was cut off for months at a time, between towns sepa:ated by scarcely a score of miles.
Over such roads as these, as msy wel be supposed, the only practicable method of traveling was on foat or on horse. The rich rode: the poor walked. What the latter lust in comfort and speed they more than made up in fafety, for the
dangers of the road were by no means confined to its rugged-
ness. The mounted highwayman, a marauder known to this generation only from books, was to be found on every main road. The members of Parliament, the country gentlemen, and the rural merchants traveled in bands from the remote counties to the capital, armed with swords and pistols, and in hourly fear of being stopped and plundered by Turpin or Bradshaw, Duval or Macheath, or the hundred other celebrated banditti who infested the great North Road, Hounslow Heath or Shooter's Hill. Justices rode the circuits in jack boots, the bar following on foot, surrounded by a numerous escort armed to the teeth. Indeed a sum of money, called "dagger money", was annually contributed by the sheriff for the purpose of providing such eacort with weapons.
Such a state of affairs in our day would bэ mads the eub ject of "indignation meetings", "reform associations", and loud public demands for improvement. Bat with the men of Charles II's time, the casewas quite the reverse ; they vigorously resisted improvement; and it was not till many toll bars had been violently pulled down, and some blood shed, that a good system of road repairs was established; and not till the stage coach had been made the subject of much heated discussion, and numberless grave pamphlets and petitions to Parliament for its suppression had appeared that it ceased to be looked upon as a crying evil. This latter mode of conveyance was first introduced into England in the closing days of the Protectorate, but did not excite much public interest till the spring time of 1669, when a daring innovation was attempted. It was announced that a vehicle described as the "Flying Coach" would make the journey, " Providence permitting", from Oxford to London between sunrise and sunset. This spirited undertaking was solemnly considered a od sanctioned by the heads of the University, and appears to bave excited the same kind of interest which is excited in our cay by the opening of a new railway. The success was compl-te; but with the boasts of its supporters were mingled the complaints and invectives of its enemies. Large inter ests bad been unfavorably affected, and as usual many were disposed, from stupidity and obstinacy, to clamor against the innovation simply besause it was an innovation. In John Crasset'a 'Reasons for Suppressing the Stage Coaches", published in 1672, they are denounced as one of the greatest evils that had happened of late years to the kingdom; mischievous to the public, destructive to trade, and preju dicial to lands. The breed of horses would be destroyed, and men would grow careless of good horsemanship; th Thames, that had so long been the important nursery of sea men, would cease to be the chief thoroughfare from Londo ap to Windsor and down to Gravesend ; and saddlers and spur iers would be ruined by hundreds. It was vehemently argued that those who traveled in coaches became weary and listless when they rode a few miles and were unwilling to get on horseback, "not able to endure frost, snow, and
rain, or to ludge in the fields"; that to save their clothes and keep themselves clean and neat, people rode in coaches that this was ruinous to trade, " for that most gentlemen before they rode in coaches, used to ride with swords, belts, pistols, portmanteaus, and hat cases, which in these coaches hey have little"or no occasion for" ; and that after traveling wo or three journeys on horseback their "clothes were wont to be spoiled; which done, they were forced to have new very often, and that increased the consumption of the manufactures and the employment of the manufacturers, which traveling in coaches doth no way do." Such were
he cogent reasons for which our worthy forefathers de the cogent reasons for which our worthy forefathers de manded that the stage coach should be "put down." How it ultimately triumphed over all opposition, and became with its roey gilled coachman and facetious guard, its upsets nd break downs, its " outsides" and "insides," a peculiarly English institution, is familiar to all readers of English novels for three generations back.

## The Scient.

Mr. Proctor recently asked for a single word, whish, with out being objectionable,should convey the meaning of " man of science." Mr. Gosse has recently suggested the name "scient"-a word which receives the support of Mr. A. J Ellis, who, in the Academy for September 19, says: "I beg eave formally to introduce a scient into this heterogeneou company (from 'an incumbent', through 'a president', to
'an insolvent'), and to propose that this strictly formed disyllable should take the place of the American barbaric tri yllable 'scientist'. A 'scient' would not mean one who possesses knowledge in general' so much as one who re. jects all but knowledge for the foundation of bypotheses, and therefore constructs only with such materiald as be already 'knows'. A ' scientist' would then be an 'adherent to scients.'" It will be seen, however, from the letter of a correspondent that the word is not entirely unobjectionable, as it may be confounded with Science when it is spoken in he plural.-English Mechanic
We suggest that our cousins call him the " sci-ist," which will be O. K., used in the singular or plural.

Cause of Some Blasting Accidents.
One cause of accident in blasting, but little understood nd which applies to powder as well as nitro-glycerin, is thus tated: "The blaster, not aware that he is a walking charge of electricity, proceeds to his work, inserting cartridge after cartridge of nitro-glycerin, until he comes to the last, which is armed with the elertric fuse. The moment his hand oucbes one of the naked wires, the current passes through he priming, and explosion follows. Let a blaster, before he anoles these wires, invariably grasp some metal in moist enfd contact with the earth, or place both hands against the enfd contact with the earth
moist walls of the tunnel."

The following hints on examining a horse appear in The Maryland Farmer. They contain much good advice to the non-professional dealer, but fail to cover all the defects a horse may possess. But the chances are that the purchaser who gets a horse free from every defect herein enumerated will have a pretty sound animal.
Examine the eyes in the stable, then in the light; if they are in any degree defective, reject.
Examine the teeth to determine the age.
Examine the poll or crown of the head, and the with ers, or top of the shoulders, as the former is the seat of poll evil, and the latter that of fistula.
Examine the front feet; and if the frog has fallen, or setled down between the heels of the shoes, and the heels are contracted, reject him ; as he, if not already lame, is liable o become so at any moment.
Next observe the knees and ankles of the horse you desire o purchase, and, if cocked, you may be sure that it is the result of the displacement of the internal organs of the foot, a consequence of neglect of the form of the foot, and injudicious shoeing.
Examine for interfering, from the ankle to the knees, and if it proves that he cuts the knee, or the leg between the knee and the ankle, or the latter badly, reject.
"Speedy cuts", of the knee and leg are most serious in their effects. Many trotting horses, which would be of great value were it not for this single defect, are by it rendered valueless.
Carefully examine the hoofs for cracks, as jockeys have acquired great skill in concealing cracks in the hoofs. If cracks are observable in any degree, reject. Also both ook and feel for ringbones, which are callosities on the bones of the pastern near the foot; if apparent, reject.
Examine the hind feet for the same defects of the foot and ankle that we have named in connection with the front foot. Then proceed to the hock, which is the seat of curb, and oth bones and blood spavins.
The former.is a bony enlargement of the posterior and ower portion of the hock joint; the second a bony excrescence on the lower, inner, and rather anterior portion of the hock; and the last is a soft enlargement of the synovial membrane on the inner and upper portion of the back. They are either of them sufficient reason for rejecting.
See that the horse stands with the front feet well under him, and observe both the heels of the feet and shoes to see if he "forges" or overreaches; and in case he does, and the toes of the front feet are low, the heels high, and the heels of the front shoes a good thickness, and the toes of the hind feet are of no proper length, reject him; for if he still overeaches with his feet in the condition described, he is incu rable. If he props out both front feet, or points them alternately, reject.
In testing the driving qualities, take the reins while on the ground, invite the owner to get in the vehicle first, then drive yourself. Avoid the display or the use of the whip; and if he has not sufficient spirit to exhibit his best speed without it, reject. Should he drive sarisfactorily without, it will then be proper to test lis amiability and the extent of his training in the use of the whip.
Thoroughly test his walking qualities first, as that gait is more important in the horse of all work than great trotting speed. The value of a horse, safe for all purposes without blinds, is greatly enhanced thereby,
Purchase of the breeder of the horse if practicable; the easons are obvious.

Mr. Le Neve Foster, an English Government Inspector of Mines, has given notice to the managers of Cornieh mines to comply with the act, and remove their vertic $l$ Isdders and put them "on the lay." This is an alteration which will prove a great boon to the working miners. It is a terrible task for a man to climb up vertical ladders, someimes from 180 to 260 fathoms deep, after working, perhaps n bad air, for eight hours. The climbing of these ladders has given the miners a peculiar complaint in the lungs, unknown to miners who ascend and descend in any other way.

## 

Improved Grain Cleaner.
Samuel B. Johnson, Oswego, N. Y.-This invention contemplates the elieves the grain of all dust or chaff in a speedy and effictent manner, the machine itself belng cheaper in construction and doing its work more ecoomically than those now known to the public.

Improved Steam Trap.
William H. Jenkins, Philadelphia.-The object of this invention is to educe the cost and nncrease the rellabllity and general efficlency of steam
raps of the class in whtch a rising and falling float is employed to operate raps of the class in which a rising and falling float is employed to operate
the valve or valves that control the discharge of the water of condensation accumulated in or recelved from the connected steam-heating coll pipe or vessel. The invention consists in providing a hollow float with a tube through which steam is admitted, and by which the wate condensed therefrom escapes into the chamber of the trap. The float has no other
outlet save the tube. The invention further consists in a wetghted valve outlet save the tube. The invention further consists in a weighted valve
for discharging the water which fills the lower portion of the trap below for discharging the water which fills the lower portion of the trap below
the Ifne of buoyancy of the float. The invention also consists tn the construction of the filter through which the water, condensed in the steamheating coll, plpe, or vessel, flows in to the trap.
Improved Fence.
William C. Banks, Como, MIss.-This invention consists in forming a fince of ralls, stakes, posts, and blocks, so that it is entirely protected
against winds, floods, orstorms, and, being without tenon or mortise, may against winds, floods, or storms, and, betng
be constructed at a very small expense.

## Improved Water and Gas Meter.

Thomas M. Snank, St. Albans, W. Va.-This invention consists in novel and greatly improved means for rocking the valve which admits and allows
the discharge of the fuid. The invention not only stmplifes the instruthe discharge of the fluid. The invention not only simplifies the instru-
mentalities by which the oscillation is produced, and therebygreatly lessens the liability to get out of order. but insures perfect accuracy and uniform. fty of action in the measurement.

