

## A WEEKLY JOURNAL 0F PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES. Vol, XXIX.--NO. ${ }_{\text {[NEW SERIES.] }} \mathbf{1 7}$ <br> NEW YORK, OCTOBER 25, 1873.

## APPARATUS FOR EMPTYING CESSPOOLS

While the system of sewerage, or water carriage of night gases soil, as a means of removal, has been largely adopted in Such an efficient direct-acting pump, an airtight tank, and it at the time of its collapse forming about the obstruc
portion is deposited in vaults and cesspools; to the sanitarian, therefore, the question of how this pefuse shall be removed from such receptacles, without that violence to the senses and to decency and without that detriment to public health so long tolerated as an inevitable accompaniment of the well known and well nigh unive and well nigh univer sal bucket system, is one of no small imporance.
Up to the present time none of the various methods proposed have been largely adopted or attended with substantial success, although the most plausible solution would seem to be the use of some means of conveying the soil to conveying the soil to out agitating or ex. out agitating or ex. posing it to the open
air.
The principal mechanical difficulty has been the inevitable obstruction and choking, of the valves and working parts of the pumps usually employed, by the innumerable odds and ends that find their way into the depository. Strainers for ex. cluding every thing
${ }^{t}$ he more advanced cities of the world, still by far the larger a deodorizing attachment are claimed toconstitute the prom. tion an airtight joint, Fig. 2 . At the succeeding stroke th


APPARATUS FOR EMPTYING VAULTS AND FOR THE REMOVAL OF NIGHT SOIL.
valve is arain dis tended, and the ob straction passes ward without in the least interferingwith the action of the pump. Each valve is provided at its base with rigidstraps or braces, C, which prevent it from be ing forced into the port by external pres port
The pump is single acting (Fig. 2), and in form a straigh cylinder, provided with one fixed valve (the induction) and one movable, both marked $A$ in the engraving, the latter attached to the piston, $D$, moving in the center of the cylin der. The passage of the material through the pump is there fore direct and with out counter currents and such is its cap and such is its capa city for passing ob structions that we have seen large pieces of cloth (and it is stated, an entir pair of heavy cloth pants may be) pump edthrough with ease In fact, any obstacle not too large to en ter the suction hose and of whatever length, will pass cluding every thing the more fluid portions have been found of little avail, as the material, with its obstructions found of little avail, as the matrions, is not only not remove
Various pneumatic systems have been proposed, and several methods of exhausting the tanks bave been employed, Apparatus Company," about to be described. By this plan, Apparatus Company," about to be described. By this plan, working hours of the day, not only without offense but with the greatest efficiency and dispatch.

## The chief point of novelty in the pump employed lies in

 action. This capacity for passing obstructions renders the action. This capacity for passing obstructions renders theuse of a strainer on the end of the suction hose superfluous, use of a strainer on the end of the suction hose superfluous,
and it is used with a clear, free opening. Usually this will and it is used with a clear, free opening. among them the use of air pumps and tangled material is of tough worked by hand or steam; or, when attached to the tank, such pumps have been made to exhaust the air from it by being geared directly to the wheels of the tank, so that while it was being drawn through the streets to the vault, the air would be exhausted and the tank be in readiness for filling.
In other cases exhaustion has been effected by injecting steam or heated air into the tank and subsequently condensing or cooling it, or by filling the tank with
water and discharging it through
a tube, having its outlet some 35 or 40 feet below. All of these systems, though excellent in theory, have encountered many practical difficulties. What is needed is a pump so constructed as to raise and force, by direct action and without obstruction to its working parts, the contents of sinks and cesspools, just as they occur. To this must.be the irtich requirement that, in discharging the matter into the airtight


Fig. 2
 in the vault, such as masses of shavings and rags, a curved foo pipe is used, having an opening on its side of the full capacity of the hose. Should an accumula tion of tough materials occur at this point, it is removed occasion ally by the action of a sliding blade or cutter, attached to the foot pipe and operated by a rod This device is only used in the worst cases, but by its use the capacity of the apparatus is greatly increased, and it is under more perfect control.
the valves. Virtually, these appliances, by their construction and positions in the pump, form a continuation of the conin direct hose leading from the vault to the tank, and, being passage of the material. The valve shown in the sectional view of the pump, Fig. 2, and in the smaller engravings, Figs. 3 and 4, is made of soft, elastic, vulcanized rubber A tubular in form ; and being composed of two flat pieces placed face to face and riveted together at their edges, is, in its normal condition, collapsed. Its length is equal to some normal condition, collapsed. One end is distended, and, embracing a collar, B, that surrounds the port, is securely fastened thereto by clamps and bolts. There is, therefore, a collapsible tube, one end of which is permanently distended to embrace the port through which the material passes. This passage, in one direction, is direct and unresisted through the valve, while it cannot take place in the opposite direction by reason of the collapse of the tube by the pressure on its sides. The valve, being of much greater length than diameter, presents an extended bearing or contact sur-

The rods, E, moving the piston
are pleced at the sides of the pump, and do not obstruct the opening through it.
For convenience, the pump is mounted on wheels placed at the center. When in position for work, it stands at an angle of some thirty degrees elevation, and is conveniently operated by the brake or lever. By reason of its inclined position, the air contained in the pump is displaced with

facility and the valves retain their charge. The pump therefore, seldom requires priming, even when used to raise the material a great distance. Two props in front serve to support the pump firmly while being operated. They are closed in when not in use. The balancing of the pump on two wheels at the center also renders the discharging of its contents and cleaning very convenient, by reversing the inclination, in which position it may also be readily charged, when necessary, through the induction port, the discharge being closed.
The couplings, F , used for connecting the sections of hose together and to the pump and tank, are of novel construction and designed especially for this purpose. Those at tached to the pump and tank are furnished with fixed wrenches, by which the connection is quickly and perfectly effected. When the hose is detached, both portions of the coupling are sealed with suitable caps, and the entire apparatus rendered airtight. The receiving tank used is of or dinary construction and provided with inlet and discharge openings, and also with an indicator for showing correctly the quantity of material contained. "The action is said to be sensitive and accurate.
A flanged collar, attached to the top of tank, supports the charcoal furnace in which the noisome gases, displaced from the tank while being filled, are deodorized and rendered inoffensive. This form of deodorizer is employed as being the most efficient and economical. The purifying action of the fire is intense, and the displaced gases, after passing through it, are entirely without odor.
In addition to its use for removing night soil, the apparatus is claimed to be equally efficient in removing the contents of sewers and traps in a like inoffensive manner.

The original patent for the use of the deodorizer, in combination with an airtight tank, for cleaning sinks and cesspools without offense, was granted to Louis Straus, January 28.1868 , but the apparatus has been in very limited use, owing to the inefficiency of the pumps heretofore designed for use in connection with it.
The patent on the pump valve was granted to William Painter, of Baltimore, August 5, 1873. Patents on other portions of the apparatus are now pending, and the company is about to apply for patents abroad.
The apparatus, we are informed, has already been adopted in the National Capital to the entire exclusion of the old bucket system. The plan there employed is represented in Fig. 5, the soil being pumped into barrels fitted with the deodorizing furnace. It is also in successful operation in Baltimore, and negotiations are now pending for its introduction in other cities. Our large engraving will give an excel lent idea of the complete apparatus as it appears in use. For further particulars, address The Odorless Excavating Apparatus Co., 44 North Holliday.street, Baltimore, Md.

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## MTEMS.

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technical research and education.
One of the most eminent English chemists is reported to have recently said, in response to a question relative to the progress of original investigation in England, that in that country such research seemed to be declining, while in the United States far more was being accomplished toward its pursuit. Were we disposed to doubt the latter part of this assertion, and even were we unaware of the constantly advancing labors of the scientists of Yale, of Harvard, of Cornell and of other seats of learning throughout the country, we should be strongly inclined to admit its truth from the evidence afforded by a recent visit to that model technical school, the Stevens Institute. In three laboratories we found orig inal labor in virtually actual progress, and from three work ers -professors, yet only students in that highest of colleges. Nature-we gleaned a few general words in explanation of
the object to which the researches of each were directed,

President Morton's investigations into the beautiful phe nomena of "fluorescence," and also his brilliant discoveries
of thallene and petrolucene, we have already described in detail. We have also ailuded to his spectroscopic research es in relation to the uranic salts, and we found him still en gaged upon the same subject. We were shown his laboratory for the purification of the uranium, a process of some length, carried on by himself in order that he may obtain the metal free from impurities, with which he states it is always combined when obtained direct from commercial sources. From the result of this operation he obtains various compounds of the body, among which are several new salts amongothers, thallio-uranic sulphate and rubidio-uranic sul phate. President Morton is also investigating the properties of chrysene and pyrene, both substances obtained from coal tar subsequent to the production of anthracene, and which tar subsequent to the production of anthracene, and which
differ from each other in many respects. We were also shown a specimen of pure anthracene, which appeared in delicate sheets of a pearly luster, almost perfectly white Other specimens of the same substance, not so pure, had a decided greenish yellow tinge, while another preparation, by distillation; of the material resembled moist sugar, with, of course, the above noted difference in tinge. A very beauti ful product also obtained was pure alizarine, from anthra cene, the last process of the operation being sublimation, when the alizarine appears of its natural brilliant orange red hue. Dr. Morton tells us that he has been unable, thus far, to obtain thallene in sufficiently large quantities to meet his requirements-he wanted a barrel of it-and that he is there fore turning his attention to anthracene as being the riearest similar substance. He hopes, eventually, to be able to pro duce, from thallene, artificial alizarine.
Professor Mayer is engaged upon a series of very interest ing investigations in acoustics, mainly relative to the rela tion between sound and heat. He promises some strikingly original experiments and important lectures in the course of the next month or two, which we shall take occasion to lay before our readers.
Professor Thurston, our late correspondent from the Vienna Exposition, has returned to this country and is engaged in the continuation of his experiments on the torsional strength of materials; obtaining his results by the aid of the testing machine of his own device, an invention which we have already described. His most recent work has been up. on specimens of iron and steel, from which he has obtained the following data: The pieces were made in nearly uniform thicknoss and of about $3 \frac{3}{4}$ inches in length. In the center, a neck was formed $\frac{5}{8}$ inch in diameter, to which point the strain was applied. Sample No. 1 was of Ulster iron, 1 inch bar, twisted to $220^{\circ}$; it broke under a torsional force of 225 pounds. No. 2, ordinary spike iron, nail rod, $\frac{8}{4}$ inch bar, angle $150^{\circ}$; it broke at 240 pounds. No. 3, French tool steel annealed, $\frac{1}{2}$ inches round, angle $160^{\circ}$; it broke at 400 pounds. No. 4, Bessemer steel $1 \frac{1}{2}$ inches round, angle $75^{\circ}$; it broke at 300 pounds. No. 5 , Lowmoor iron, 1 inch square forged down from $1 \frac{1}{2}$ inches, angle $220^{\circ}$; it broke at 200 pounds. No. 6, common American iron, make unknown, for inch bar, angle $220^{\circ}$ : it broke at 200 pounds. No. 7, Naylor's tool steel, 各 inches octagon, angle $140^{\circ}$; it broke at 400 pounds.
It would be hardly fair to close this brief reference to the labors now in progress at the Stevens Institute without duly crediting the work of the students as well as that of the professors. Among the practical results of the instruction
afforded, we were shown two admirably constructed magic afforded, we were shown two admirably constructed magic
lanterns, destined for use in the lecture room, made entirely lanterns, destined for use in the lecture room, made entirely by a pupil, and in a manner which would compare favorably with that of skilled instrument manufacturers. Besides these there were a large number of metal articles used in blowpipe operations, and also many other excellently made tools and instruments for the chemical and physical laboratories, all entirely the handiwork of the students. We also noticed several original designs for machinery, and an admir ably executed graphic representation by curves of the results obtained by Professor Thurston in his late experiments upon the torsional resistance of wood.
There is an excellent sys ${ }^{2}$ em carried out in the mechanical department of the Stevens Institute which we do not remem ber to have seen practiced elsewhere, and which it appears might be advantageously followed in every technical school. We allude to instructing the student how to invent. It must be generally conceded that the young man who leaves his college, perhaps an able draftsman but withal a mere copyist of the original ideas of others, labors under disadvantages and will find greater obstacles in his path of progress than another student who graduates able to suggest ces. Than this, no fact seems to be more thoroughly recognized in the course of study above referred to; and instead of requiring the pupil to duplicate completed plans or pro duce merely handsome drawings, he is called upon at once to use his own brains in direct origination, and thus to apply in practice the instruction he gains in theory in the clasd room. To each student the Professor assigns some special work; to one, for instance, he hands a rough general idea of a steam governor, and tells him to improve it and construc finished machine, bringing in every requisite calculation, o another, he assigns a peculiar form of steam boiler; to third, an anchor hoisting gear for the Stevens battery; and on through the class, each individual being left free to design precisely as he chooses, working only from the mere crude hint given him in the beginning. If the articles are of such a nature as are capable of ready construction, they are actually made within the Institute in the machine or in. strument shop, and afterwards utilized for their purposes
bodied the result of his thought. It is needless to add tha if the student has any inventive genius, this means developes
it; and he leaves the school with a mind trained to think independently, or, in other words, to grappleat once with the problems which are constantly presenting themselves in the everyday practice of his profession.