Improved Wheat Cleaner.
Herman Kurth, Milwauzee City, Wis.-This invention relates to improved means for freeing wheat of light or defective grains, cockle, or other im.
purities. It consists in the mode of suspending and rotating the cylinder; purties. It consists in the mode of suspending and rotating the cylinder;
the application of a wioer wheel for vibrating a sieve or cleaner within the application of a wiper wheel for vibrating a sleve or che
the cylinder; the srrangement of an inclined plate or board to convey
 they are discharged; and in
break the fall or coucussion
tory movement to tre sleve.

## Improved Mail Bag Holder.

Blanchard Chamberiatiand Augutus G. Wright, Bellefontaine, Ohio. This invention consists in making the standards which support a mallbag In two parts, one of which may be adjusted on the other to raise or lower
it. Also in angle plates to support the rear welghted lever horizontally on the top of the post when the mall bag is upon it. Also in a plvoted cover to work with the
the angle irons.
Improved Machine for Cleaning and Separating Grain.
Herman Kurth, Milwaukee City, wis.-The object of this invention is to provide a machine for cleaning and separating grain from cockle and other impuritles. It consists in a tapering metalifc cylinder suspended
upon double acting friction wheels, and provided upon its inner periphery with flat-bottomed cavities. Said cylinder is rotated by the friction wheels, and has two guide roflers to keep it steady. At one end of the cylinder is and has two gulde roilers to keep it steady. At one end of the cylinder is
agrain recelver, consisting of a series of sleves, whith said recelver is ex-
tended througn the cyllinder in the form of two chutes, one for the impu-. tended througn the cylind or in the form of two chutes, one for the impu-
rities, and the other for the grain. The grain recelver and chutes are sup. rittes, and the other for the grain. The grain receiver and chutes are sup-
ported upon springs, and agitated by means of eccentric barrels. Inclined ported upon springs, and agitated by means of eccentric barrels. Inclined
toward the top chute, inside the cylinder, are two adjustable silde boards
 into the top chute; and just above sald sildes is a reciprocating brugh,
which engages the inner pertphery of the cylinder and insures the removal of all particles of dirt, chaff, etc.
Improved Slate Roof.
William Ellis Elliott, St. Denis, Md.-This invention relates to new and
mproved methods of roofing, and consists in the use of slabs of slate, inimproved methods of roofing, and consists in the use of slabs of slate, instead of ordinary tiles, having chamfered edges and joined together in
seams at right angles to the ridge pole, by means of a cement, and supportseams at right angles to the ridge pole, by means of a cement, and support-
lag each other by means of grooves in their upper ends running parallel to sald ridge pole. Said slabs are screwed to up and down pleces, resting upon a felt or other waterproof screathing, which pleces divide the space
between the slabs and sald sheathing into two compartments, one passing between the slabs and sald sheathing into two compartments, one passing
up the middie of the slabs, extending up and down the incline of the roof and forming a ventllatng passage, and the other fashioned into a trough and passing up and down the roof just beneanh the seams where the slabs breaking of the cemen

Improved Spring Board for Vehicles.
Norris, Glen's Falls, N. X .-The object of thts in
George E. Norris, Glen's Falls, N. Y.-The object of this invention is to
provide spring board wagons with a support by which the board may be provide spring board wagons with a support by which the board may be
readily kept level or crowned, as required, and therebya lighter and better looking vehicle obtained. A spring board has central springs and longitudinally conn
the board.

Improved Music Leaf Turner.
George W. Rogers, South Brooklyn, N. Y., assignor to Ida Rauten berg, New York city.-This invention consists of a sllde for moving the swinging wires for turning over the lea ves, the sald silde betng arranged to ran in a
race alittle below, and partly in front of, the lower arms of the leaf-turnrace a irttle below, and it has a little tongue rising a little higher than the arms, that Ing wires It has a
springs behind each arm when it passes the outer end, swings the arm
around as it moves back, and passes the axis of the arm. The silde is around as it moves back, and passes the axis of the arm. The silde is
worked in one direction by a foot treadle and cord, and in the other by a worked in one direction by a foot treadle and cord, and in the other by a
spring. The leaf- turning wires are plvoced side by side in a row parallel With the sllde face, so that whichever way they may be turned the front wire will swing a little short of the next at ind to swing the wire fortongue passes off the front wire, to spring beniad to swing ented from
ward, it will strike against the next wire, and thus be prevented
engaging it. A notched bar is arranged alongside of the foot treadie, to engaging it. A notched bar is arranged alongside.
engage and hold it against the spring at any point.

## Improved Watch Regulator.

Foster Keeptng, New York city.-Th1s is an attachment for regulating the balance spring in connection with the hands, in exact proportion to the distance to which they are moved forward or backward on the dial, so as
to admit thereby the mechanical regulating of the watches without opento admit thereby the mechanical regulating of the watches without open-
ing the inner cap and interfering with the interior part of the watch ing the inner cap and interfering with the interior part of the watch
mechanism. A pinion is keyed to the set hand square, for gearing with an
 carried forward, which wheel gears also with a secter-shaped wheel of the balance spring, for regulating the same by turning the hand square. When,
therefore, the silde plece is carried forward and the hands turned by the therefore, the silde plece key, the pinion cases the
wheel. The regulation of the balance spring, and thereby that of the watch, is effected by stmply pressing
ward or backward direction.
Lysander L. Hawortb, London, Ohio. - The object Cords.
Lysander L. Hawortb, London, ohio.-The object of this invention is to
provide a joint for check row cords, used for dropping devices in corn planters, so that the cord can be readily unhooked and passed around trees,
and be hooked again witbout requiring the changing of the corn-planting implement, or the position of the cord across the field. There is a metallic bell-shaped sleeve with projecting hook, which 1s jointed to the connecting
hook, while the sleeve is firming closed or clinched on the loop-shaped cord end after passing the samie around the hook. The joint is thus adapted to serve as stop
check cord.

Hamproved Valve.
Impen D. Lockwood,Charlestown, Mass.-This valve is mainly for use withrubber piping, it being located in a short section of tube, over flanged ends of whith the rubber pipe fits. One portlon of the short tube extends
into the valve box and opens upward with a flanged aperture. By pressing the upper arm of a spring toward the cap, a pin is forced inward, which presses the middle part of a rubber disk down upon the flange of the hole,
and closes the valve securely. At the sametime, the end of the upper arm of the spring is caught by the spring catch, which holds the valve closed until released by pressing back the catch, when the elasticity of the rubber disk raisesthe pin, and the valve is again open.

Improved Pen and Pencil Case.
Richard M. Collard, New York city. $\rightarrow$ The works of this pen and pencil case are so contrived that the extension tube may be forced down by the
pen slide to force the pencll back into the case when the pen is shoved out, pen silde to force the pencll back into the case when the pen is shoved out,
and yet the extension tube may be drawn back for use all the same. There
Is also an improved way of fastening the revolving tube in the stationary 1s also an improved way of fastening the revolving tube in the stationary
tube, so that it can be readily unfaistened when it may be required to
do so.

Improved Pulp Regulator for Paper Machines.
Robert Hutton, Holyoke, Mass.-A box, of nearly square form, t flexible waterproof diaphragm. The pulp flows up in one compartment to the flexible diaphragm, and thence over a vartitionin to two small com-
partments. When the pulp is thick, it will not pass over the partition partments. When the pulp is thick, it will not pass over the partition
so readily, and will gatheron the diaphragm and will depress it, and also a plate beneath on the inner end of a scale beam, which ralses the outer end plate beneath on the nner end of a scale beam, when rinses the outer end
and an adjustable weight, thus operating a simple mechanism, which has
the effect of raising a valve,which allows water to flow into and mingle with the effect of raising a valve,which allows water to flow into and mingle with
the pulp which is flowing down to the pulp reservoir. The flow of pulp is the pulp which 18 flowing down to the pulp reservoir. The flow of pulp is
increased to one compartment and diminished to the other, according to the direction in which a gagemoves.

Improved Turbine Water Wheel.
Joseph E. Saftord, Hartford, Vt. -There is a prolongatt nds of the buckets below the lower rim of the wheel. Thition of the inner are Inclined backward and out ward relatively to the direction in which the the water will balance on them, and at thetr middle, so that the pressure or offset formed on the clrcle described by them, so as to cut oft the wate from behind, and at the sam
Improved Grain Binder.
James L. Skelly and William Skelly, Sparta, IIl.-In this invention there
Is a needie for passing the twine through the gavel, a clamp or loop catcher is a needie for passing the twine through the gavel, a clamp or loop catcher
for recelving and holding the twine while the needle goes back, and an arm for recelving and holdng the the whine the neede goes back, and an arm
for carring the twine around the bundle. Apparatus is provided for operating this mechanism, and there are clamps for compressing and holding
the bundle while being bound. bundle whlle betng
lmproved Boiler Feeder.
Elmira, N. Y.-Thts
Phllip T. Brownell, Elmira, N. Y.-This invention consists of a double chambered hollow cylinder, having a slow oscillatory movement imparted
to it by any suitable connection with the operating gear of the engine. Ports in the chambers are thus alternately caused to register with ports in Ports in the chambers are thus alernately caused to register win portsin
the heater, a feed plpe to the boller, and with a steam pipe connecting with the boiler at the water level, in such manner that one of the chambers
with will be recelving water from the heater whlle the other 1s belng emptied
into the boller. This last is caused by the action of steam admitted through nto the boller. This last is caused by the ac
the steam plpe to the surface of the water.
Improved Book Holder.
Andrew J. Furr and Walter C. Knaus, Boonsborough, Mo.-The stde ges of the book cover are clamped aganst hooks by set screws, which to pins attached to the blocks, upon which are placed colled springs by
which said fingers are held down upon the book leaves. By this construcwhich said fingers are held down upon the book leaves. By this construc-
tion, by moving the fingers to one side, the leaves can be conventently tarned. In using the holder, bars are placed upon the bed just beneath the shoulders of the invalid. The book is then, by means of the mechanism,
adjusted to the proper hight, and also farther from or nearer to the read-