## the vienna prizes.

Seventy thousand articles have been exhibited at the Vien na show, and 26,002 awards have been distributed. Of this aggr gate number of premiums, 421 were diplomas of hon or, 3,024 medals for progress, 8,800 medals for merit, 8,326 medals for good taste, 978 medals for art, 1,998 medals for coöperation, and 10,465 diplomas of merit or honorable mention. These were awarded as follows: Austria (withou Hungary) 5,991, Germany 5,066, France 3,142, Italy 1,908 Hungary 1,604, Spain 1,157, England and colonies 1,156 Russia 1,018, Switzerland 722, Belgium 612, Norway and Sweden 534, Turkey 470, Portugal 441, United States 411 Denmark 309, Holland 284, Roumania 238, Japan 217, Bra zil 202, Greece 183, China 118. Egypt 75, Republics of Cen tral and South America 44, Persia 29, Morocco, Tunis, an Tripoli 20, Madagascar, etc., 10, Monaco 9, Mexico, Siam and Turkestan, each 1
It will be noticed that the United States ranks No. 14 on the list, and it will at first sight seem rather curious that we should be distanced in numbers of prizes gained by coun tries so far behind the age as Spain or Turkey. It is hardly fair, however, to draw any comparison except through the relative proportion of distinctions gained as compared with the number of exhibitors from each nationality, while the na ture of the articles for which the honors were given must als be taken into consideration, regarding which facts accurate nformation has not yet appeared. The position of the United States is, of course, attributable to the paucity o our representation, a circumstance, however, which cannot
be urged in the case of England; so that, so far as that country is concerned, and even considering everything, we are somewhat at a loss to understand how, not merely with its own fine display, but also with that of its dependencies, Great Britain ranaged to reach so low a place on the list. We expected, as a matter of course, to see local industrie fostered, and consequently the leading of the nations by Austria, followed closely by Hungary, does not surprise us. The proxinity of Germany, France, and Italy also accounts for their large figures ; but on what possible ground Spain, a country for the past three years in a constant sta te of tur moil, with what little industries it had all but paralyzed, and producing nothing of major importance either in manufactures or arts, is granted a higher number of prizes than En gland, is totally beyond our comprehension. We shall await the full reports of the exhibition with increased impatience, if only for a solution of this paradox.

## FAILURE NO. 2 Of the balloon to europe.

Soon after the collapse of the Daily Araphic advertising balloon, on the occasion of its original inflation preparatory to the start for Europe, the proprietors determined to make use of such portions of the cloth as might be serviceable in the manufacture of a smaller gas bag for another trial. They accordingly reduced the bag from a capacity of 500,000 cubic feet to 250,000 ; and on October 6th, at $9: 30 \mathrm{~A} . \mathrm{M} ., \mathrm{Mr}$. Donaldson, the aeronaut accompanied by two newspaper men, Ford and Lunt, started from Brooklyn, N. Y., "direct for Europe." During the preceding week Donaldson had made a couple of short ascensions in a small balloon, and had difficulty, he said, in reaching that " easterly current."
On this last excursion, the balloon was provided with a life boat, as a car, to be used in case the voyagers should, by any unforeseen circumstance, be compelled to descend upon the raging deep. The boat was stocked with water and provisions for 40 days, together with a considerable quantity of sand ballast. The morning of the ascent was fine, and the balloon rose majestically, passing northerly over the cities of Brooklyn and New York at an elevation of about a mile, and for some time formed a conspicuous object in the heavens, for the gaze of our citizens. But it finally faded away into a mere speck and then wholly disappeared, going northeaster ly. At 3 P. M. intelligence was received that the balloon had come down in a furious rainstorm at New Canaan, Conn. 60 miles from New York; and from the accounts of the poor aeronauts, they narrowly escaped with their lives. They represent that they sailed along beautifully untilabout 1 P.M., when they suddenly entered $t$ he precincts of a violent rain storm, which, spite of all they could do in the way of throwing out ballast, drove the balloon down to the earth, upon which they were tumbled in great disorder and violence, while the big bag and boat brought up against the trees and rocks. The balloonists further admit that, almost from the beginning of the voyage, they had to continue throwing out ballast in order to keep themselves afloat, which would seem to indicate that the balloon was in a leaky condition at the start. The Graphic people, however, insist that the machine was sound and strong, and allege that the fall was due to the great weight of water which accumulated on the surface of the balloon. If this is the fact, it might be desirable to provide the balloon with an umbrella, on the next trip to Europe, to keep off both rain and sun.

## CAOUTCHOUC FROM COMMON PLANTS

The extensive demands for india rubber, and the compar ative scarcity of the supply, has augmented the price until it now stands at nearly one dollar per pound in this market. The crude matter comes from tropical regions, and is derived mostly from certain trees, the nomenclature and localities whereof were presented in a recent article in the Scientiftc American.

A variety of attempts to find substitutes for rubber, or new sources of supply, have been made. In the matter of substitutes, several valuable compositions have been invented, wh ch are used in place of rubber for specific purposes. Among the new sources of supply are the fruits, seeds, and juices of various plants, which have been successfully treated by Mr. D. M. Lamb, of Strathroy, Canada. By fermenting the asclepia or common milkweed plant, followed by pressure and evaporation, he separates a gummy liquid having the characteristics of rubber, and, like it, capable of vulcanization.
From the bamboo berry grown in the South, from flax seed and other seeds, he also obtains in tnis manner a similar gum, from which, it is said, a good article of vulcanized rubber may be made, and also an excellent waterproof varnish. It is alleged that these substances may bs produced at a cost not exceeding 20 cents per pound, and that a company with a large capital subscribed is about to intro duce the manufacture here.

## RECENT GUNNERY trials.

The special Board appointed to make comparative trials of howitzers, field guns, and mitrailleuses, assembled at Fortress Monroe on the 1st of October and closed their labors on the 6th. The trials were made under direction of General Gilmore, President of the Board, assisted by Colonel Treadwell of the Ordnance Department, and Captain Lorraine of the Artillery. The trials were made on the seashore ne the Artillery. The trials were made on the seashore.
the Fort, the target being 9 feet high and 40 feet long.
The gunstried consisted of the ordinary Napoleon 9 poun
The guns tried consisted of the ordinary Napoleon 9 pound-
er field gun, carrying 12 lbs canisters ; weight of gun about 900 er field gun, carrying 12 lbs. canisters; weight of gun about 900
lbs. ; worked by 8 men; range of firing 800 yards; the orlbs.; worked by 8 men; range of firing 800 yards; the or-
dinary 8 inch field howitzer, weight of gun about 2,500 lbs., dinary 8 inch field howitzer, weight of gun about 2,500lbs.,
worked by 8 men, range of firing 800 yards; the small Gatling gun, caliber 42 , weight of gun 200 lbs., worked by 2 men, range of firing 800 and 1,200 yards; the one inch Gatling gun, 900 lbs., worked by 4 men using canister cartridges each containing 21 half inch balls, range of firing 800 and 1,200 yards.
The remarkable advantages of the Gatling gun were never more thoroughlyestablished than on this trial. At 800 yards the small gun threw 600 shots in 90 seconds, of which 515 hit the target, being from 8 to 10 times more than the hits made by the howitzer and field guns.
At 1,200 yards range the latter guns, owing to some defect in the ammunition, were withdrawn, to be tried on another occasion.
At 1,200 yards range the Gatling guns, both sizes, exhibited great success in striking the target with deep penetration. The heavy Gatling threw 5,355 missiles in 90 seconds, of which 1,595 struck the target. These are remarkable results and have probably never been surpassed in this species of gunnery.

## CRUDE PETROLEUM FOR FUEL

We are indebted to our correspondent at Norrisiown, Pa We-are indebted to our correspondent at Norrisiown, Pa.,
Mr. H. L. Acker, for a further communication in reply to our comments on his letter upon the above subject, recently published.
He states that further trials, from which more exact data may be expected, will shortly be made; and it is therefore unnecessary to give his present letter in full. 'He informs us that the price of coal at Lamokin, Pa., is $\$ 6.30$ per tun, and the price of crude oil 64 cents per gallon in kulk; and, on an allowance of 4 lbs . of coal per horse power per hour as a basis, he figures the relative costs of the two fuels at $\$ 5.40$ for coal for ten hours, and $\$ 4.37 \frac{1}{2}$ for the petroleum.
In respect to an allowance of 4 lbs . of coal per hour, he says: "That is, of course, when the boiler and engine are most favorably constructed. But you are aware that, as a general thing, this will not hold good," etc. We will here remind our correspondent, and others who are studying on
steam power, that a favorably constructed boiler and engine, steam power, that a favorably constructed boiler and engine,
properly run, should consume not over two pounds of properly run, should consume not over two pounds of
coal per hour per horse power, and it is this quantity of fuel that they must beat, if they expect to drive coal out of use. We allowed 4 lbs . for the particular engine referred to, because more than half the fuel actually required to do the work is ordinarily wasted. But it is an unnecessary waste.
By reference to back numbers of the Scientific American, our correspondent will find plenty of examples of marine, portable, and stationary steam engines which run on 2 lbs . of coal per hour per horse power. Nearly all of the ocean steamers now plying between New York and Liverpool run on 24 lbs . per horse power per hour, some of them on 2 lbs ., while the Cowper compound marine engine runs on $1 \frac{1}{2} \mathrm{lbs}$. This latter is the best practice yet reached, we believe; but theoretically, we ought to use only $\frac{1}{4}$ of a pound of coal per horse power per hour.

## STREET PAVEMENTS.

About three years ago, the subject of street pavements attracted considerable attention, and we had specimens of nearly every description that had ever been patented laid in various parts of the city. The general interest in this matter seems of late to have died out; but to those who own horses or have any regard for the sufferings of the noble animals, this will always be a subject worthy of consideration. The patent pavements, almost without exception, were found to be worthless, and the city authorities at last found this out and came to the conclusion that stone in some shape, and stone only, was fit for the pavement of our streets, particularly the thoroughfares. Of the other kinds of pavements, the Nicholson is the only one which has still any advocates.