## adjusted t

## Improved Surface Blow- 1 ff .

Robert Waugh, New Orleans, La.-This Invention consists of a kind of hollow flat skimmer, with wide openings to recelve the surface water from all directions, suspended in the boiler from an outside support, in which it
vertically adjustable. It 1s provided with a test cock at the top, by which to determine the position of the skimmer relatively to the water to recelv e the scum from the surface, and also with a blow-off cock, through whtch
the scum will be expelled. The arrangement 18 such that the escape passane
the scum will be expelled. The arrangement is such that the escape pass-
age will not be aftected by the rising and falling of the pipe. mproved Pulley Block Hanger
Ray Howland, Brooklyn, N.fY.-This Block an improvement upon the device for which letters patent were granted to G.B. and C. Lewis, January 1, 1867;
and it consists of a $U$ or equivalent shaped bar, to the bottom of which the and it cons1sts of a $U$ or equivalent shaped bar, to the bottom of which the are jointed catches, with which adjusting screws are combined in such man ner that the hanger can be readily and firmly attached to any overhead beam by placing the catches one on each slde of the beam, and pressing them
against the sides by the screws. The object ts to provide a simple and effil against the sides by the screws. The object tis to provide a simple and eff
cient hanger for use in warehouses, by which to suspend the pulley blocks. cent hanger for use in warehouses, by which to suspend the pulley blocks. or holsting tackle temporarily over any part of
quired for handllng and pillng packages, etc.
Machine for Applying Paris Green Compounds to Cotton Charles H. Levy, Natchitoches, La.-Two cylindersare made of fine wire gauze. To the inner surfaces are attached longitudinal strips, to one side of each of which is attached a strip of tin, which thus form flanges, which, as the cylinders revolve, raise the compound and allow it to fall back, so as to keep it stirred up. These cylinders are mounted on the ends of a crank
haft which is supportea in a frame and rotated by suitable mechanism. $\underset{\text { York clty, assignorto }}{\text { Improged }}$ Lathe Dog.
William Grout, New York city, assignor to Levid. Fuller.-This is a car ate of tron lathe it the compor of two 0 cone the plvot bolt which passes through the face plate of the lathe. The carrier is fastened to the face plate by means of screw nuts, so that it will stand out an inch from the surface of the face plate. Notches are cut on
the inner sides of these jaws to more effectually hold a square or round the inner sides of these jaws to more effectually hold a square or round
piece of iron. The clamp is made to hold by means of a curved ratchet bar plece of fron. The clamp is made to hold by means of a curved ratchet bar
and thumb nut. By means of a ratchet and screw the jaws can be adjusted as to hold any articlefrom the size of $a$ quarter of an inch up.

## Improved Pruning Shears.

Orson P. Smith, Buford, and Andrew w. Miller, Morrisonville, ill.-A ook-shaped cutting blade sllde on a main bar, to the uppermost end of
which is pivoted a lever. The opposite end of the latter ts agan o a brace barconnected with an extension lug near the lower end of the hook blade. A cutting blade or knife is pivoted to an intermediate point
of the lever and to the hook blade at suitable distance from the cutting part of the same. A spring serves to secure the sliding part of the hook blade, for the purpose of keeping the shears in open position ready for
cutting. The hook blade is placed on the branch to be cut, and the main bar pulled down, which produces the upward motion of the knife blade and t
limb.
Improved Bilge Water Gage.
William G. Conklin, Seattle, Wash. Ter.-This invention consists of a tube formed partly or wholly of glass with a valve in the bottom to allow the tube to fil, and a scale on the side to show the measure of the hight of water in the tube, which will be the measure of the depth of water in
thehold. The valve is arranged so as to be forced open to admit the water

## by the stem striking the bottom, and closed by a spring.

Improved Grain Binder.
Newell whitney, Osage, Iowa.-
Pascal Whitney and Newell Whitney, Osage, Iowa.-This invention relates to certain improvements in grain binders. It consists in a curved passage for the grain, formed by a slotted plane surface on one side, and
spring guide bars on the other. Down this passage moves a rake, attached to chains passing over rag wheels, which gathers up a gavel of grain and presses it forward to a feed which carries it under a presser foot, where it
is sewn through and through by a sewing machine device, and the sheaves
mproved Pump
Herman Thalhelm and Joseph Gordon, Atlanta, Ga.-This invention re lates to thatclass of double-acting pumps which are used in connection with hydraulic presses, and consists in placing upon the piston rod of a
steam cylinder a much smaller pump piston, constructed to operate in a water cylinder with an alternating high pressure and low pressure stroke by reason of the smaller volumes of water on one side of the sald smal,

Improved Rein Holder.
Albert K. Smith, Nebraska, 0 . -This device is designed to take the place frame containing two metal rollers held against each other by sprig pressure. The objects of the invention are to prevent the twisting of the
retns and their falling underneath the animal's feet-inconveniences which retns and their falling underneath the animal's

Improved Neck Yoke.
Willam A. Lloyd, Cheshire, Mass.-The:object of this invention is to re Heve the horses from the sudden strain caused by the pole and collar con-
necting chains, when the vehicle pole is thrown, by rough roads or obstructions, in an upward or downward inclined position. Spreading rods are adjustably applied to the pole end of a vehicle. Connecting chains extend
from the ends of the rod to the extremity of the pole. The triangles formed by spreader rods and chains swing readily at both sides above and below the pole, according to the higher or lower posit.
neutralize thereby the injurious and annoying jerks.

Improved Apparatus for Spreading Plasters. William G. Neubauer,Long Island City, N. Y. -This is a device for spread
ing plasters, consisting of a bed having ad justable hinged straps and hinged ng plasters, consisting of a bed having adjustable hinged straps and hinged
plates, which hook over a straining rod so as to tightly clamp the clota to the bed by means of a strainingscrew. There are plates for round plaster and another plate having apertures for ear plasters. These are secured to the bedby thumb screws andmay be clamped down by straps. Thespreaderils a metalic bar of any desired length. When the material for the plaster
is laid upon the cloth, this spreader, heated to the proper temperature, is is laid upon the cloth, this spreader, heated to the proper temperature,
moved over, and melts and spreads the gum evenly, leaving the margin of

Improved Spark Arrester and Consumer.
Thomas E. Roberts, Ionia, Mich.-By sutable construction, as the sparks Ise through the smoke stack, they are divided and gulded into the space
between a ring and the enlarged top of the smoke stack, and are guided by V partitlons into spouts, through which they pass into the space between
In ewalls of the smoke box and a jacket, and thence through the outer row

## Improved Folding and Extension Trestle. K. Stevens, Providence, R. I.-This invention consists

Hiram K. Stevens, Providence, R. I.-This invention conslsts of a pair of vertical posts with braces jointed to them at the top to fold against the
posts for packing away, and having other braces to hold them in the exended position for use. The posts are made in two parts, placed a little apart and connected by cross pieces to form guldes. In the latter exten sion posts connected by a cross beam at the top work up and down to vary
the hight of the bench. The whole forms a simple and cheap bench for the hight of the bench. The whole forms a simple and cheap bench for
plasterers and others to use for holding stagings inside of rooms of differ plasterers and others to use for holding stagings inside of rooms of difier
ent hights. The extension posts are fastened at any required hight by ant hights. The extension posts are fastened at any required
pins put in holes in them above the cross bars of the main posts.

## Improved Oar Lock. ma, Ala.-Thts invention co

 ment of a portion is connected with the oare lock through the omedum on a projection on the latter, which fits in one of the links of the chain. By
the provision of the bridle chain, the oar is secured to the oar lock, so as to provision of the bridle chain, the oar is secured to the oar lock, so as
to prevent it from silpping through the same; and furthermore means also furnished for adjusting the oar in a longitudinal direction, so as Increase or diminish the leverage, the swiveled oar lock

George Montgomery, Galena, Mll.-Thls is a doub
George montgomery, Galena, mil.-Thls is a double cutter head in com
bnation with the eccentric journal of a revolving shaft having a radia stop. A stop is arranged symmetrically to the point of greatest eccentri city of the spindle, producing thereby the throwing out of the cutting edge to a greater distance from the axis of the shaft, whose shoulder is
carried against the stop. The othercutting edgeis thereby thrown within the circle formed by the revolving outer edge, so as to clear the work
completely. By reversing the motion of the shaft, the cutter head is carried with its opposite shoulder against the stop, producIng thereby
the eccentrictty of the other cutting edge, and the clearing of the former The cutter head is secured by washer and lock nut on the spindle, and au tomatically reversed by the reversing of the shaft motion,forming thereby

Improved Means for Propelling Boats.
William H. Holdam, Crab Orchard, Ky.-The longitudinal guide ropes th directions on the canal without interfering with urning a leverpawl to one side, friction pulleys are instantly applied to a gulde rope, and the boat is propelled thereby, betng detached by turning the pawl in opposite direction, so as to rotate without imparting mo-
tion to the boat. A reversing gear of the engine admits of the ready protion to the boat. A reversing gear of the engine admits of the ready pro-
pulsion of the boat on the same rone for the purpose of backing up in friction rollers for taking up the saging ropeand gulding it in horizontal position to and from the friction rollers.

Improved Machine for Dressing Millstones. Samuel G. Johnson, Willam S. Terry, Robert Y. H. Terry, and Alonzo
W. Terry, Hamburg, Ark.-The standards are laterally connected bystrong bars carrying at the front a top bar. with hollow screw, which guldes the shaft of the plck bar, and controls also a colled spring, by which the force ly with its free end into a hole at the top of the pick bar below the spring. Its shorter rearend is provided with a small roller, on which a ratchet wheel acts, operating the front end of the lever. raising the plack
bar, and producing short, rapid blows of the same by the force of the colled spring.
Improved Screw Propeller.
le blades for propeller wheels sean.-This ine hub consists of detachin a dovetall spiral groove, and keyed in the groove by a key, which itself secured by collars screwed against the hub by a nut screwing on curely than when bolted through a flange. The hub is as smooth and free from projections as a solid hub, and the blades may, on account of not requiring a flange by which to fasten them, be made of
they may be shaped by stamping or pressing in dies.

## Improved Scaffold.

Charles M. French and John J. McFadden, Akron, O.-This is a scaffold Which comprises four slotted corner posts, connected in palrs by horidirection through the medium of long screw shafts passing directly
through the top ends of the vertical slotted parts, through the tenoned through the top ends of the vertical slotted parts, through the tenoned ends of the vertically adjustable platform beams, and bearing at theirlower
ends against metallic plates at the bottom of the slots in the posts. The devices above referred to constitute the means for adjusting the scaffold
beams in a vertical direction, while the longitudinal expansion or contracbeams in a vertical direction, while the longitudinal expansion or contrac-
tion of the entire scaffold is effected by means of slotted braces or connect ng bars, which extendettherin a diagonal or horizontal direction, and are Improved Horse Protector
Reuben P. Lawton, Oramel, N. Y.-In this device the headplece mor be used in place of the check rein, and be thrown out of the way on da..ch
ing it, while the body of the protector is so applied to the thllis that the ing it, while the body of the protector is so applied to the thills that the
horse may be readlly unhtiched without belng hindered thereby. The retns are furthermore gulded and supported in such a manner th

Treating Animal Fats and Manufacturing Artificial Butter. William L. Churchill, Rahway, N. J., and Jacob L. Englehart, New York
city, assignors to Churchill Dairy Company, New York clty.-Thls process consists in softening, washing, and disintegrating the fat of animals for
the purpose of rendering the oleomargarin and stearin separable from the membranous tissues. The hashed fat is then heated by steam for the purpose of melting the same and rendering its elements mobile. Hot alr
is forced through the same while in the heating caldron for the purpse is forced through the same while in the heating caldronfor the purpose of
effecting the thorough separation of sald oleomargarin and stearin from the useless tissues, by means of whtch the oleomargarin and stearin are eliminated from the tissues, and left in such relative positions in the caldron as to be readily separated. The eliminated pure fat is maintalned at
a temperature of $110^{\circ}$ Fahrenhelt fortwelve hours, after which the partia separation of the oleomargarin and stearin is accomplished by decanta tion, and the complete separation of the oleomargarin from the stearin
is effected by compression in cotton bags at a temperature of about $80^{\circ}$ Fahrenhelt. For these purposes a sultable agitating and purifying appa18 employed.

Improved Seed Planter.
La wrence S. Connor, Orangeburg, S. C. - This invention relates to cer tain improvements in seed planters, and consists in the pecular construc-
tion and arrangement of an opener with reference to the furrow wheel ion andarrangement of an opener with reference to the furrow whee
the combination with the after portion of the frame of an afjustable cov erer, and the construction and combination of devices for operating and
adjusting the feed in the bottom of the grain box
smatirss and sersomal.
 Key Seats weaken shafting-Set.Srews
ring it and oston beltug ans clot thing. Both Kers and


 $\quad \begin{gathered}\text { Phladaelpha, , Pa. } \\ \text { Second } \\ \text { Hand }\end{gathered}$ Portable and Stationary En




 efther by Bleetro Platung or hemitcal process, always on
 Patent. Chemical Metalilic Paints - Mired
cead yor use. 50 cos. 81 , and 81.50
per gal.
Eng. Rool











Diamond Carbon, of all sizes and shapesfor
ariling rock, surnn gtone, and turrung emery wheols;





 please adreses E . Mann $\&$ son, Milifor, Mass. The Improved American Governor. Send
 prevent salal ti any steam Boller, and mase no charge
untul the wort 1 to found satistactory.
Geo. W. Word Pullade.phia,, i,
New
Now
New Iron Ore and Dry Quartz Pulverizer
s unequaled:
F. Alden, Patentee, Pittsburgh, Pa. A situation wanted as malleable iron melt
 For small size Screw Cuting Engine Lathes
and drill Lathes, a a arress s star Tool co.. Providence, R.I. For Inventors-A Practical System for the

C. B. Cotton \& Co, A. Aents for the Sale of
 Recerds of the Peitent ofitee hhow that therer have paid

 For the Best Portable Engine in the world,
ddreses Paxter Steam Engine Co. 18 Parr Place, $N . Y$. Eames Patent Molding Machines for Metal



 Best Philadelphia, Oak Beltiong and Monitor Direct Steel Castingss-Solid and Homoge.
neous. Conesive Power rour timea greater than cati


Steel Lathe Dogs, 14 sizes. and 7 sizes of
tteel Clamps. The Bees ana chaneoest. send for criruar
 Tingue, Howse © Co., 69 Duane St., N. Y.
 Pano Forte Makers, Paper Makers, Callto Printers
Punching or Washer Cloth, Filter and straner colth for all kinds of llyuluse. Sample eant on application. Double-Acting Bucket Plunger Steam Pumps




For Solid Wrought-iron Beams, etc., see adMining, Wrecking, Pumping, Drainage, or
Trigating Mactinery, for sale or rent.
see advertisenent. Andrew's Patent, 1nstde page.
Temples \& Oilcans. Draper, Hopedale, Mass Buy Boult's Paneling, Moulding, and DoveR. Mach'y Co.. Battie Creek, Mich.. Box 222 .
Rue's "Little Giant" Injectors, Cheapest
di Best Boller Feeder in the market. W. L. Chase O., 939.95. 97 Liberty street. New York.
For Surface Planers, small size, and for For Surface Planers, smand size, and for Lathes, Planers, Drills, Milling and Index For best Presses, Dies and Fruit Can Tools,
Bliss $\&$ Willams, cor.of Price only three dollars-The Tom Thumb
a compact working Telegraph ap aratus. for sending messages, making magnets, the olectrrc light, glving alarms, and various other purposes
Can be put in operation by any lad. Includes battery ey and wres. Neatly packed and sent to all parts of he world on recelpt
roadway,New York.
All Fruit-can Tools,Ferracute,Bridgeton,N. N . Peck's Patent Drop Press. For circulars, Small Tools and Gear Wheels for Models The Improved Hoadley Cut-off Engine-The he Unted States. Send for circu
o., $95 \& 97$ Liberty St., New York
Portable Engines, new and rebuilt 2 d hand, spectaly. Engines, Boilers, Pumps, and Machinist
cools. I. H. Shearman, 45 Cortlandt St... New York.
 Mechanical Expert in Patent Cases. 'T. D.
tetson, 23 Murray St... New York. Gas and Water Pipe, Wrought Iron, Send Forges-(Fan Blast), Portable and Station The "Scientific American" Office, New York, fitted with the MInIature Electric Telegraph. B. B,
ounhng 1 Ittle buttons on the exss of the mangers, gnals are sent to persons in the various departments
the establishment. Cheap and effective if the establishment. Cheap and effective. Splend1c
or shops, offlces, d wellings. Works for any distance rice ${ }^{55}$. F. C. Beach \& Co., 263 Broadway, New York Bron's Coal ard Quarry 8 Contracto
Brown's Coalyard Quarry \& Contractor's Ap.