It is a good pavement as long as it lasts; but its lack of du-
rability, the insecure foothold it affords in frosty weather and its high price, are drawbacks which will always tell against it; besides, it cannot but be considered prejudicial to the public health, for it absorbs a portion of the effete matte constantly deposited upon it, and retains this in a moist state, favorable to decomposition, much longer than any other pavement we have. Of the stone pavements, the Belgian and the Guidet are generally acknowledged to be the best; and their superiority over the cobble stones, as usually laid in our streets, cannot be denied. The principal complaint against these pavements, particularly the former, is that the stones wear smooth and the horses slip; not only in winter, when there is frost, but at all times when dragging heavy loads and on starting. Th.e fault found with the cobble stones, as they are put down in the streets of New York, is that the smaller stones sink after they have been subjected to a certain amount of travel, the larger ones, against which the hoof is apt to strike when thrown forward, remain ing prominent, tearing off the sboe and causing the horse to stumble. Moreover, owing to the numerous inequalities of the surface, the horse must expend an increased amount of force to pull his load, and starting is rendered very diffi-
cult But if cobble stones are properly selected, that is if cult. But if cobble stones are properly selected, that is, if they are small and of a uniform size, they are superior to any stone pavement ever put down in giving a good foothold and doing little injury to the hoof.
Now, notwithstanding stone pavements are the only o to be recommended at present, it is possible we may be able to secure something better for the future; and it being a matter of so much importance, there is every reason why the city government should seek to ensourage ev periment. Not such experiment as was tried under the old régime and which cost the tax payers so much; but let each patentee have a chance to exhibit his $p$ vement, and de onstrate to the public whatever merits it may possess, by laying down a hundred feet or more in some of our public thoroughfares at his own expense. In this age of progress and enlightenment, it would seem as though we mightride with more comfort and have some feeling for our horses.
To the city railroad companies this is a matter of special interest, and it.seems strange that they have not made greater exertions to protect their horses' feet and thereby diminish one great item of expense. No one has ever rode on the front platform of any of our horse cars without noticing with pain the difficulty the poor brutes experience in start ing for want of a good foothold. The average length of time that a horse is serviceable on any of the city lines of cars is about three years and a half, and at least fifty per
cent are rendered unfit for service on account of injury done to their feet or limbs, or from strains, the result of frequent slipping and consequent over exertion.
A model pavement would be one affording a good foothold, impenetrable by water or moisture and comparatively level, that is, presenting an even surface. It should possess a cer tain amount of elasticity, which would not only render it less injurious to the horses' feet but would tend to deaden the sound of vehicles passing over it. If such a pavement could be produced at a reasonable price, and if it were dura ble, it would certainly meet with public favor, for it would prove a blessing to the horse and a great saving to the owners of horses.

## curiosities of butter and churning.

The art of making butter is by no means of modern date this, the derivation of the word from the Greek buturon, and this again from bous, a cow, and turos, cheese (litera!ly cow's cheese) sufficiently indicates. But although the word is of Greek derivation, it was late before this people had any nution of it. Their great poets, Homer, Theocritus, and Euripides, who, like Shakspeare, drew the stores for their immortal creations from all sources of
knowledge, do not speak of it, although they mention milk and cheese. Aristotle,the famous philosopher of olden time first speaks of a fat substance contained in milk which, under certain circumstances, becomes like oil. Herodotus the Greek historian is the most ancient writer who, in his account of the Scythians, describes a process for making who was century B. C. "The Scythians," says Hippocrates, " pour the milk of mares into wooden vessels and shake it up violently, making it foam, when the fat part which is light rises to the top and becomes buturon." Dioscorides, 33 B. C., says that good butter is prepared from the fattest milk of sheep or goats, $\mathrm{kyy}_{y}$ shaking it in a vessel till the fat separates. He says, also, that it can be melted and poured over pulse and
vegetables, instead of oil, and might be used in pastry invegetables, instead of oil, and might be used in pastry in-
stead of oil. It is evident from this that drawn butter is not a modern invention, and that our pastry cooks have certainly learned something from their grandmothers.
But the principal use of butter among the Greeks and Romans was as an ointment and a medicine. The Romans were accustomed to anoint the bodies of their children with applications by using it as a hair oil. Plutarch, the prince of ancient story tellers, informs us that a Spartan lady once paid a visit to Berenice, the wife of Deiotarus, and that one smelt so strongly of ointment and the other of butter, that neither could endure the other. We are not told what kind of ointment it was, but we can safely assert that the butter must have been very rancid.
The ancient Christians of Egypt burnt butter in their lamps instead of oil; and in more recent times, it was used the Christmas festival, to avoid the great consumption of
olive oil. The Cathedral of Rouen has a tower called the butter tower, from the fact that the Archbishop of Rouen, in A. D. 1500, finding the supply of oil to fail during Lent, permitted the use of butter in lamps, on condition that each inhabitant should pay six derniers, with which money the tower was built. There are other "butter towers" at Notre Dame, Bourges, etc.
It is evident from the early history of butter that the Greeks and Romans did not use it to any extent in cooking or in the preparation of food, but Anaxandrides, a poet who lived shortly after Hippocrates, mentions a banquet where the Thracians ate butter, to the astonishment of the Greeks. But the article formerly called butter was oily and impure, wanting the firmness and consistency of that of modern times. It was consequently prone to decomposition, and its use limited. The ancients had usually accustomed themselves to good oil, and butter, in later times even, has been very little used in Italy, Spain, and the south of France, but was sold chiefly by the apothecaries for medicinal purposes. Most modern Biblical critics agree that the word translated butter in our version of the Scriptures means milk or cream, or, more properly, sour thick milk. In the 30th chapter of Proverbs, we find a verse beginning "t the churning of milk bringeth forth butter, etc." This would certainly seem to describe the preparation of butter, but the original Hebrew words chaleb metz signify squeezing or pressing, as for example, the udder of a cow; so that milking, and not mak ing butter, is supposed to be meant. It is very probable that the formation of butter was discovered by accident in the transportation of milk in skins, which are still used in Barbary. In this country the Arabs churn their cream by suspending it contained in skins of goats in their tents and pressing it to and fro. Dr. Chandler, in a journey from Athens to Corinth, noted the mode of churning in the Levant. It consisted in securing the cream in skins, and then treading them with the feet. In Bengal, probably owing to indisposition to exertion in consequence of the ex cessive heat, they manage to make butter come by simply turning a stick around in the milk, but the product cannot be large. The inhabitants of the interior of Africa seem to be favored with respect to butter. The famous traveller Mungo Park, whose adventures delighted our boyish days, says that a tree grows there, resembing American oak, which bears a nut like an olive. When the kernel of this nut is boiled in water, it yieldsa butter, which the traveller asserts is whiter, firmer and of a richer flavor than any he eve tasted from cow's milk; and which will keep without sal for a whole year. The natives call it shea toulou or tre butter, and large quantities are made.

## sCientific and practical information

test for arsenical colors on wall papers and in

## paper generally

Professor Hager recommends the following method for deecting this dangerous class of arsenical colors, which, we may remark, are not confined to green alone, for even red sometimes contains arsenic: A piece of the paper is soaked in a concentrated solution of sodium nitrate (Chili saltpeter) in equal parts of alcohol and water, and allowed to dry The dried paper is burned in a shallow porcelain dish. Usu ally it only smolders, producing no flame. Water is poured over the ashes, and caustic potash added to a strongly alkaline reaction, then boiled and filtered. The filtrate is acidified with dilutg sulphuric acid, and permanganate of potash is added slowly as long as the red color disappears or changes to a yellow brown upon warming, and finally a slight excess of chamelion solution is present. If the liquid becomes turbid it is to be filtered. After cooling, more dilute sulphuric acid is added and also a piece of pure clean zinc, and the flask closed with a cork split in two places. In one split of the cork a piece of paper moistened in silver nitrate is fastened, in the other a strip of parchment paper dipped in sugar of lead. If arsenic is present, the silver soon blackens. The lead paper is merely a check on the presence of sulph hydric acid. According to Hager, the use of permanganate of potash is essential, otherwise the silver paper may be blackened when no arsenic is present.

## curious sjbstances in guano.

In former communications, says La Nature, M. Chevreul has called attention to the unexpected effervescence manifested by guano when combined with water. The author now considers that this property is due to the presence bicarbonate of ammonia.
It is quite credible that this effervescence might take place if the guano were placed in a moist field, the material losing instantly all its excess of carbonic acid and consequently its activity. Once saturated, it becomes inert. M. Chev reul finds that the material dissolved by the water is crys talline and, as above noted, constituted by an ammoniaca salt but as yet the acid is not determined, though it is pro bable that it belongs to the long series of uric derivatives The residue obtained after the action of water is partially soluble in alcohol, the solution containing various imm $\curvearrowleft$ diate principles of the guano, and amung them the odorous principle or avic acid. The portion not dissolved consists espe cially of phosphate of lime.
It is an interesting fact in relation to avic acid that guano, despoiled of this substance and hence rendered inodorous, regains in a short time its characteristic aroma. The same has been found true of musk, which although once deodor ized becomes again a perfume after several years. It is be lieved that, by a peculiarity analogous to the above, game
leaves upon the ground a permanent scent, traceable by the delicate organs of the dog

## INEXTINGUISHABLE FIRE FOR LIFE BUOYS.

 In order to provide a promp: means of support for men who may happen to fall overboard at sea, all vessels in the United States navy are provided with life buoys. These, usually two in number, are hung directly over the stern, so as to fall well clear of the ship when they are let go. The apparatus consists of two hollow copper vessels somewhat elliptical in form, joined together by a horizontal bar, three feet or so in length. The latter is attached at its middle to a vertical standard, on the lower part of which is a crosspiece for the person to rest his feet against while he clings around the standard above the crossbar with his arms. The upper end of the standard carries a square plate of metal, on which is coiled a tube whish is always kept filled with portfire composition, of gunpowder or other ingredients, which will burn for twenty minutes or so with quite an intense flame. The buoy is attached to the vessel by a simple tripping apparatus communicating with a pull on or near the taffrail. The plate carrying the portfire fits under another piece on which is placed a lock and hammer which, when sprung, explodes a cap and so sprung, explodes a cap, and so ignites the portfire. For thisalso there is a pull, generally also there is a pull, generally placed immediately beside the on above mentioned. Night and day at sea, a man is kept stationed at this post, and it is his duty the instant the cry of " man overboard" is raised, to pull first the portfire handle to light the powder, and then to let the buoy drop, while a hand in the mizzen top watches its position and that of the person in the water, and so directs the move ments of the rescuing boat.
Once afloat, the apparatus remains upright and of sufficient size to be readily discerned by a swimmer during day, while its
bright flame directs him toward it at night.
As may be imagined, there is an objection to the use of any combustible liable to be fextinguished by water or wind, as, if portfire or other composition be not directly put out by spray or rain, its flame may be so weakened as to render its light too faint for the discernment of objects in its neighborhood. Messrs. Silas and Seyferth, in order to obviate this objection, have suggested the use of phosphide of calcium. This substance is prepared by distilling phosphorus over lime heated to a low redness. An anhydrous mass of a dull red color is obtained, hard enough to strike fire from steel, which experiences no change in dry air nor in oxygen at the ordinary temperature. In a moist atmosphere it slakes, emits phosphuretted hydrogen, mixed, however, with free hydrogen, and not self-lighting; but if it be thrown with free hydrogen, and not self-lighting; but if it be thrown
directly into water, phosphuretted hydrogen gas only is evolved, and this, as is well known, takes fire spontaneously in atmospheric air. The form of apparatus proposed is
epresented in our engraving, for which we are indebted to La Nature. The buoy is of wood or cork, analogous in form to that ordinarily employed in the French navy, and has in its center a hollow space in which is arranged the lighting rrangement. The latter is com posed of a metallic box con taining the phosphide of calcium, through which passes a tube which extends beyond it a short distance both above and below. This tube, in the portion which traverses the box, is pierced with a number of holes so as to admit the water necessary for the decomposition of the phosphide. Two cocks, arranged one at the upper part of the tube and wo cocks, arranged one at the upper part of the tube an


## INEXTINGUISHABIE FIRE FOR LIFE BUOYS.

together by a rod. These are worked by the traction of a cord attached to the upper cock, which is protected against hocks by a metallic cup, through which the line passes. The latter arrangementis connected to the tube with a screw, so that it may be removed and the box lifted out to renew the phosphide when exhausted. There is also provision made for hermetically sealing the contents by a little melted osin in a suitably placed cavity.
The entire device is suspended by a single cord, which is cut by the operator. A slight line is connected with the cocks, and also with a staple on a pulley through which the suspending cord of the buoy passes, so that when the latter falls its weight is sufficient to cause the thread first to open the cocks and then to break. The apparatus adrift, the water enters the bottom of the tube and, rising up, enters the phosphide through the perforations. The reaction set up disengages gas, which escapes at the upper orifice of the
tube, giving a flame of intense brightness and, during the
frst five minutes, of some 11 inches in length. On the oc asion of experiments recently made at Toulon, with a charge of 7,084 grains of phosphorus and a tube with an pening of 0.1 inch in diameter, the flame lasted for one hour and ten minutes.
It is suggested that phosphide of calcium might be ar anged with ordinary life preservers so as to float in a suit able vessel at some distance from the swimmer, and thu mark his position. It would also be useful, in cases of wreck, to enable a vessel, over which seas are continually breaking, to communicate with the shore, or it might be employed on railroad trains in distress as a signal inextin guishable by wind or rain

We learn that the apparatus as above described, has been distributed throughout the French navy, for experimen in different parts of the world in order to determine not only the operation in cases of neces sity, but also whether the phos phide will keep perfectly when submitted to variable atmo spheric conditions.