E. C. will find directions for dyeing sill
 everal matertals black on p. 107, vol. 30-C. R. will
 W. L. H. can make a colorless varnish by the directions n. 150 , vol. 29. Marking 1 k 18 described on p .251
vol. 29.-E R. W. will find full directions for making waterproof paper on p. 346 , vol. $30 . \mathrm{J}$. M. Will find
deesription of the field camera on p. 58 , wol. 31. C. will find directions tor treating clder on p. 10 , vol. 29 .
(1) W. T. H. says: I read that oleate of
 bles. What is this? A. Olete acle combles with
soda to form oreate of soda, whtch it a hard soap. and
enters argely enters largely into the composition of what is known
as Marsellles soap. The corresponding salt of potash a soft soap, and 1s the chlef Ingredient in the so
called Naples soap.
(2) T. I. H. asks: I am about to build a lewater should be equal to or greater or less than the
aggle towards the land. It will be a trapezium in cross section, 15 feet at base, with a 4 foot brow parallel to
the base. What are the best Incllinations for the othe the base. What are the best tinclination for the other
two sides? A. The dimension given by you are the therefore, be deduced from them what is to be the
light of the levee, and yet upon this depends the grade the slopes. The shape and size of a dam or levee not usually determined by the dimens sions and form ne-
cessary to resist the pressure of the water, so much as
 Water through the levee, and the effects of that filtra-
ton on the work itselt. The pressure, however, is tion on the work itsif. The pressure, however, 18
greatest at the base of the levee, and therefore, for th1s alone, requires the greatest reststance there; if the wa. on the first foot will be 6 times that on the highest foo -and thls later will be only $62 \%$ lbs. per square foot of the surface. Sut an embankment erected of earth,
smply to resist this pressare, would soon be worked comes, necessary, therefore, to construct tit of muc greater dimenssons, and this in accordance with the
character of the earth of which it 18 constructed. character of the earth of which it is constructed.
shonid be of a good binding earth, the surface soll re monded under $1 t$, and the depositt rammed in layers not over a foot thck. If possble, a stratum of puddling
elay should be built up in the center of the levee, from bottom to top. To prevent the washing of the current,
the slope towards the water should be the greatest, and the slope towards the water bhould be the greatest, and
may be from three to stix base to one perpendcular may be from three to six base to one perpendicular,
the reverse slope need only be a little more than the natural slope of the earth. The roots of plants have a
tendency to hold the earth in place, and thelr growth upon the sides of t
bie to tts stabilty
(3) T. A. W. asks: What is concrete? Can ized in bulliding? if so, wrin what should they be mised, and in what proportion? A. If you mix one
measure of a good quality of cement with three or four measures of sand, gravel, small stones, stone chips, or
pleees of brlck, and add enough water to combtne $t$, preees of brick, and add enough water to comblne the
whole and saturate the ingrediente, so that the cement and sand may assume the form of a paste, the eement War soon set, and the whole composition become as
hard as some kinds of stone. This is called concrete,
(4) J. S. says: I am a mechanic and have
 bor.
sor.
sertit scription price. No other paper I have ever read glves me such usefiliknowledge. A. All readers will agree
to the testimony of our correspondent concerning the sefulc character of the Sciremtiric Ambrican. ake water frgm a well 140 feet from pump and 28 feet deep, using a check valve in the well 6 feet from the bottom? I Inave a well 22 feet deep, of 41/ Inches
bore, In which the supply of water used to be good. bore, In which the supply of water used to be good.
Butnow itis pumped dry in a few minutes, all other hings betng the same as when the supply is ample. Can you give me a remedy? A. The plunger pump, if
well made and placed within say 20 feet of the water, will operate. To the delivery nozzle of the pump, ptpe contatinng a check valve conducts the water up
to any destred hight. The pump piston 18 worked by a lever above the mouth of the well, a rod extending from the lever down to the piston. We advise the use of a
arst class torce pump instead of a common pump. Perhaps some of our readers $c$
drylng up here spoken of.
(5) A. L. C. asks : 1. How many asteroids is thetr average dameter? A. One hundred and thirty seven. The largest are: Pallas 600 miles, Juno 560 , Ves.
ta 300, Ceres 220: the rest probably number 100,000, and re to small to measure. 2. Allowing the earth to be d dameter how much depth of the earth would in dameter, how much depth of the earth would 11
take to make a body as large as the moor? $A$. About
and 40 miles. 3. Allowng the sun to be 886,000 miles 1 di di
ameter, how muchdepth of sun would 1 t take to make body as large as the earth? A . The sun's mass 18 355,
Co and hlis volume $1,00,000$, times that of the earth.
(6) W. B. asks: When is the date of the iter? A. Jupter will be tn aphellon, or furthest from
(7) E. A. D. asks: 1. In the conjunction he earth at which Venus will appear to pass over the
ace of Juplter, In other words, where the conjunction will become an occultation? A. No. At the conjunc-
wat ion of August 12 , Venus was 58 minutes south of Jupl. ter. 2. Is there a rule by which the distance of the
lanetsfrom each other at the time of their conjunc ons may be calculated arthmetically? A. See Loom-
(8) J. P. asks: Will you put your method o. 51 ,

 ss we can Is galvanized sheet iron as good for a mmall botiler as
Ity.

(9) A. C. asks: How much steam can I afely carry in a boiler 2 feet long by 14 nchesin dame.
er, with flve $1 / 2$ Inch flues, and a stay bolt ? The shell

(10) C. McC. asks : How far can steam be carrled through one tnch plpe from a ten horse botiler
oarlvea small one horse engine? A. Several thousand
(11) W. C. F. asks: What is the centrifu-解 per minute? A . 4 bout 170 lbs . (12) M. S. T. asks: 1. Has nitrate of am so, by whom? A. Yes, by Messrs. Notrbln and Ohlson,
of Stock holm ; but tt requirestoo hlgh a temperature for Its decomposition. 2. Who was the frse discoverere
of gunpowder, and when was it discovered? A. The date of its invention is involved in obscurit been said that it was used in China as early as $A, D .85$, and that the knowledge of it was conveyed to England from the Arabs on the return of the crusaders to Europe 90; ;nd that they derlved it from the Indians.0.c. Are tity? A. We belleve mills
Is ozone

## aplaly oxydzed tn any kind of

(13) G .
(1) G. F.L. says : How are perishable gives the following directions: The flowers must be a manner that they will hold thetr form, the pressure of
the sand upon all surfaces belng alike. Any fne clean and will answer; it should be sifted to remove all coarse parttcles. and then washed in successlve waters
untll dust and all earthy and clayey matters are washed Way, and the last waters when poured off are perfect viear. The sand 1 then to be dried and then placed
over a fire in a proper vessel, until quite hot, hotter than the hand can bear, and when cool 1 t will be fit to ise. After heating, It should be used at once, before it
can a bsorb molsture from the air. We have had good success by taking a clean, thoroughly dry flower pot,
he hole in the bottom of which was stopped by a cork. Mis was mited a turd full or the dyy sana, the llower set carefully tn the sand, and then more sand slowly
added, so as to surround and cover the flowers inside and at,and set in a warm place. At the end of 24 hours nd cork was removed from the hole in the flower pot,
nd the sand allowed to run out in a small and gentle ream. The flowers were left in the pot, perfectiy dry (14) A. V. D. V. asks: Can nitrogen be of what is illuminating gas composed? A. It consts chlefly of hydrogen and carbon. Can I cast brass in plaster of Paris molds, and
ow should the molds be prepared?
A. Mix the plas ter wity
them.
Wher
( fifice. $A$, and covers for binding them? A. At this Immer 19 years of age; am I too old to go to college an
In
(15) I. G. H. - Several kinds of cigar ma
king machines are in use.
$\underset{\text { pear at regular intervals dur ing the spring and eummer }}{\text { (16) }}$ pear at regular intervals during the spring and summer
quinoxes? When and how ma y it be observed? I have en it somewhere stated that, on watching the reflecof water, the 11ne of the light could be distlnctly traced
in the reflection ; but $I$ have falled to tind it. A. The odacal light, as its name imports, in rariably a ppears the zodiac, or, to speak more precisely, In the plane
the sun's equator, which is 7 o 1 nclined to the
zodiac de which plane, seen from the sun, intersects the elip ptic tn I Iongltude $78^{\circ}$ and $255^{\circ}$, or so much in ad vance of the equlnoctal polnts. In consequence 118 seen to
the best advantage at or alltte after the equino nexe, after unset at the spring, and before sunrise at the autumn, sunset at the spring, and before sunrise at the autumn,
equinox. At the vernal equinox the appearance of the zodacal light is that of a pretty broad pramidal, or
ather lenticular, body of light, witch begins to be vis le as soon as the twillght decays. It is very bright a bbroader or lower part near the horlzon, and (1f ther
broken clouds about) often broken clouds about) often appears 11 ke the glow of
distant conflagration, or of the rising moon only les d. We do not see the advantage of viewing it by re

Soctom months stince you published a prescription for
Sol atarrh, consistling of ammonla, aloohol, carbolic acid,
nd dstilled water,saylng: "MIX and inhale the vapors.
 is hurtful 1 f thaled. How do you reconclle these two iems? A. We were speaking of a general way of the
effects of inhaling the vapors of ammonia. It is only dangerous when a strong solution 1s used, such as "aqua ammonie fortioris, the stronger water of ammonia.
Thls applied to the skin causes pain redness, vestcaon, and destruction the part turs acting frrst as rubefaclent, then as a vestcant, and lastly as a a caustlc
or coorosivive. Its emanations are also trritutt ; when me in contact with the co ul action on the air passages is well known. Perso syncope are observed to be almostimmediately raised trom a deathllke sta te by merely inhaling the vapor hosolution. To cont be em lous or even fatal consequences may be the result. When swallowed it acts as a po werfully corrosive poicustomed to employ in the treatment of diseases, am clent. It produces a feeling of warmth in the mout throat, and eptgastrium. The heat of the skin is some
times increased, and there is a tendency to sweating which, if promoted by the use of warm diluents and frequently terminates in copious perspiratio ther stimulants, as camphor, wine, and opium, we o erve, in the first place, that the influence of ammonia is princtpally manifested in the ganglionic and tru pinal systems, while the other stimulants above men
toned affict the cerebral system. Thus the eftects ammonia are usually exhbibted on the circulation, res piration, secretion,and the spasmodic actions; but cam
phor, wine, and opium, though they also affect these nctions, yet principally affect the intellectual fun ns. Secondly, the effects of ammonia are more Thirdly, the vascular excitement caused by wine tion, and is