Ditching by Steam Power In North Germany the recla mation of the extensive low lands, that have heretofore re mained uncultivated for lack of drainage, is now proceeding with vigor under the auspices of a company employing a large capital and effective steam ditching machines. Each ma chine cuts a canal 20 feet wide and 6 feet deep, and from 100 to 120 feet in length, every 10 hours. The peat is delivere on the surface of the ground alongside the canal, where it is dried, cut into bricks, and sent to market. It is an excel lent fuel. In Holland and Friesland thereare 1,000 square miles of this bog land now worthless, which will be ren dered habitable and profitable as fast as the canals are cut to say nothing of the immense quantities of fuel that wil be obtained by the ditching operation.

## THE ENGLISH STEAM LAUNCH FIREFLY

Some tine ago we gave an account of the trial of the steam launch Firefly, one of those wonderful little high speed vessels for which Messrs. John I. Thorneycroft and Co., of Chiswick, England, have gained such a reputation. Of this craft we now publish a sketch, fromEngineer ing, which will serve to show her general character. Al though only 53 feet long over all, 6 feet 6 inclıes beam, and 2 feet 6 inches draft of water, the little vessel made, on her trial he speed of 18.94 miles per hour, the observations of the runs being made with a care and accuracy which admits of no question. The Firefly is driven by a pair of engines of the inverted direct acting type, wi.h 6 inch cylinders and 8 inch stroke, also made by Messrs. Thorneycroft; and it was

built for Mr. Henry Morel, of the Sociétéde la Lys, of Ghent. Messrs. Thorneycroft and Co. have made a specialty of these high speed boats, and there appears to be constantly increasing demand for them. The firm are now construct ing some of these launches with compound engines.

## PERIPOLARGINDUCTION

Those of our readers who have attended the very interesting lectures delivered by Professor Mayer, of the Stevens Institute, Hoboken, N. J., on the subject of magnetism, will remember the striking experiments which he performs with the aid of the huge electro-magnet belonging to that institution and a disk of copper suspended so as to freely swing between its poles. When the magnet is uncharged, the plate vibrates, like a pendulum, from side to side with perfect readiness, retaining its motion for some little time after the impelling force is removed. If, however, a current is established, converting the masses of iron into actual magnets, the vibration of the plate is almost instantly stopped; an in visible resisting medium appears to have been formed between the poles, through which the disk is unable to pass, or, if forced through, acts, as Professor Mayer expresses it, "as if it were penetrating cheese."
On conducting an experiment somewhat similar to this, Fara day was led to the conclusion that the arrest of the coppe plate was due to induced currents produced therein. In other ex periments, which we will not here describe, the existence of these currents was demonstrated by the direct exploration of a disk of copper turning before a magnet an operation which defined the paths of the currents with cer tainty. Foucault modified Fara day's mode of investigation by arranging his plate of red coppe on a horizontal axis, and revoly ing it by suitable mechanism a ing it by suitable mechanism a he rate of 10,000 turns per min te. The disk passed betwee the two extremities of the soft
iron core of an electro-magnet in which a current could be es tablished at will. As long as the the latter remained broken, the plate, when swiftly rotated, would retain its motion for some time; but as in the case al ready cited, a prompt stoppage followed the establishmen of the electrical flow. Foucault intended not simply to re produce Faraday's experiment, but he wished to study the results incident to the application of a force sufficient to continue the rotation of the disk in spita of the obstruction. It was found that, to accomplish this, considerable mechanical energy must be expended, which could be calculated and which reached quite large figures. What became of the excess of work over and above that necessary to ensure the rotation of the disk, maintaining a given velocity (or, in ther words, that rendered necessary by the effect of the current), was the question, and Foucault determined it to be transformed into heat. This conclusion was soon justified by experiment, as it was found that the temperature of the disk became elevated to a degree appreciable by the hand and when the rotation was prolonged for two minutes and the current produced by six Bunsen elements employed, he melting point of wax could be attained.
We have now given, of the salient points of this study enough to show its progress up to the present; for since Foucault's experiments, no particularly notable investigations have been made into the action of magnets on copper in motion. M. Le Roux, however, has recently devised the apparatus represented in our engraving, and, besides, inves tigated that which he calls "peripolar induction."
Supported by iron feet on a solidly constructed table are four coils of isolated copper wire, so arranged as to be connected with a battery by means of the commutator, C, by which the current is interrupted or established at pleasure. Within these coils are cores of soft iron, the extremities of which extend beyond the wire and form the poles of the magnet when the current passes. A disk of red copper, $\mathrm{DD}^{\prime}$, is placed symmetrically in the center of the apparatus and parallel to the axes of the coils, and turns on a horizontal axis which extends between the opposite extremities of the iron, as at A. At this point is shown the pinion which, with other gearing, transmits the motion of the handle to the disk, so as to cause it to rotate 180 times per second, or about 10,000 times per minute. To the ends of the cores of the opposite coils and below are fixed two pieces of soft iron, $\mathrm{F}^{\prime}$, between which passes, though without touching either, the copper disk, D.

Thus arranged, the machine forms a powerful Foucault apparatus, with which the experiments above indicated can be repeated. But above the cores of the me gnets are placed other pieces of soft iron,' F, arranged similarly to those marked $\mathrm{F}^{\prime \prime}$, which, we have stated, are fixed below. When this portion of the device is in position, all the pieces become magnetized by contact with the electro-magnets; and as is evident, the disk, D , in its entire extent, is submitted to the action of a magnetic field presenting the greatest sym. metry in every direction. Here, however, the contrary of that which has been heretofore observed takes place; the
rotation of the disk is as easily accomplished when the cur rotation of the disk is as easily accomplished when the cur-
rent passes as when the circuit is interrupted; and that the rent passes as when the circuit is interrupted; and that the
same resistance experienced in the Foucault apparatus is not here encountered is proved by the fact that the copper does not become sensibly warmed.
The current nevertheless passes, and zinc is dissolved in the battery. Here then is expended energy which should manifest itself somewhere. The study of the effects which should be produced by reason of the induction led M. Le Roux to admit the existence of a current running from the center of the disk to che circumference; and he proceeded to verify his conclusions. To this end, a vertical metal support is placed in contact with the axis of the disk, and a horizontal rod fized to this support terminates in a couper orizontal Whe, the end of which rests on the periphery of the disk. When the latter is turned, with pecial effect is observed, except the slight warming of the copper wire by the friction. If, however, the flow of elec.


PERIPOLAR INDUCTION.
ricity be established, at that instant a continuous series of sparks leaps from the point of contact of wire and disk, thus denoting the existence of a very energetic current in the ircuit formed by the disk, its axis, and the various pieces already described as arranged in connection therewith
It is in the fact of there being this current, as predicted by theory, that M. Le Roux' idea of peripolir induction is based No practical application of the discovery has been made but it is very interesting, in that it confirms many theoreti cal ideas regarding induction. The machine represented was by Rhumkorff, the celebrated manufacturer and inven tor of many physical instruments, and has been exhibited before many French scientific societies.

## DEMMING'S CROWN SASH FASTENER

We illustrate herewith a new and quite ornamental form of sash lock and holder, which can be readily attached to

any window without mutilation of the wood work. The device has no spring to wear out and is composed of but two pieces and a fastening screw. The latter serves as a pivot for the small cog wheel, A, the teeth of which engage in projections, formed, as shown, on the casting, B. When the sash is down the apparatus takes the position shown, so that, on attempting to raise the windows, the wheel, acting against the upper part of the casting, presses the face of the latter firmly against the batten and prevents the elevation of
the sash. By turning the wheel by means of the small projection formed upon it, its motion through the bent slot raises the piece, $B$, and at the same time draws the face of the latter away from the casing so that it no longer binds.
When the window is up, it can be held in any desired position by causing the device to place itself as shown in the dotted lines, when the wheel comes to the bottom of the slot and, as is evident, pushes out the bottom of the casting. The apparatus falls readily into the position represented, and thus forms a self-fastener when the sash is down.
The advantages claimed are simplicity, ease of application; the non-marring of either sash or frame, a preventive of sash-rattling in windy weather, a positive lock when the sash is either up or down, a self-fastener when the lower sash is down, the holding away of the lock from the frame by the use of the handle when in the act of raising or lowring (as shown by dotted lines), and a peculiar adaptability to car windows. The lock can beas easily placed on the right side of the sash as on the left, by being turned upside lown; and in either case, if the ash is left raised, it cannot be urther elevated from the out side.
Patented August 19, 1873. Further information can be had by addressing the patentee and wner, H. C. Demming, Harris burgh, Pa.

## Proposed; New Basis fo <br> Decimal Measures

A correspondent, C. A. G. writes to point out that the French basis, the $10,000,000$ of one fourth of the earth's circum ference, is unsatisfactory as a starting point for the calculation of a system of weights and mea ures, as the circumference of a circle cannot be exactly ascer ained. He proposes to use the secant equal to the radius of the ircle, that is, the side of on in cribed hexagon; and he point out many supposed advantage f the change But as the whole matter is a quation the ory we cannot que posed plan brings us any neare to absolute accuracy

## IMPROVED PRESS FOR FRUIT, LARD, ETC

The annexed engravings are views of a new and simple form of fruit or lard press, in which, among other advan. tages claimed, the usual framework for the screw is rendered unnecessary, and there is a peculiar construction of th press chamber for facilitating the removal of the cake left fter pressing.


A is the base of the apparatus, having radial corrugations raised upon its surface, the channels between which lead the expressed liquid to the spout shown. In the center is a short conical projection, over which fits the lower portion of an inner perforated tube, A. The latter is connected with

a perforated bottom which, when in position. rests on a Hange made by turning the lower edge of the outer perforated wall, C . In the center of the base is a screw, D , on which is a nut provided with suitable handles. This nut
has a conical depression in its lower face to engage with corresponding projection on the follower, E. The form of the latter is clearly shown with that of the other detached portions in Fig. 2,while Fig. 1 represents the apparatus set up.

The material to be pressed is placed between the perfora ted bottom, on B, and the follower. By suitably turning the screw, the latter is carried down, squeezing the contents of the press, the juice or liquor escaping as already noted. It is claimed, in addition to the advantages already referred to, that, by the use of a follower with a conical bearing in the nut, and guided by the central tube, a more even and level bearing on the mass to be pressed is obtained than can be got by the ordinary screw press. After the liquid has been expelled, the cake may be removed by lifting the central tube, B, which brings the mass out with it, and from which the latter can be easily broken away.

The inventor informs us that the apparatus is welladapted for pressing fruit used in the manufacture of wines, cider, and jellies, and also for dairy purposes in compressing cheese and butter.

Patented September 2, 1873. For further particulars re garding sale of patent rights, address Mr. Joseph Harlan Lexington, Scott county, Ind.

## THAT ANCIENT SEWING MACHINE.

We referred, in a recent issue, to the discovery of an old sewing machine patent among the records of the British Patent Office, which, for a short time past, has excited considerable interest in mechanical circles. We present herewith engravings of the drawing attached to the specification. The latter we give below verbatim. The patent was granted to Thomas Saint (cabinet maker) on July 17, 1790 for " An entire new method of making and completing shoes, boots, spatterdashes, clogs, and other articles, by means of tools or machines, also invented by me for that purpose, and of certain compositions of the nature of japan or varnish which will be very advantageous in many useful applica tions." It is numbered 1,764, and dated July 17, 1790.

The specifications describe three separate machines; the first a rather primitive contrivance for spinning and doubling the thread, the third for plaiting and weaving, and the second for "stitching, quilting or sewing." The last mentioned is the device represented, which is described as follows A B C is the frame. Fig. 1 is the reel for the thread. 2 is a spindle which, moving to the right, conveys the thread to the needle at 4, and moving to the left again takes hold of
he article you are stitching. 25 is a Brace or support to the top of the Machine. The Coge 14, 15, 16, 17 and 18 in the Spindle at 5 should be so fastened as to be screwed up or down according to the quality of the article and fineness or oarseness of the stitching required."
The machine was destined for use in sewing together out side and inner soles of shoes, and for joining legs, spatter ashes, etc. It seems quite certain that there was no eye pointed needle, but that the lower end of this implement which appears to be fractured, is meant to be notched in order to push the thread through the work.