- Pereira.
(17) C. F. S. asks: 1. ${ }^{\text {. How high a degree of }}$ unsen burner, upon a sheet iron surface? A. This quantity of gas construction of the urner. Whtch is variable. 2. Is there anything better as flame? A. There is nothing that will compare from in point of economy
etroleum tance, but must be looked upon rather as a mixture on indefinite, and apparently unlimited, variety of s1m umber of these compounds, 20 sintestmal are he shades of difference between each member of the series and the next in order of succession, that the
only practical method of classifying them has been to group the products of distilation into classes, accordthe serles belonging to each class with one genert name. When petroleum is subjected to distlation, the
ightest and most volatile of the substances which comose it distils over at first, the products growing heav at is circumstance that the distller is enabled to separat the several olls of which it is composed, according to Ing determined by the specific gravity of the liquid
which distils over. This 18 what is known as fractional distilation. The classtification usually adopted by distillers is as follows: Alliabove $88^{\circ}$ of Baumés hydrom
eter is called chymogene, from $88^{\circ}$ to $700^{\circ}$ gasoline, from eter is called chymogene, from $88^{\circ}$ to $70^{\circ}$ gasolne, from
$70^{\circ}$ to $50^{\circ}$ naphtha, from $60^{\circ}$ to $50^{\circ}$ benzine, from $50^{\circ}$ to
(18) J. T. and others ask: How is rosin oil
made? A. It is a product of the dry distlation of rosin. The apparatus used consists of an iron pot, a head
piece, a condensing arrangement, and a receiver. In the distillation, a light oil comes over first, together distllater. As soon as a cessation in the flow of the is further ratsed, when a red colored and heavy rosin licomes over. The black residue remaining in
pot is used as pitch. The light oil, called pinoline, is rectified, and the acetic acid water, passing over with it, ted to dryness, and the calclum acetate obtanned is mployed in the manufacture of acetic actd. The rosin , obtained after the light ofl has passed over, has ark vilet blue color, and is called "blue rosin onl.
The red oll is bolled for a day, the evaporated wate being returned to the vessel, next day the water is
drawn off and the remaining rosin oll is saponified with oduct obtained is rectifed rosin oll, whichis allowed to stand tin iron vessels, protected by a thin layer of
gypsum, whereby after a few weeks a perfectly clear oll 1 s obtained, free from water. The oll of \#rst quality pon the once rectified ofl. The residues of both ope
(19) J. S. J. asks: What is the bursting of 14 inch plates, with a single row of rivets? What is
a safe working pressure? A. Bursting pressure is
about 250 lbs. per square inch; working pressure 30 lbs.
(20) P. S. asks: What do traveling glass
 the midaleof aglass rod, and then, by suction with the
mouth, bring some kind of a melted liquid into satd ball, and silver it over on the instde. A. They gener-
ally use alconol. 2. What to they use for the silverally use ale onol. 2. What do they use for the silver
ning A. The foliowng. alloy is requentiy used: ing? A. The followng.
parts lead, 2 tin, 5 blsmuth.
(21) H. L. C. Says: 1 . What appearance
 mixtures. White clay contalns but small quantities of protoxide of iron, and becomes after burning yellow or
red ; these colors, orlgnating from the numerous orred; these colors, origtinating from the numerous or-
ganic substances, disappear after beling volatilized by many firings. The colored clays change thetr color duHing firing, becoming red or red yellow. Fine clays are prepared only from those becoming white by contin-
ued burning. 2 . Would a good mine of porceladn clay ued burniag. 2. Would a good mine of porcelan n clay
be of great value? A. Tou had better have a sample analyzed, and sodeterm tne its exact value. 3. What is
the proper name for porcelain clay? A. The technical
(22) H. A. M. asks: What will harden coal tar, os that the heat of the sun will iot cause it to run
or melt? A. The only process that we know of this
ond connection.
or asphalt.
What wo
 to the steam tube leading to to cyillider and forcing
air in with the stam?
Our engineer thinks the air in with the steam? Our engineer thnks the
expanston of the air would add to the power, and prove expansion of the air woula ada to the power,
a saving. A. Suffletent data are not sent. In
this plan would be anythtng but economical
(23) W. . . L. asks: Could not photographlitting for a picture could look at themselves, and be sure to get the desired expresi1
They could. It 18 an old didea.
(24) F. M. H. asks: How can I ascertain ton of pulley? A. Find the circumference of a ctrcle whose dameeter is equal to that of the punllee of on whicle
the pelt runs thereased by the thickness of the belt. Multiply this grrcumference by the nu
tons that the pulley makes per minute.
tlons that the pulley makes per minute.
Wnat are the princlpal questlons that
person in order to get an entineer's 11tense?
should apply to the local superryisn tnspeetor
(25) J. D. W. asks: How are glass globes, without having to use a hot golution or the ordinary
method of tinfoll and quicksilver? $A$ nitrate of silver method of tinfoll and quicksilver? A nitrate of silver
solution would be too costly, as it would take too solution would be too cootily, as it would take too
much and the waste would be of wouse. A. We can
give oun no recile that will answer all your require. give you
ments.
(26) C. B. W. Says: 1. I have tried to con-
struct C cheap telesco pe as described by you, but tit w11 not work. The lenses are a mentscus of $11 / 1$ inches diam.
eter and 48 inches focus, and a plano-convex $\notin \neq$ inch in eter and 48 nches focus, and a plano-convex $.1 / 2$ Inch tin
diameter, t tinch focus. Which way should the e lenses be set, conevex stle to toward the eve or otherwise? A. Oth-
erwise. 2 . Will not a stralght tubedo as well as a tapering one? A. Yes. 3. How far should the above lenses be from each other? A. 49 Inches
( ${ }^{(27) \text { a C.J. W. W. says: }}$ I Intend to make a telescope having a power of 80 , and another having a power of 20 ,


 you wish a pancratic or varlable power eseppecee, make
 $A$ to $D=124$ when it is open. Power 16 shut, 30 open. Dlaphragm aperture e, distant 18 from A toward B.
Ditto aperture 5, distant 8 from C toward D. 2. Has he Huyghentan eyeptece any adrantage over a single equivalent lens? If so, what is it? A. There is less
aberration. 3 . How do you tell the focal length of the Huyghenan eyepiece, when glven the focal length of
the two lenses? A. Divide focus of objective by $y /$ fo cus of fielid dens. . . Win you piease give me a formula or maknon a terrestrial eyep iece of any power for any mula 18 ; Focl, 14, 21, 27, 32. Distances, 23, 44, 40. Apertures $5 \cdot$
lens 7 .
(28) Z. says: I have an object glass 2 inchthe length of the focus by means of a concave lens
placed between the object glass and the eyepplece, so that my telescope shall be equalitn power to an ordina-
y telescope of 48 inches in length with an object tlasi
 pacea from the oujsel gass? how the calculation made? A. Place, 12 inches from your objective, a con
cave achromattc lens of 1 Inch aperture, and 24 Inches virtual focus. For optcal formule, see any work on
(29) W. B. asks: What is the cause and
what is the remedy in case of a person's hair getting wrematurely gray? 18 it to poverty of the particular constituents of the blood, Which furnished sustenance for
the easr? In so what should be a ded to enrich 1 t in
the res that APsen. It may be congenital or acctidental orgaizzation of the tndivtdual; causes which have been observed to cause it are mental emotion, disease, and in.
jurles. Grief and terror have been known to canse it. juries. Grief and terror have been known to cause e 1 t,
varying in time from a few hours to years. Bichat
 sable infuence over the internal structure of the hatr
 blanchlng the hatr, probably by means of absorptlon of
the fulds contatined in tits tussue." ${ }^{\text {The }}$ treatment is to tion by tonics, espectally chalsheates and phosphoric tan by toncs, espectally chalybeates and phosphoric
actand (where defective nutritve power prevalis) by means of preparations of iron and arsence, and to stim.
ulate the skin locally by abundant brushing and some gentle stimulant, such
used ent the same time
(30) R. H. says: If you sprinkle salt on a agatn and fly a way. What is the cause? A. The fly it
not dead, although he may ve apparently lifeless. h h salt absorbs the water from the breath
the Insect, and so restores anlmation.
(31) W. P. H. asks: 1 . How is the conccave silvered on the tsnitie? A. Dorapers method of siveper
Ing glass: Disolve 560 grains Rochelle salt in 3 ozv, of Water. Dissolve 800 grains nitrate of silver in 4 ozs. of water. Add silver solution to an ounce strong ammo
nta until brown oxide of silver remains und 18 solved Then add aiternately y ammon ia and silver solution care
fully until the fully untll the nitrate of silver 18 exhausted, when
ittle of the brown precipitate should remaln. Fite Just before usting mix with the Rochelle salt solution and dlute to 22 ozs. Clean the mirror with nitric actid Deeswax andion and tissue paper. Costa tin pan wit thick across the bouttom. pourts. Fasten a stine the silvering solu tion. Put in quickly the glass mirror, face downwards one edge frrst. Carry the pan to a wrndow and rock the
glass now be searcely visible through the flim. Take out the mirror; set tit on edge on blotting paper to dry. When
thoroughly dry, lay it face un on a dusted table. Stuft plece of softest thtn buckskin loosely with cotton. $G$ getily over the whole sllver surface with thls rubbe
in
sircularstrokes. of buckskin latd flat on the table, and Impregnate the ubber with it. The best stroke for polishing 18 a mo tion in small circles, at times gotng gradually round on
the mirror, at times across, on the various chords. At the end of an hour of continuous gentle rubbing, with occasional touches on the flat, rou ged skIn , the surface
illbepolished so as to be perfectly black in obllau positions, and, with moderate care, scratchless. It 18 sest, bef oresilvering, to warm the bottle of silver solu
ton and the mirrorin water heated to 1000 Fah. 2 Wh. tion and the mirror in water heated to 1000 Fah. 2. Wh
18
the best composition for a metalltc speculum for a fiectlng telescope, apd what proportion should the met
als have? A. Copper 1264 , tin $58 \cdot 9$ parts. 3 . How can I rind and polish a concave metallic speculum for ar $r$ fiecting telescope? A. Coarse, fine, and elutrated em
eries, then rouge, must be applled to the surface in curves, at Afrst circular, then in adjusta ble hypocyclood curves,by appropriate machinery or by hand. The hol-
low 18 ground by lead and by fron surfaces, and 18 pol10 wis ground by lead and by fron suy
1shed by pitch tempered with rosin.
 (33) G. B. asks: How can the black scale
on sneet steet be removed most efflctently? Cold acla will not touchit; and for a small quantity, the expense of a lead bath and apparatus 1 s too rreat. A.
of no method other than those you mention.
(34) R. A. says: I have a Rhumkorff inductee, and I have a Smee's battery of two elements. Is
he battery strong enough? It will work at tlmes, but
 er will tap for a few moments, ghen stop. If I touch it
twill start again, only to stop as before. Can you in form meas to the probable cuase? A. It is necessary or the proper workng of the machnne that the keeper
nd all connections should be perfectly free from dust orrosion, etc. Your battery 1 s amply sufficient for the
(35). W. L. L. Says: In Humboldt's "Cos-
nos," I read that "the early races of manktnd beheld in the far north the glorious constellation of our south ern
hemtispherer 1 be before them, whith, after rematning
hem筑
 aperlodof $14,0,0$ years, Veza in Lyra $a$ will hine forth as not the zones and climates moving around the earth lowly but surely, so that what now 1s the frigid zone Was once the torrld zone, and vice versa? Agatn: If
as Herschel says, the sun 1s leading this system through epace, is another glac clal period possible? What caused sun, and was the tee destroyed by the growing heat the sun? Is the sun's heat Increasing or decreasing? re not all the living belngs on this earth doomed
certain extinction through and by the course of the na ural laws of the Universe in the distant future? Will not the earth become as the moon 18 now,dead and non-
roductive? A. Glactal perlods have occurredt bootr hem mpheres, and may have been caused: 1. By eleva-
tion of land 5, coo feet. 2 . By changes in the obllquity the ecliptie,causing an alted here from 80,000 to to 200 ooo years ago. 3. The sun, betng now a variable star,
period 11 years, may have emitted less heat. 4. The sohr system may have travelled in cold spaces compara
tely destutu of stars.
The life hitory tively destitute of stars. The life history of a plane od requisite to cool liss surface from the bolling to the freezing potno of water, betng inhay
fintesimal part of tis existence.
(36) F. O. C. asks: Can you give me a sam
etest by which I can tell pure oxide of zinc from duterated, before it is ground in oll? A. Oxide o nc and tits hydrates are white powders, which are tit oluble tn water, but dissolve readily in hydrochloric,
Itric, and sulphurlc aclids The oxide of zinc acquires lemon yellow tht when heated, but it reassumes its original white color upon cooling. When Ignited be-
fore the blowplpe, it shines with considerable bril ore the blowplpe, it shines with considerable bril
Hancy. You do not state with what you constder the zInc to be adulterated. The substance most commonly the acids (except in an almost imperceptible amount) nd can be separated from zinc in that manner, the tn oluble residue 1 lfftrom a metrong acta solution in thit
nstance beting bartc sulphate. nstance betng baric sulphate.
What is a good test to detect impurites in hydrochlo. He acta? A. Pure hydrochloric acid must be color-
less, and leaveno restdue upon evaporation. Hydroless, and leaveno restdue uoon evaporation. Hydroof potasstum must not impart the least red tint to reatly dllu ted acid.
Thave been told that, tn one of Sorel's formulx ion of carbonate of baryta. cement, he used a por Sorel's cements contans 3 per cent of borax or the
ame proportion of sal ammoniac, but we have no tec ord of any baryta salt betng used
(37) F. H. B. asks: What vessels have made eiliese that the run of the steamer Adriatic of the White Star Hine, from Queenstown to the lightshlp off Sandy Hook in 8 days less 5 minutep, is the qulckest
western trip on record. The Adrratic is 450 feet long,
(38) E. L. H. asks: How can I set the lenses plano- convex lenses. A. The Huyhentan eyc lers is
one throt the fous of the fled lens, and is placed its
own
(39) J. C. B. of Berlin, Germany, asks: 1 ca when he takes a postitlon tin the draftligg room or ma-
chtne works? A. he to the head draftsman, he fs ex chtne works? A. If he is the head draftsman, he fis ex
pected to design and superintend the construction or pected to design and superintend the construction n work. 2. What percentage on the estrimate of an en ngs, etc.? A. No general answer can be given to this uestion. The compensation recelved depends upon he ability and reputation of the designer. 3. How do the proprietors of machine works charge for work done
in their shops, and also for a man going out to do work? their shops, and also for a mangolag out to do wor verage amount.
How many editions of "Uncle Tom's Cabin" have been published altogether? A. It 1s stated on good au.
thority that the number of coplessold amounts to mi:thorlty that the number of coples sold amounts to mi:-
lions. We do not thinkthat the number of editions is ions. We do not thinkthat the number of editions
$\qquad$
(40) J. H. F. asks: 1. Will turpentine do preserve antmals in place of arsenic? A. No, be
ause of evaporation. 2. Is there any book on the an mals of New York? A. The "Natural History of New York" contains all the information you require.
What is a standard work on clvil engineering Mahan's "Clvil Engineering.