## Carrespondemer.

## Crude oll for Fuel

To the Editor of the Scientific American:
In your issue of October 4, in an article on the combustion f petroleum as fuel and for manufacturing gas, you se forth that the best result of combustion of petroleum a compared with coal was as 2 to 3. Now Mr. Daniel Fisher, at Fisher Brothers' storage tanks in Oil City, Pa., has a burner in operation that he has used since last winter continuously. He uses from one barrel and one half to one barrel and three quarters during the run of ten hours, using in the same time one tun of coal. He uses steam as a mo tive power, throwing a jet of oil into a chamber, thence through a small opening in the chamber to the furnace, the jet being accompanied by a current of air, fed in connection with the oil, of such quantity to make perfect combustion there being no smoke. Mr. Fisher has not patented his in ention, nor does he propose to.
to be her
Remarks by the Editor.-The idea intend to be her nveyed is, we presume, that 74 gallons of crude petroleum or 518 lbs. , is made by means of Mr. Fisher's apparatus to enerate as much steam power as a tun of coal. There i evidently a mistake somewhere. The power of the engine is not stated, and therefore we cannot judge of the economy
of the fuel. But we may observe that, if the engine and of the fuel. But we may observe that, if the engine and boiler are well made and intelligently run, then two pounds of coal per horse power per hour would be consumed, on which basis a tun of coal would drive a steam engine of 112 horse power for one day of ten hours, and it would requir ,494 lbs., or 5 barrels, of petroleum to do the same work.

## The Hot Air Engine

To the Eaitor of the Scientific American:
I have read with much interest the suggestions latel made by the different correspondents for the im provement of the hot air engine. I have had the care of a caloric engine for almost two years. It is of $2 \frac{1}{2}$ horse power. I am troubled to keep the upper door and also the poppet valves tight. I would throw out two suggestions that I think would make them better as far as valves and doors are concerned, they are these: Have the door seats cast separately from the engine, and have them fastened to it by a flange around the seat, with bolts screwing into the engine; the door and seat could then be easily taken from the engine and planed or ground together as the case might require. As they now are, it is a vexing tedious job to grind them to a surface by hand and the change might sometimes save the re moval of the whole furnace to a shop for repairs
I think that the poppet valves would be bet ter if they were made somewhat like a cone, hav ing the same bearing surface as those in use at the present time; this would make them less lia ble to warp, they would be more quickly ground together if they leaked, and by no possible means could anything lodge on the valves or seat. Someimes we have had the engine nearly stopped by
the stitch and keeps it tight till the needle has brought an other stitch through the last taken; and so it goes on alter nately until the whole article is completely stitched. 3 is the awl that makes the holes for the needle to pass through. 5 is a spindle that goes through the poppet at 6 ; while by turning the spindle at 5 , the awl and needle is worked by the cogs 1.5 and 16 , which are in the spindle at 5 ; and the motion of this spindle gives motion to the prongs 26 and 27 , which


Fig. $\%$

jeig. are in the spindle at 2. 14 is a cog that gives motion to the wheel 7 , which gives motion to a slide at 12 which moves along the grooves at 9 and 10 by means of a screw that is fixed in the wheel, to which slide the article is fixed for stitching. The prong 26 goes into gives motion to it " which draws the thread on the under side of the article and ho'ds it tight till the next stitch is taken, and so on till it is done. 22 in Fig. 6 is a shoulder rks against. At 21 is a shoulder that the Cog at 16 works against; these work (in?) the Poppet at 6. 19 and 20 are two screws to fasten the Awl and Needle 3 and 4: in 23 is the thread passing in between the Awl and Needle which the eye of the Needle receiveth. 24
mall lumps of coal catching between the valve
nd seat; and at others it bothers me to start it for the sam
reason.
Frank 0. Clark.

## Huminating Gas from Crude Petroleum.

To the Editor of the Scientific American:
As you are happy to chronicle any new facts, let me make a statement of what has been done at our mill at Passaic N. J., since January, 1871, when we had works erected for us, by Dr. W. C. Wren, of Brooklyn, N. Y., for the manu facture of illuminating and heating gas from crude petro leum. The works are the invention of Dr. Wren, and we have ever since been using them to light our mill (which we run all night) with the following results
First, we use crude petroleum (which is quoted at 6 cents per gallon) and make a fixed permanent gas of eighty candle power. Secondly, we have no difficulty in making the gas. Thirdly, we make, on an average, more than four shousand feet of gas of the above candle power from one barrel of crude oil, which we use through a burner consuming one foot per hour and one foot and three tenths per hour. The barrel of crude petroleum, at the rate of ten cents per gal lon, costs us, when made into gas, seven dollars; that is, in practice it costs us seven dollars for four thousand feet of petroleum gas that goes farther and gives us a better light than seventy dollars worth of coal gas at three dollars and a half per thousand. The above is the result in actual practice. If we used coal gas, we would want five feet and six feet urners for the same light we now get with a one foot and a ne and three tenths feet burner. We have now had the works in steady and constant use for more than two years
and a half. This is no "statement of the inventor," but pain indisputable fact by a consumer.
The retort for making the gas is a simple contrivance, and
is not given to choking with carbon, as you seem to think probable. It is so simple and easy to
At some future time (not to use more of your space at pre sent) I will give you some of the results of heating with petroleum gas. Miles W ATERHouse, Superintendent.
52 and 54 Murray Street, New York city.
Remarks by the Editor.-We are glad to make public the excellent practical results here given for the Wren pro cess, which is evidently a discovery of much importance The apparatus employed involves, we believe; the employ ment of a series of chambered retorts, through which the oil is slowly passed.

## Strange Lightning Freak.

To the Editor of the Scientific American:
About twenty miles east of Santa Fé lay the remains of an ancient Indian city. The church (which is, or was ten ears ago, complete) has been so much appropriated by th eighbors that the roof has caved in and only the outer wail re now standing, In one corner, near a tower, a ten yea ld boy recently took refuge from a thunderstorm. Th lightning struck the north side of the tower, tearing the dobes, of which the church is built, for about three fee downward; it then went inside the wall (how cannot be een) and came out again through the wall of the church, a is shown by an aperture, at the hight of the boy'shead. Hi hat shows a large hole; and when his father found him, he showed no sign of life, his eyes were open and his arm kimbo, as if calmly awaiting for the storm to pass. His outer garments are entire; but his shirt is somewhat torn on the back and his drawers are ripped down the left leg. Some cientific travelers advised the father to break into the wall as they believe that metal inside attracted the lightning and caused this irregular course. He tried and found that ther is, inside, a separate wall, apparently built after the origina wall was finished, the entire being five feet thick.
About two centuries ago, the Indians had troubles with Spain, and closed up their wells and mines, and left. It i possible that the priests at that time secreted their precious. metals in masonry. This will soon be found out; but thi is one step more to destroy the remains of strange early civilization in America; and moreover, the Indians (Monte umas) are fast dying out.
Saı Cristoval, New Mexico.

## The Bisulphide Auxiliary Engine

## the Editor of the Scientific American

Your correspondent, Mr. Joel A. H. Ellis, does himself and is engine great injustice when he says that in it "the hea used twice;" and this is no mere question of words, for $h$ mplies that his machine is a kind of perpetual motion, and eads one to ask why, if the heat can be used twice, may it ot in some similar way be used three or an indefinite num ber of times. Such a statement is calculated to bring into disrepute a really meritorious thing, and is productive of istrust and suspicion in the minos of power users.
The celebrated professor, the late W. J. Macquorn Ran Eine, has shown indisputably that the efficiency of any hea engine is in a certain way proportional to the difference of the temperatures at which the steam, or other heat vehicle, is admitted to and ejected from the machine. In a condens ng steam engine, for instance, the greater the difference be tween the temperature of the steam in the boiler and tha in the condenser, the greater the efficiency of the engine nd, disregarding the question of heating feed water and ther economic adjuncts of the steam engine, by continuing the reduction of temperature from that of the exhaust steam in a non-condensing engine to that of the bisulphide condenser, Mr. Ellis has a heat engine, considering it as whole, working between much greater extremes of temper ature than is possible with either the steam or bisulphide ngine alone.
With our present light on thermo-dynamics, he may say that in the steam engine alone a certain quantity of the potentia energy, resident in the steam and called heat, is transmuted into external work, and that his bisulphide addition trans mutes a quantity of the energy remaining in the exhaus steam into equally useful work; but not that he has used the heat of the steam twice. He transmutes into useful work or uses more of the heat imparted to the water in the steam boiler than can be done with the steam engine alone, but he does not use any of it twice; and a very large proportion o it he does not even use once

John T. Hawkins.
New York city.

## A White Blackbird.

To the Editor of the Scientific American:
It will give the ornithological world some pleasure to learn that another rara avis has been added to its collections. This is none other than a "white blackbird" or, more pro perly speaking, a " red winged starling." It was secured by Mr. E. A. Andrews, of Watertown, N. Y. While Fayette Noble, of Ellisburg, was "sitting" this gentleman for duck on the marsh at the mouth of Sandy Creek Landing, Mr Noble discovered a "white blackbird" amid the thou sands of starlings that frequent that marsh. Of course such an object could not fail to attract attention and by dint of careful paddling, Mr. Andrews was at length placed in a position to secure this rare prize. The bird, as we have said, is of the red winged variety, a fledgling of this year, with cream colored feathers interspersed here and there throughout its snowy coat, the cream color predominating especial ly on the wing, where in another year the red would appear. It is unnecessary to say that the bird was a great curiosity. The oldest hunters on the marsh, who have seen myriads
of blackbirds, as they call them, come and go, never saw such a thing as a white one before. The appearance of this anomalous bird, as he arose and settled amid his companions of a darker hue, was very striking, they seeming to no mөre for him than if he were one of their own color.

Bird Lover.
[Rev. A. H. Gesner, of Sing Sing, N. Y., states that he had this bird in his hand.-EDs.]

## LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

## NUMBER 15.

Paris, September, 1873.

## hiege,

Belgium, and the surrounding country is by far the busiest district that we have yet visited on the continent. The city is quite large, having a population of about 120,000, and has is quite larg
been called
the birmingham of belaium.
En route to Brussels, our road took us through a wonderfully active country, and we were continually called to look at the smoky, clustering villages, situated in pleasant and romantic spots among the hills, blots upon beautiful landscapes; yet such defects have made this little domain the most successful and prosperous portion of Europe.
The manufacturers of Belgium have a history dating back as far as the Roman occupation of North western Europe at the commencement of the Christian era. The energy and courage, which then won from the great Cæsar a respect which was accorded to few other tribes, has never been lost, and has developed itself splendidly in gaining victories of peace. The character of the work done in Belgium is better, as a rule, than is found in any other country of Europe, and
is second only to that done in England. In some cases, Belgian manufacturers of machinery have even successfully competed in England with British builders. The country produces its own flax, and textiles are produced from it of the best quality. Cotton and wool are largely imported, and, in some branches, the manufactures of these staples are carried on with greater success than in any other part of the world. The best machinery, however, is usually purchased in England, and the superintendents of mills are frequently imperted. The manufactures in iron have an antiquity which antedates history. The Romans are supposed to have found rude forges and furnaces in operation, and vast cinder heaps are found here and there which testify to the extent as well as the early date, of the transition in Belgium from the age of stone and brass to that of iron; and the method of working has been learned also by the discovery, at Lustin, about three years ago, of two

## ancient smelting furnaces,

with their contents just as they were when they went out of blast two thousand years ago. They were merely excavations in the clay, oval in form, some twelve feet long and a yard in depth. No artificial blast was used, but a long channel, opening toward the quarter from whence blew the strongest winds, served to direct the air supply into the lower part of the furnaces. The result was the reduction of the ore without carbonization, the product being a crude sort of wrought iron. The iron, found in the furnaces just referred to, contained nearly 95 per cent of pure iron, the remainder consisting of a variety of generally injurious impurities.
From that time to the present, the Flemings have never lost their skill as workers in iron, and they have succeeded well in keeping pace with the progress of improvement. To.day, we are told that Liège possesses 98 iron works, turning out, in 1872, 178,000 tuns of pig metal and 103,000 tuns of finished iron. Charleroi threw into market 400,000 tuns of pig and 250,000 tuns of manufactured iron. Verviers, where was built the Thompson road locomotive exhibited at Vienna by Bede \& Co., Seraing, where is the establishment of the Cockerill company, Ghent, Brussels and Antwerv and many other towns are well worth visiting, but we had not time to explore other cells of this busy hive of the Flamands.
Had the Belgians the steadiness and persistence of the English workman, or the energy and activity of the American, this little kingdom would become a most formidable industrial rival to all its neighbors. As it is, the people have nobly illustrated their national motto " $L$ ' Union fait la
Force;" and by industry and frugality, and by close attention Force;" and by industry and frugality, and by close attention
to their pursuits, whether of commerce or of manufactures, to their pursuits, whether of commerce or of manufactures,
have converred their once unproductive fields into a vast and beautiful garden, have turned their mineral resources into national wealth, and have built up beautiful towns and mag. nificent cities in every distrist of their State. The whole country has an area of but eleven thousand square miles, just the area of the State of Maryland; yet Flanders produces eight millions of dollars worth of flax, Hainault raises two millions of tuns of coal, and cotton manufacturing employs some fifteen millions of dollars of capital. Brussels and Mechlin lace, Ghent calicoes, Tournay carpets, the paper and the firearms of Liège, and the more important branches of iron working already considered, have been as useful in stim ulating commerce as in directly contributing to the national prosperity.
The work people are not usually as well provided with the comforts and conveniences of life as they should be, but instances are not infrequent of employers making special provision for their welfare in a degree which is not actually incumbent upon them. I am very confident, however, that in no instance, at home or abroad, does the employer fail ultimately to receive a bountiful return for all capiat expended in providing for the physical, intellectual and
moral welfare of his employees. Physical benefits conferred bring back a return in healthful energy, intellectual training gives intelligence which invariably finds application, and moral advancement results in an increased sense of responsibility; and all together promote wonderfully that appreciation of the mutual obligations binding master and man which is the best of all preventives of strikes and lock-outs, and of all those unfortunate disagreements which divert the trades unions from their legitimate work and bring embarrassment and distress upon all classes. The Messrs. D'An drimont have erected, at their collieries at Micheraux, the

## HOTEL LOUISE

for their work people. The house contains 200 beds, the rooms are fitted up plainly but neatly, with all modern conveniences, and the prices charged are as slight an advance upon cost as will secure the proprietors against absolute loss. Each man pays about a franc and a half (thirty cents) per day for lodging, meals, washing and necessary attend ance. A miner, returning from work, goes to the lavatory, removes his begrimed suit of clothes, sends them down by a "dumb waiter" to the laundry, takes his bath, receives a clean suit of his own clothes in return for those sent down, and makes his appearance ready for his meal, or for cleanly occupation during his "off watch," dressel very like a gentleman, and, with his neat suit and freshly blacked boots, ordinary régime of less well administered coal mines.
Here the maximum earnings of a miner are given as about ninety francs (eighteen dollars) in a month, one half of which might have been saved by a frugal single man. In the COTTON AND WOOLEN MILLS,
as well as in many other branches of industry, the work people labor generally seventy-two hours per week, and no abatement of time is made for women and children, in which classes thirty-five per cent and twenty-five per cent, respectively, of the working population are included. In some cases, the working hours have been reduced to ten, and that without decrease of production. The amount of work done by each hand probably averages less than with us, although the speeds of machinery are about up to our standard. Thus cotton looms run 125 to 180 picks per minute, woolen 140 or 150 , and sometimes at higher speeds. Cotton spindles are driven up to 6,000 revolutions on American and 5,000 on East Indian cotton, woolen spindles make 5,000 or 5,500, and flax spindles 3,500 turns per minute. The number of oper atives varies from seven to ten per thousand spindles, a num ber exceeding the figures of our own and English mills. Some of these mills contain 200,000 spindles, and the tend ency is, as with us, continually toward increasing the size of mills, and securing the increase of economy which is a usual consequence of enlarged production. That sound business policy which dictates the purchase of the best possible machinery is also well understood there, and the less frequently acknowledged principle that prosperity always ultimataly attends honest work and liberal dealing is, perhaps, more renerally recognized than among many other manufacturing peoples.
A pleasant afternoon ride from Liège through a very busy country, during which we were rarely beyond the sound of the armorer's hammer or the hum of spindles, was ter minated, toward evening, by our arrival in

## BRUSSELS,

a favorite city with travelers, who can usually second the thusiastic in their admiration.
We had but little time to spare, and could not even find opportunity to call upon our distinguished friend and col league, M. Le Professeur Lambert, who, some years ago, so intelligently examined the resources and studied the indusries of the United States, under the direction of his govern ment. We were more fortunate in the attempt to meet the
" friend of excursionists," Mr. Cook, from whom we learned " friend of excursionists," Mr. Cook, from whom we learned
that the party of circnmnavigators of the world, who are to trust their fortunes in the hands of his guides, is composed principally of Americans. "Natürlich," his German assistant remarked, and the French attendant added: "parfaitement." Brussels is indeed a noble city, and we regretted
 it is fespecially to visit the galleries of paintings for which tion and inspiration. However, as an uncultivated taste has caused me to prefer the paintings of Titian to those of Rubens, and the masterpieces of Correggio to the chefs d'eu Rubens, and the masterpieces of Correggio to the chefs in sem
vres of Raffaelle, this disappointment may have been, in some vres of Raffaelle, t
degree, deserved.

The pleasant streets, the noble old cathedral, the beautifu Hotel de Ville with its odd sculptures and tall, graceful spire, and the magnificent, but still unfinished, Bourse which we thought the noblest modern structure which we had yet seen in Europe, all delighted us, and we came away
most reluctantly, but with the hope that we may see more o most reluctantly, but with the hope that
We left Brussels by the evening express train and arrived here early next morning. We had not a comfortable ride, for the French railway carriages are not as comfortably cushioned nor as nively upholstered as those of Germany and Austria. They were in this train nearly as meanly fitted up as the general run of English cars. Reaching Paris at an early hour this morning, we enjoyed greatly the ride to our hotel through the clean streets, already enlivened by crowds of working people on their way to commence their
tasks, the clear fresh air giving every one a cheerful huruor and a brisk manner that was quite inspiriting.
During the short period of our stop here, we have had op portunities of visiting the more interesting portions of the
city
visited
and have admired
trance strange taste which could have placed above its galleries and on the towers the ugly carved monsters which were probably once supposed to add to the beauty of the venerable pile. In their presence, it is easy to imagine Quasimodo. We bave looked upon the tomb of Napoleon Bonaparte, at the Invalides, and, with less of interest, perhaps, but with greate pleasure, have explored the Pantheon, where lesser heroes but greater men are interred. We have admired the Made leine and the beautiful little Sainte Chapelle, and have viewed the new Opera House from every accessible standpoint. We have enjoyed the "Concerts des Ambassadeurs" in the Elysian Fields and have stood in half pleased, half sad admiration within the structure which contains the beau tifully executed and wonderfully well designed panorama of Paris during the siege. The spectator is almost convinced as he gazes upon this splendid picture, that he is actually upon the battle field before Paris, so perfectly do the art of the painter and the scenic arrangement combine to deceiv him. We have been courteously received at the Ecole de Mines and at the Ponts et Chaussées, and have examined thei collections and studied their methods, and have been; in de fiance of regulation, shown through the rough looking halls, lecture rooms and dormitories of the famous Polytechnic School, from which have graduated the greatest engineers both civil and military, that modern France has produced, We have seen the Institute, the home of the French savans and have looked upon those sad reminders of the existence of the commune and the falsity of the authors of the legend everywhere seen, "Liberté, Egalité, Fraternité," the ruins o the Hotel de Ville, the Louvre, and the Colonne Vendôme We have visited that wonderful depository of ancient in dustrial relics and of the marvels of modern invention and art the

## CONSERVATOIRE DES ARTS ET METIERS

Here we spent a large part of a day, meeting General Morin and M. Tresca, the distinguished Directeur and Sous Direct eur ; and, by the kind attention of the son of the latter, we succeeded in making a very thorough exploration of thi world renowned institution and of its unequaled collection in every department of human industry. The old looms of Vaucanson and of Jacquard are preserved here in the Sall des Filatures, in the midst of a multitude of models and ma chines beionging to the department of textile industry, and are guarded with jealous care as most precious relics. A ong gallery is filled with machinery and models of variou orts of machinery, including beautiful models of steam en ines, which have cost, in some cases, several thousand dol $\mathrm{g}_{\mathrm{j}}$ ars. In the chapel, for this was formerly the monastery of St. Martin des Champs, aresteam engines of large size, steam fire engines, turbine water wheels, all sorts of apparatus fo testing the efficiency of machinery, and large models driven by steam power. In this hall is the first steam carriage eve constructed, that of Cugnot, which was built in 1769. Thi was before the introduction of the crank, and the engine ha a ratchet-like arrangement by which it turns the wheels For so oll a construction, the work seems surprisingly wel done, and the proportions are also good. It is an exceeding ly interesting machine. We may hope, but can hardly ex pect, that some future day may see such a splendid collection in our own country. At present nothing approaching this in extent or completeness exists in any other city in the world
R. H. T.

## A Compound Locomotive.

An ingenious member of the Manchester Scientific and Mechanical Society proposes to apply the compound principle to locomotives. This is how he sets aboutit, says the Eng lish Mechanic. He would use steam of 250 lbs. on the square inch to work the small cylinder, and expand this steam into a supplementary boiler bearing a pressure of 60 or 65 lbs . to the square inch, so as to have a surplus of effective pressure of 180 lbs . or 190 lbs .in the small cylinder, or about 60 or 65 lbs in the larger one. The principal alterations proposed are in the boiler. Jn adapting his plan to a locomotive of the me dium size, he would make the boiler 2 feet longer than at present, and divide it into two distinct parts, the part con taining the furnace or fire box to be 2 feet shorter than a present, so as to have the supplementary boiler 4 feet longer both being equal in diameter, and equal in number, size, and position of tubes, the two parts of the boiler being firmly bolted together, and so arranged that the tubes of one are in a line with the other, so that the hot air and flame may pass freely through from one to the other. An important advantage claimed by the plan is that the driver of the locomotive will be enabled to start his engine with the full power of steam in both cylinders at once, which he could not do if compounded in the usual way. Although this plan will require extra outlay, there will be a considerable saving in fuel, which, with other advantages, it is claimed, will more than compensate for the extra cost. We are not surprised to hear that discussion followed the reading of the paper, in
which the feasibility of the plan was generally condemned. which the feasibility of the plan was generally condemned.
Ultimately, however, the discussion was adjourned, in order that the inventor might give further information on the subject.
J. W.S. writes to say that he has a perpetual motion in run ning order, and he will dispose of it for $\$ 2,000,000$ for a "plot ;" but if he has to carry it to Washington, he will ask \$5, 000,000 . The existing financial crisis will, we fear, preven our correspondent from receiving either of the sums he mentions.