## A. Yes, very.

(41) W. C. B. asks; What is a foot pound? o ralse 772 lbs. wetght to the hightof one foot; buthe does not say how long a time may be occupited in rais
ing it. A. A foot pound is the amount of work reWe think you aremistaken in the definition you attri-
(42) H. B. says: Your correspondent J. A
asks where the fallacy Is in the following demonstra-$x+y)(x-y)=y(x-y) . \quad x+y=y . \quad 2=1$. He mighthave $2 \times 0=1 \times 0$; or both sides divided by $0,2=1$. The fallacy consists in dividing the two sides of an equation by a divisor equal to 0 , in which case the resulting equar-
tion is no necessarily right, though it may be so in ost cases.
(43) B. F C. says, in answer to J. L. L., who mon earth, well mixed with water, to which is added a
small quantity of rock salt ; let the water stand untll the salt d dssolves, which will take a bout 2 or 3 hours. It
is then ready for use. Apply it as fire clay 1 used, and (4) B. C.
(44) B. F. C. Says: I see that a mechanic of
Cleveland, o., secured a good draft and succeeded in consuming the smoke from his furnace by the applicsI have a simillar apparatus; but instead of two jets there are five, and it not only creates a bright light,but,
with careful fring, it consumes at least two thirds of With careful firing, it consumes at least two thirds of
the smoke. Where you have a gooddraft, I would not dvise any one to use it, as it creates rapid combustion,
(45) D. M. says, in answer to I. A., who that $2=1$ ? It should be remembered that multiplying an equation by a factor of the first degree rases the Which is found by making that factor equal to zero first degree, the quotient is an equation one degree
less, and has one solution less, which solution is that expressed by making the diviser $=0$. Thus, in the pres ent instance, $x=y$ or $x-y=0$ has but one solution. Mul-
tiplying by $x$, we have $x^{2}=x y$, or $x(x-y)=0$. which, beliplying by $x$, we have $x^{2}=x y$, or $x(x-y)=0$. which,
ing of the second degree in regard to $x$, has the two so hations $x-y=0$ and $x=0$. If we divide by $x-y$, the sup-
position that $x=y$ disappears, andthere remains only $x=0$ From which it appears that in $x+y=y$, the quotient ob tained by I. A., $\mathbf{x}$ should be made equal to zero. The quan-
tity ${ }^{2}$, subtracted from each member of the equation $\mathbf{x}^{2}=$ tity $y^{2}$, subtracted from each member of the equation $x^{2}=$
yy, since it does not alter the equation, has nothing to do jith the result obtained.
Minerale, $\operatorname{kTC}$.-Specimens have been re. ceived from the following correspondents, and examined with the results stated:
W. F.S. and G. S. A.- Your insects have been put in
the hands of a distinguisbed entomologist for examina on, and will be reported upon as soon as an answer is recelved.-W. E. D.-It is plumbago.-J. E. B.-They make such a palnt as you desire, -J. B. - No. 1 is bitu
but minous shale. No. 2 is brewn hematite, with consider ine smount of clay. No. 318 jaspery hematite. No. 4 clayandsand,cemented with hydrated sesquitoxide of
ron. No. 6 is fosillferous yellow and red hematte No. 7 is compact clay. No. 8 is bituminous clay. No. Is argillyte. No. 10 is galena.-F.J. R.-It is hornblende
and quartz.-C. O. R.-No. 1 is chalcopyrite. No. 2, the gray part is fibrous zeolite ; the green is in too minute amphibole. No. 4 is leucopyrite or arsenide of fron. No. 5 is azurtte. There was no No. 6 in the box. No. 7
is flesh-colored calcite.

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific American acknowledges, with much pleasure, the re eipt of original papers and contributions pon the following subjects:
On Cribbing in Horses. By D. C.
On the Decomposition of Eggs. By Z: M . K.
On Mosquitoes. By W. C.
On the Treatment of Criminals. By H. H On Floating Magnets. By H. P. H. On a Carpenter's Bench. By J. C. P On a Boiler Explosion. By M. A. K. On the Potato Bug. By E. S. W On the Phylloxera. By R. J.,and by R.B.S On Tides. By P. G. McE.
On an Amalgamator for Gold and Silve Ores. By W. T. B.
On Crucibles. By J. D
Also enquiries and answers from the following

HINTS TO CORRESPONDENTS.
Correspondents whose inquiries fail to ap ear should repeat them. If not then pub ished, they may conclude that, for good rea ons, the Editor declines them. The address the writer should always be given.
Enquiries relating to patents, or to the paentability of inventions, assignments, etc., will not be published here. All such quesions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally ake pleasure in answering briefly by mail the writer's address is given.
We have some queer correspondents: One writes to know if we will not be so good as o send a messenger to an address which he ives-distance two and a half miles from ur offlce-to make certain inquiries for him. It would require one and a half hours' time o do the errand, and not a stamp inclosed. nother wants us to write a letter and tell him where to get a combined thermometer and barometer. Another: "Will you be ood enough to give me the names and adresses of several of the makers of the best rick machines", another wants water wheels nother threshing machines; each writer de res our written opinion as to which is the est device, with our reasons, and not one is houghtful enough to inclose a fee, or to re lect that to answer his request will consume considerable of our time. Another party ishes us to write to him the recipe for maing ornaments out of coal tar, where he can buy the mixture ready for use, and how much heckermen will sell for in the New York market. For this information he sends us he generous sum of three cents in postage tamp. Mr. C. wants us to tell him of some valuable invention, of which he can buy the atent cheap, that would be suitable for him to.take to sell, on his travels out West, by owns, counties, etc., three cents inclosed. thers want us to put them in communica ion with some person who will purchase an interest in their inventions, or manufacture for them, or furnish this or that personal inormation, our reply to be printed in the Cientific american. We are at all times appy to serve our correspondents, and when hey present enquiries which we consider of eneral interest to our readers, we give space or them in the above columns; but if eplies to purely personal errands are expect d, a small fee, say from one to five dollars, should be sent.

## Index of Inventions FOR WHICH

Letters Patent of the United States were grantrd in the week ending September 22, 1874, and each bearing that datr.