## PALMER'S POWER SPRING HAMMER

In the illustration is presented a view of Palmer's power spring hammer, an invention, it is claimed which has the advantage of being operated by the same power as is used to run the works in which it is used and without the additional expense of extra boilers and attendants. The machine, it is stated, can be governed by the foot of the forger so perfectly as to cause it to crack a walnut or to strike a blow equal to a steam hammer of the same grade. The smallest size will deliver 500 strokes a minute, and is especially adapted to forging cutlery of all descriptions, bowls of spoons, small hardware, jewelry. etc. The medium size is designed for the use of a general forge shop, and will is designed for the use of a general forge
strike 250 blows a minute. The largest strike 250 blows a minute. The largest
forms, it is believed, are as well adapted to forms, it is believed, are as well adapted to
all classes of work as the steam hammer, while they are free from the expense attending the use of the latter.
In the engraving is shown a side view of the machine, now on exhibition at the Chicago Exposition. The dies are made in the usual manner, and are keyed in position. The machine is driven by a friction pulley sliding on a splint in the shaft, the belted pulley being loose on the latter. The friction pulley is operated by a forked clutch worked by the right angled levers attached worked by the right angled levers attached
to the long foot lever, which is bent around to the long foot lever, which is bent around
the fore part of the hammer so as to be the fore part of the hammer so as to be
accessible on both sides and front of the accessible on both sides and front of the
apparatus. The shaft has a crank forged apparatus. The shaft has a crank forged
in the center and carries upon it a connection which extends to a leaved spring. On the other end of the spring is attached the hammer head, in which is keyed the top die. The spring works upon the bearings of a flat rocker shaft to which it is securely bolted.
The operations are as follows: The iron being heated and placed upon the die, the forger places his fort on the treadle to depress it, thus drawing down the arm that moves the clutch friction into the running loose pulley. The crank is thus revolved, drawing down the spring which carries up the hammer head, and producing by its velocity a vibration of the spring in which the blow given is in proportion to the velocity"in which the crank revolves. It is aptly illustrated by cracking a whip. To forge a long rod or scythe, an aperture cast through the body of the upright part so as to allow the work to be passed lengthwise the forging dies is provided. The slightest pressure of the foot on the treadle is easily observable in the working of the machine, but the head never allows the dies to meet until there is velocity enough to
produce the requisite vibration of the spring. The balance wheel, on the end of the crank shaft, acts in two capacities, the wheel having a balance placed within its rim to counteract the weight of hammer head, thus allowing the hammer to stop in any position in which the friction may leave it, thereby preventing the weight of the hammer head from always resting on the lower die when stopped; and the momentum of the wheel keeps the machine perfectly steady when running, and prevents, by the balance within its rim, that oscillating movement of frame which would be the result of the blow if not thus balanced.
There are, we learn, some twenty of these hammers now in. operation in various parts of the country, doing all classes of forging, from the smallest forks upward.
Patented by James Palmer, January 9, 1872, and reissued April 29, 1873. The sole 'manufacturers are Messrs. S. C., Forsaith \& Co., Manchester, N. H., who are also builders of the Abbe bolt forging machine, recently described in our columns. Further particulars may be obtained by addressing them.

## IMPROVED RAILROAD SWITCH.

Our illustration represents an invention which has for its object the construction of a switch connection which shall be free from the disadvantages resulting from the expansion and contraction of the switch rail a different temperatures, causing either a too close contact so as to prevent the working of the rail, or a too wide opening resulting in the battering or a too wide opening resulting in the battering of the rails and their consequent frequent replacement. In the ordinary form of switch, it sometimes happens that the rails open as much as three inches during the night; while if the fish plates are screwed up tight, the ends may close up entirely in the heat of the day.
A, is the switch rail, connnected rigidly, at the point B, to a long timber, C, placed underneath and passing through the cross ties which are cut for the purpose. The connection, at $B$, is such that the rail, A, pivots freely sidewise, while at its other end it communicates with the track rails, $D$, by means of a suitable lever connection moving on a bed plate, E , as a substitute for the heavy cast iron blocks. Bed plate E, rests on the crossties and gives a more elastic support to the switch rail, preventing thereby the anvil-like resistance and quick wear of the same. The track rails, $D$, also rest upon the bed plate and are rigidly attached thereto. 'The timber, C, passes below
the plate under the middle rail and is firmly attached by bolts.
It will be observed that it is not so much the intention to overcome the expansion of the switch rail, A, from point, B, to bed plate, as such would only be about $\frac{1}{4}$ inch in some 18 feet; but the main object sought is to make a firm connection. between rails A and D , so that the adjoining rails of the track cannot crowd the former together. The inventor states, as the result of his experience, that unless some arrangement of this kind be used, the rails, when the fish plates are tightly screwed up, will run perhaps for a quarter of a mile, shoving up the switch joint (that being the weak est part) in preference to overcoming the friction of the


## PALMER'S POWER SPRING HAMMER

fish plates and closing the usual $\frac{1}{2}$ inch spaces left to allow for expansion between every two rails. By the present system, it is claimed, through the means above described, the rails are obliged to fill up these spaces completely, as they cannot crowd or creep toward the switch, so that the latter remains unaffected and the relative distance between the ends of the rails always uniform. The device, we are informed, has been in use on the Central Pacific Railroad during the past summer, and,even when the thermometerranged from $100^{\circ}$ to $110^{\circ}$, worked with perfect success. . The construction is such as to resist any strains to which may be subjected the plates under both throw and stationary rails, being bot at the end so to cut down into the timber and thereby be prevented from any possibility of slipping.
thereby be prevented from any possibility of slipping. Patented through the Scientific American Patent Agency,
May 13, 1873. For further particulars regarding rights, evc., address the inventor, Mr. John R. Adams, Truckee, Nevada county, Cal.

Important Patent Litigation.
The loom improvements patented by William Webster pertain to the operation of the wires used in the manufac ture of carpets and other pile fabrics. The practical result of the use of the Webster invention is to augment the pro-

duction of the loom by more than 33 per cent, without increase of the power or othor expenses. No sooner had the uccess of the improvements been practically demonstrated than various carpet and other factories sought to modify heir looms so as to gain the same advantage. In this they are alleged to infringe the patents above alluded to, and an
extensive series of litigations has been commenced on the part of the patentee. Testimony is now being taken, prior to argument in the United States Court.

## Habits of the Baltimore Oyster.

In a conversation with a prominent oyster packer,says the Baltimore American, some curious and interesting feature of the oyster trade were related. As is well known, the habits of this bivalve are an entire mystery; what it eat and how it lives are questions not yet understood. The spawn of the oyster floats around with the action of th waves and tide, and adheres to whatever it may come into contact with. Oysters taken from a rocky bed are of superio quality; those taken from a soft bottom are comparatively poor in quality. Thous ands of "poor innocent" oysters die annually from resting on a soft bottom, fact which should arouse the sympathie of all tender hearted people.
The weight of the oyster, as it gradual ly matures, sinks it beneath the surface and as soon as it is covered with sediment or mud, it dies. Many people suppose that the oyster really eats, and kind heart ed people, buying oysters in the shell, sometimes throw corn meal over them thinking to feed them. The peculiar noise emanating from them has been supposed to be produced by feeding. All shellfish at times have their shells open, and when touched will instantly close them. The noise thus produced has been mistaken for mastication, when, in reality, it is from fright.
Most of the Baltimore dealers in raw oysters during the summer months transact their business at Fair Haven, Conn. whither large beds of Baltimore oysters have been transplanted. The beds are so arranged that,on the receding of the salt water tide, fresh water from a small stream covers the oysters; it is said that this fat tens oysters better than any other method Orders are received for the article in question during the summer months, and they are taken from the beds and shipped with the greatest possible dispatch, and many eat them with apparent relish, notwithstanding the warmth of the season Altogether the oyster packing trade of Baltimore is an enormous one, and, in con nection with fruit and vegetable packing business, employs a capital of about $\$ 25$, 000,000 , a fact which sufficiently express es the great importance of this interest to Baltimore.

## Determination of the Heat of

## Combustion of Explosives

M.M. Roux and Sarran communicate to Les Mondes the following description of the mode of determination and results obtained, in testing the heat disengaged by the com bustion of various kinds of gunpowder. The deflagration was produced in cylindrical cast iron shells of 0.9 inch in thickness and of an interior capacity of from 16 to 17 cubic inches. These bombs were closed by a bronze screw plug through which passed an isolated wire, which conducted a current sufficient to heat a thinner wire within to redress and thus inflame the charge. They were placed in a copper vessel 4.5 feet in diameter, $5 \cdot 1$ feet in hight, and containing about 4 pounds of water. The temperature of the bath was determined by the end of a thermometer graduated to tenths of a degree, with reading to hundredths. The water was of a degree, with reading to hundredths. The water was ing atmosphere, the explosion caused,and then the differenc in warmth noted. The following results were obtained

Sulphur Saltpetre Charcoal Unitg of heat Weight of


## New Heth of Preparing Caustic Soda

The crude lye is evaporated in cast iron boil ers. At a certain heat the cyanides contained in the pasty mass are decomposed, with escape of ammonia and deposition of carbon. When this point is reached, the heat is raised to redness, and the mass becomes more fluid. A sheet iron cover is then fitted upon the boiler, provided with an opening through which enters an izon pipe. This is plunged into the mass, and air is forced in. The graphite which separates rises forced in. The graphite which separates and may be collected. The mass is tested from time to time to see if the sulphur is perfectly oxydized. When this is the case the blast is stopped, the mass allowed to become clear, and run off as usual.-M. Helbig.
Poisonous Undershirts.-J. N. writes to tell us of an instance of a man being blistered by wearing an undershirt dyed with cochineal. He advised the sufferer to bathe the partin a solution of soap and soda to neutralize the tin which had been absorbed from the dye, and put the shirt through the same treatment. He attributes the evil to the carelessness of manufacturers who send out the evil to the carelessness of manufact
goods without rinsing or washing them

## A FORTY THOUSAND DOLLAR COW.

We doubt if more extravagant sums have ever been paid for fancy cattle than those lavished during a recent sale of the herd of the Hon. Samuel Campbell, at New York Mills, near Utica, N. Y., as reported on page 201 of our current volume. Representatives of the most prominent short horn breeders in the world were present, including a large delegation of Eaglish cattle stock buyers, consisting of lords and other titled persons.
The breeds which brought the largest sums were Duchesses and Oxfords; and the first animal sold, known as the 2 d Duke of Oneida, a three year old bull, brought $\$ 12,000$. The cow represented in our engraving, sented in our engraving, known as 1st Duchess of Oneida, was next offered, and, after an extraordinarily exciting contest, was knocked down to Lord Skelmersdale, of England, for $\$ 30,600$. Subsequently other cattle of the same strain followed at $\$ 19,000$ and $\$ 35$,000 , and the interest culminated with the sale of the 8th Duchess of Geneva, the dam of the animal in our engraving, which was bought by Mr. R. Pavin Davis, of Gloucestershire, England, Gloucestershire, England,
for the unp
of $\$ 40,600$.
The Live Stock, Farm, and Fireside Journal, to which we are indebted for our illustration, says that there were, in all, one hundred and eleven animals presented, and that the amount realized was $\$ 380,890$. The Duchess herd was originally from England, imported in 1853, and has been since Eept in perfect purity in Duchess county, N. Y.

HELICOIDAL CONCAVO-CONVEX PROPELLER.
The primary object sought in the construction of the propeller to which our engraving refers is so to form the blades as to impart to the water in which they turn a longitudinal motion in a direction coincident or parallel with the axis of the screw, while, at the same time, avoiding all lateral or tangential motion. To this end the blades are constructed of concavo-convex form, to give them greater efficiency, and are comhined with a helicoidal curvature, thus obtaining, in addition to advantages otherwist gained, the propelling power and easy rotation of the helicoidal bladed screw.
Fig. 1 is an elevation of the working face of the propeller, and Fig. 2 a section of one of the blades on the line, $x x$. A is the front or cutting edge of the blade, and B theback edge, considered in respect to its brward rotation.
Located near the cutting edge, at $C$, is the center of concavity, or point from which the surfaye has a curvature of equal pitch or radius in each direction, inward, outward, or rearward, as indicated by the radial lines shown. It is claimed that, by thus placing the point, $C$, pressure is prevented from being produced at the back of the blade either by the rotary movement of the screw or by the forward motion of the vessel through the water. The blades are perfectly connected to the hub by short arms, as represented, and may be two, three, ber, and cast in as many pieces as desired.
The inventor informs us that his theory, claimed as true, has been fully demonstrated by practice. A 30 inch wheel was recently constructed at the United States navy yard, Washington, D. C., and tried on a steam launch; the usual, and best formed, helicoidal four bladed wheel used on the launch was of the same diameter, 30 inches. The pitch of the Eagle Wing was made as nearly as possible the same as the helicoidal, namely, $54^{\circ}$. The Eagle Wing had but three blades. Several experimental trial runs were made, placing the two wheels alternately on the same shaft, and, as nearly as possible, regulating the steam pressure so as to be alike for each trip. The fairest specimen of the trials was a pair of trips from the navy yard ship house to Fort Washington and back. A low pressure of 60 lbs . of steam, as nearly as possible, was carried.
The following are the data of the trial: Helicoidal: Average steam 60.35 lbs . ; number of revolutions, 41,920 ; time occupied, 2h. $54 \frac{1}{2} \mathrm{~m}$. Eagle Wing (or helicoidal concavo-convex) : Average steam, $59 \cdot 7 \mathrm{lbs}$; number of revolutions, 32,660 ; time occupied, $2 \mathrm{~h}, 46 \mathrm{~m}$ Differences in favor of Wing: Revolutions, 9,260 ; tlme, $8 \frac{1}{2}$ minutes
A trial run from the same starting point to Alexandria lighthouse and back (something over half the former distance), at a pressure of 80 lbs . of steam, resulted as follows:
Helicoidal: Revolutions, 25,130; time, 1h. 30 m . Eagle Wing: Revolutions, 21,200 ; time, $1 \mathrm{~h} .23 \frac{5}{4} \mathrm{~m}$. Difference in favor of Eagle Wing: Revolutions, 3,930; time, 64 minutes.