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 Desk, seat, and table,
Dial, sun, G. Mehr..
Digger, potato, L. A. Aspinwall..................
Ditching and embanking machine, W. B. Hyde Ditching machine, F. L. Delfer..
Door check, L. M. Johnson ....................
Drill for drilling metal, J. Sargent.
Drills in wells, grappling, J. S. Munger Drilling machine, rock, G. Downing...............
Electric machine, magneto, w. Hockhausen. Electric ctrcuit spilce, w. Robinson
lectric battery, earth,
Elevator, J. L. Bates
Engtne, air compression, J. W. Middleto
Engine, eccentric piston, C. C. Kletn
Engine, osclllating, J. Hemenway, Jr.
Engine slide valve, steam, H. Elliot.
Engine valve, Bevins \& Wels.
Fan, H. Harris..
Faucet, J. Jones
Faucet, self-clostng, T. Miller
ences, bartable wrore, s. W. . Holt
ertillzer, Sparhawk \& Ballard
rearm, breech-loading, A. B. Maguir Firearm, breech- loading, H. Updegra
Firearm, magazine, L. W. Langdon... Fire escape, T. P. Forsyngulsher, ©. T. Hollow
Fire extingulsher, G. W.Pierce....
fishing apparatus for vessels, C. Bre
Fishtng tackle, H. L. Sprague........
Fly bush, 'automatic, L. D. Howard
Fork, horse hay, E. V. R. D. How
ruit jar, T. Hipwell.....
Furnace for burning kills, G. C. Surls Furnaces, etc., metallurgic, M. Foster.. 155,140 Grate, f. S. Bissell...
Gultar head, H. W. Whit
Harness breech stay, croughwell et
Harvester, W. F. Randolph..
Harvester dropper, I. and I. Hills,
Hats, sewing leather in, A. Morehous
eater, steam, Peake \& Kitchen
Hinge, table leaf, J. C. Gove
Horse detacher. I. L. Landis.
Horse detacher, Pillep \& Mayer
njector, W. B. Mack
nsect-destroying compound, J. W. Tottenham
Knife sharpener, $\Lambda$. Gross.

Latch, locking, w. H. Cooke
Letter box, w.D. Dann
ocomotive crank er, etc., Jackson \& Irwin.. ocomotive water supply
Loom shuttle guard, E. Beach
umber, trimming, Lamb \& Fra
Mill shoe, fanning, A. J. Cleland
Mortar, machine for mixing, P. White
Nailing boxes, machine for, M. Blaser Needles, making cutters 1
Oll compound,
Oller, F. Lehr.
Ore concentra
Organ reed board
Packing, piston, A. Burlingame
Pan lifter, W. J. \& C. C.
Paper box. D.S. Robeson...
Paper pulp, disintegrating, F. Genin.
Patterns, gulde for cutting, J. Lemley
Peg, hat and coat, c.
Pianoforte attachment, J. W. Brackett
Plpes, automatic valve for dip. W. .................. St. John
Pipes and plates, non-corrosive w. Pipes and plates, non-corrosive, W. A. Sh
Pitcher, molasses, E. B. Manning (r).... Planter, cotton, A. G. W. Foster
Planter, cotton seed, W. J. Cook....
Plaster of Paris, J. M. Reda.......
Plate holder, ple, J. L. Daugherty
Plow, pulverizing, J. T. Mange
Press, cotton, B. M. Mllner
Pressing paint from cans, G. H. Chinnock
runing hook, E. E Stedma
Pulley, T. A. Weston.....
Pulley block, A. Schindle
Pump box, W. A. Spooner........................
Punching metal plates, device for, W. Tucker.
Puritier, middlings, W. H. Lamb
Railway track, street, P. Mihan
Railway trains, telling distances of, w. H. Wyt
Reel for textlle fabrtcs, G. G. Bates
Sad iron, D. B. Snow..
Saw for sawing stone, S. G. Morrison..
Screen, portable, H. L. Leach
Sewing machine, w. R. Landfear
Sewing machiue cloth cutter, H. Parson
Shears, animal, c. Courtols,
Shirt bosom, S. Laskey
Snoe, J. Murphy .....................
Stamp holder, J. M. Keep

| 155,20 |
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| $.155,18$ |
| 155 |

$\left\lvert\, \begin{aligned} & \text { Steel, manufacture of, T. S. Blatr } \\ & \text { Stone-crushing mach }\end{aligned}\right.$ Steel, manufacture of, T. S. Blair.
Stone- crushIng machine, A. Dtetz
Stone, artificlal, J. Stone, artificlal, J. J. Bartlett.... (r)
Stone, artificlal, E. L. Ransome ( Stone polishing machine, J. N. Clemmer Stove, coal, H Greentree.
Stove, coal, G. Wellhouse.
Stove grate, I. G. Macfarlane
Sugar mold, A.H. W. Schrader.
Table, pork packer's, W. Notter
Tar from pine wood, H. F. Watso
Telegraph, district alarm, W. D.
Toy attachment, carriage, J. D. McAnult
Toy dart, E. B. Morgan...
Tubes, dressing ends of, W.
Tubing, welding, J. Sadier.
Valve, test, E. A. Wood.................
Vehicle running gear, J. O. McColley.
Vehicle seat, J. L. Glessler
Vehicle sand guard for wheels, J. B. Winchell.
Velocipede,
Velocipede, Dale \& Hend
Velocipede, H. Thiessen.
Veesel, utilizing force of waves, E.
Vessels, propulsion of, R. Kirsch..
Violis, H. W. White.
Washboards, rubber for, R. M. Herring.
Water closet, ete , guard, J. F. Larrabee Water from mains, etc., measuring, Ball \& Titts.
Water wheel, A. B. Rentff................ Wheelwright
Windmill, T. C. Little..................
Winnower, reciprocating, H. Keller.
Wood, preserving, T. Jon
Wrench, B. C. Bradley...
Wrench, B.C. Bradley...................
APPLICATIONS FOR EXTENSION.
Applications hava been dulyfled and are now pending
for the extension of the followingLetters Patent. Hearor the extension of the following Letters Patent. Hear the days herelnafter mentioned:
31,082.-Dovah Mixing Machine.-W. Hotine. Dec. 23 .
31,330 .-Carriage Work Collars.-M. Seward. Jan. 20
EXTENSIONS GRANTED
153.-Attaching Saw Handles.-I. Pelham

30,138.-Saddle Tree.-S. E. Tomking
$30,175 .-$ Earth Borer.-A. S. Ballard
DESIGNS PATENTED.
763\& 7,764.-Carpets.-H. F. Goetze, Boston, Mass.
7,765.-Oil Cloth.-H. Kagy, Philadelphia, Pa.
7,766 to 7,770 . - Clock Cases.-F. Kroeber, Hoboken, $\mathrm{N}, \mathrm{J}$
7,771.-Soda Water Apparatus.-G. F. Meacham, Jas
W. Tufts, Bedford, Mass.
7,772 to $\boldsymbol{7}$,774.- Watch Cases. - S.Strasburger, Boston, Ms
F7th-Spoon handles.-W. K. Vandersice et al.
Francisco, Cal.
TRADE MARKS REGISTERED. 1,990.-Electric Chain Belt.- J. Bryan, New York city
1,991.-CAkes. etc.-W. E. \& N. H. Camp Phila., Pa. exandria, Oh10.
1,993.-OIL.-J. B. Hay, Philladelphia, Pa. 1994.-Destifrice.-M. F. Keeshan \& Brother, Cinctn nati, Ohio.
1,995.-SToves.-C. Noble \& Co.,Phlladelphia,"Pa 1,996.-Corn SALVE.-J.H.Richelderfer, Philladelp
1,997.-Soap.-Schultz \& Co., Zanesville, Ohio. 1,993.-Bread.-H. C. Stewart \& Co., Cincinnati, Ohio.
1,999.-Finished Leather, etc.-G. H. Thomas \& Co Middleville, N. $\mathbf{Y}$
sCHEDULE OF PATENT FEES.

## On each Caveat......

On nilng each appitcation for a Patent (17..................... On 1abuing each origtnal Patent.
On appoal to Examiners-in-Chiet
On appeal to Commisioner
On application for Relssue..
On application for Rextension on of Pate......
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On an application for Design ( $3 \%$ yeara).
Onappication for Design (7 years)..
CANADIAN PATENTS.
List of Patents Granted in Canada September 25 to $30,1874$.
,868.-W. C. Stone, Pictou, Prince Edward county, On
"Stone's Instantaneous Process for Dressing and Dy ing Furs, Wools, Halrs, Skins, Pelts, and Hides." (Extension of provinctal patent No. 3,260.) Sept. 25,
1874. the means of and apparatus for productng and matn taining motive power or assisting to produce and maintain such power, called
Movement." Sept. 25,1874 .
3,8i0.-D. Whittemore. Boston, Suffolk county, Mass. County, Mass machines, called "Round's Improved Heel Trimming Machine." Sept. 25. 1974.
ty, Pa., U. S., and H. Wood, same place ments on loeks for sliding doors, called "Dotterer's Railway Frelght Car Door Lock." Sept. 25, 1844. ,872.-J. Behel, Rockford, Whnnebago county, Ill,,
U. s. Improvements on whifletree hooks, ealled Behers Whiffietree Hook. Improvements in a machine for tilling land, called "Fost's Combination Beam." Sept. 30, 1874. 3,874.-O. T. Springer, Wellington Square, Holton coun-
ty, Ont. Improvements in windmils, called " The ty, Ont. Farmer's Windmill." Sept is, ,875.-G. d'Infreville. New York city, U. S. Improvement in sending messages by a current of electricity
in opposite directions by the same wire and simulta neously, called "Improvement in Duplex Telegraphy." Sept.
876.-T. Graom, Guelph, Wellington county, Ont. Improvements in cooking ranges, called "Guelph Eco nomical Cooking Range." Sept. 30, 1874. ,877.-G. B. Durkee, Alden, Erite countr, N. Y., U. S.
Improvementr in axle boxes, called "Durke's Im. Improvements in axle boxes, called "Durkee's Im-
proved Axle Box for Wagons." Sept. 30, 8874 . proved Axte Bax for Wagons." Sept. 30, 1874. U.S. Improvements in elevators, called "The Page


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