A higher pressure of steam revealed a gain in difference $f$ time in favor of the Eagle Wing, but a proportionate loss in difference of revolutions. This, it is thought, proves the fact that, for rapid revolutions of wheel, the concavoconvexity of the Eagle Wing should be reduced and, pos sibly, its pitch of blade lessened.
A form and pitch of blade proper for, say, 200 revolutions

The Siemens Steel Furnace as Described by the Inventor.
In the course of a recent lecture at Bradford, Eng., by Dr. C. W. Siemens, he gave the following description of his elebrated furnace for melting steel:
Taking the specific heat of iron at $\cdot 114$, and the welding heat at $2,700^{\circ}$, Fah., it would require $\cdot 114 \times 2700=307$ heat units to heat 1 lb . of iron. A pound of pure carbon devel opes 14,500 heat units, opes 14,500 heat units,
pound of common coal 12,000 and therefore 1 tun of coa should bring 39 tuns of iron up to the welding point. In an ordinary reheating furnac a tun of coal heats only 1 ? tuns of iron, and therefore produces only one twenty third part of the maximum third part of the maximum theoretical effect. In melting 1 tun of steel in pots $2 \frac{1}{2}$ tun of coke are consumed, and tak ing the melting point of steel at $3,600^{\circ}$ Fah., the specific heat at $\cdot 119$, it takes 119 by $3,600=428$ heat units to mel a pound of steel; and taking the heat producing power of common coke also at 12,000 units, 1 tun of coke ought to be able to melt 28 tuns of steel. The Sheffield pot stee melting furnace therefor only utilizes one seventieth part of the theoretical hea developed in the combustion. developed in the combustion
per minute, if revolved 250 or 300 per minute, instead of
throwing the water back coincidently with the line of the ves throwing the water back coincidently with the line of the
sel's motion goes further, and throws it across the line.
In the trial tests referred to, it was especially noted that a quick and increased power was exerted by the rudder under the force of the Eagle Wing, the compacted water being thrown directly on the rudder.
In summing up results under the trials made, from 22 to 27 per cent of superior efficiency is claimed for the Eagle Wing, and advantage thereof may be taken either in a speed equal to the best average with much less fuel; or, if the usual amount of fuel be used, a highly increased speed of


HELICOIDAL CONCAVO-CONVEX PROPELIER, OR EAGLE WING Here, tberefore, is a very wide margin for improvement, to Here, therefore, is a very wide margin for improvement, to
which I have specially devoted my attention for many years which I have specially devoted my attention for $m$
and not without the attainment of useful results.
Without troubling you with an account of the gradual im provements, I will describe to you shortly the furnace whic I now employ for melting steel. This consists of a furnace bed made of very refractory material, such as pure silica sand and silica or Dinas brick, under which four regenera tors or chambers filled with checkerwork of brick are ar ranged in such a manner that a current of combustible gas passes upward through one of these regenerators while current of air passes upward through the adjoining regen erator, in order to meet in combustion at the entrance into the furnace chamber. The pro ducts of combustion, instead of passing direct ly to the chimney as in an ordinary furnace are directed downwards through the two other regenerators on their way towards the chimney, where they part with their heat to the checkerwork in such a manner that the highest degree of heat is imparted to the upper layers, and that the gaseous products reach the chimney comparatively cool (abou $300^{\circ}$ Fah.). After going on in this way for half an hour, the currents are reversed by means of suitable reversing valvos, and the cold air and combustible gas now enter the furnace chamber, after having taken up hea from the regenerator in the reverse order in which it was deposited, reaching the furnace therefore nearly at the temperature at which the gases of combustion left the same. A great reversion of temperature within the re renerative chambers is the result, and the two first mentioned regenerators are heated to a higher degree than the latter. It is easy to conceive that in this way heat may be accumu lated within the chamber to an apparently unlimited extent, and with a minimum of chim ney draft. Practically the limit is reached a
essel may be obtained.
The mechanical principles involved in the device are embraced by two patents, respectively dated January 21 and August 26, 1873. Further particulars may be obtained by addressing the inventor, Mr. N. A. Patterson, Cleveland, Bradley county, Tenn. ; or for the next ten days he may be consulted personally at the Astor House, New York. We understand that a prominent firm in this city is now making arrangements for a complete practical trial of this propeller.

Telegraphing Maps and Plans.
A very ingenious invention has recently been exhibited by M. Dupuy de Lome, at the French Academy of Sciences. It consists in a mode of sending a plan or topographical sketch by telegraph, without necessitating a special drawing for the purpose. Over the map already made is laid a semicircular plate of glass, the circumference of which is graduated. At the center is an alidade, also graduated, which carries, on a slide, a piece of mica marked with a blade point. The latter, by its own movement along the alidade, and also by that of the alidade itself, can be brought over every point in the glass semicircle. Just before the plate is a fixed eye piece. Looking through this, the black dot is carried successively over all the points of the plan to be reproduced and the polar coördinates of each noted. The numbers thus obtained are transmitted by telegraph. The receiving device is analogous to that just described, but a simple point is substituted for the mica dot, and by it the designated positions on the glass are successively marked.
the point where the materials composing the chamber begin to melt, whereas a theoretical limit also exists in the fact that combustion ceases at a point which has been laid down by St. Clair Deville at $4,500^{\circ}$ Fah., and which has been called by him the point of dissociation. At this point hydrogen might be mixed with oxygen, and yet the two would not combine, showing that combustion really only takes place between the limits of temperature of about $600^{\circ}$ and $4,500^{\circ}$ Fah. To return to our regenerative gas furnace. It is evident that there must be economy where, within ordinary limits, any degree of heat can be obtained, while the products of combustion pass in the chimney only $300^{\circ}$ hot. Practically a tun of steel is melted in this furnace with 12 cwt. of small coal consumed in the gas producer, which latter may be placed at any reasonable distance from the furnace, and consists of a brick chamber containing several tuns of fuel in a state of slow disintegration. In large works a considerable number of these gas producers are connected by tubes or flues with a num jer of furnaces.

## The Devil Fish.

T. L. P. writes to say that the Italian fishermen of San Francisco, who travel about the Farallon Islands and down the coast, not infrequently take devil fish from eight to ten feet across, and he has heard of one being taken of which the extended arms measured twelve feet. "Some montbs ago, I saw one (hanging at a door) which measured at least nine feet from tip to tip of the tentacies. I believe that the Italians here eat parts of these repulsive looking creatures, and call them quite good.'

## meeting of the british association.

The annual meeting of the British Association took place September 17, at Bradford, Eng., and was opened by a very able address by the President, Professor Alexander W. Wil liamson. He dissussed the importance and value of the atomic theory in chemistry, paid an excellent tribute to the memory of Liebig, traced the pathway and the difficulties that attend the chemical investigator, showed the importance and value of chemistry in its relations to education, and ex pressed his opinions upon the proper methods of developing and encouraging the young in the study of the sciences. He thought that our schools and colleges should be far more abundantly supplied with professors and assistants able to
teach the sciences, so that the young should be constantly teach the sciences, so that the young should be constantly surrounded, as it were, by influences which should lead their tastes in that direction. Secondary schools, he thought, ought to be established, wherein the children of the poor might receive scientific instruction, which would make them more useful, in whatever industrial occupation they might afterward be employed.
In the great task of promoting scientific education and original research, he thought the government ought to take a prominent part, and contribute liberally for the erection of buildings and the endowment of professorships.

## steel.

In the Mechanical Section, the opening address was deliv ered by W. H. Barlow, C. E., upon steel, relative to which he presented a large amount of useful information.
The tensile resistance varied in the different qualities of steel from twenty-eight to forty-eight tuns per inch, and ex periments established conclusively that the relation subsisting between the several resistances of tension, compression, and transverse strains is throughout practically the same as in wrought iron; that is to say, that a bar of steel whose tensile strength is 50 per cent above that of wrought iron will ex hibit about the same relative increase of resistance under the other tests. They further showed that the limit of elasticity in steel is, like that of wrought iron, rather more than half its ultimate resistance.
The series of experiments recorded in the book published by the committee gave the results of tempering steel in oil and water. They were made by the officers of the gun factory at the Royal Arsenal at Woolwich, and show a remarkable increase of strength obtained by this process. This property of steel is now fully recognized and made use of in the steel which forms the lining of the largest guns. The third series of experiments was made by the committee upon bars 14 feet long, $1 \frac{1}{2}$ inches in diameter, with the skin upon the metal as it cane from the rolls. The object of these experiments was specially directed to ascertain the modulus of elasticity. In these experiments sixty-seven steel bars were tested whose tensile strength varied frcm thirty-two to fiftythree tuns per inch, and twenty-four iron bars varying from twenty-two to twenty-nine tuns per inch.
These experiments, which were very accurately made, showed that the extension and compression of steel per tun per inch was a little less than wrought iron, that the extension and compression were very nearly equal to each other, and that the modulus of elasticity of steel may be taken at $30,000,000$, which result agrees with the conclusion arrive at by American engineers on this subject.
The fourth series of experiments were made by the committee on riveted steel, and show clearly that the same rules which apply to the riveting of iron apply equally to steel; that is to say, that the total shearing area of the rivets must be the same, or rather must not be less than the sectional
area of the bar riveted. In applying steel to engineering area of the bar riveted. In applying steel to engineering structures, we may dismiss from consideration those superior
qualities which are of high price and made in comparatively qualities which are of high price and made in comparatively
small quantities. I propose, therefore, to confine my observations to the mild steels, such as are made by the "Bessemer," the "Siemens-Martin," and other processes, having a tensile strength varying from thirty-three to thirty-six tuns per inch, a material which is made in large quantities and at moderate cost.
Following the same rule as is adopted for wrought iron namely, that the maximum strain on the metal shall not exceed one fourth of the breaking weight, we may consider steel of this quality capable of bearing at least eight tuns per inch, instead of the five tuns per inch estimated for like purposes in iron. We know from established mechanical laws that the limiting spans of structures vary directly as the strength of the material employed in their construction when the proportion of depth to span and all other circumst?nces remain the same. We know also that, taking an ordinary form of open wrought iron detached girder (as, for example, when the depth is one fourteenth of the span), the limiting span in iron, with a strain of five tuns to the inch upon the metal, is about 600 feet; and it follows ihat a steel girder of like proportions, capable o! bearing eight tuns to the inch, would have theoretically a limiting span of 960 feet This theoretical limiting span of 960 feet would, however, be reduced by some practical considerations connected with the minimucc thickness of metal employed in certain parts, and it would, in effect, become about 900 feet for a girder of the before mentioned construction and proportions.
Assuming a load in addition to the weight of the girder of one tun to the foot, the relative weights under these conditions would be as follows:

Weight of steel girder. Welght of fron girder
tuns.
$\left.\begin{array}{c}\text { Weight of steel girder. } \\ \text { tuns. }\end{array} \begin{array}{c}\text { Welght of fron girder } \\ \text { tuns. }\end{array}\right\}$

It is not alone in the relative weight or in the relative cost
that the advantage of the strongermaterial is important, but
with steel we shall be enabled to cross openings which are absolutely impracticable in fron. Steel is used in the Illinois
and St. Louis Bridge in America, a bridge of three arches, and St. Louis Bridge in America, a bridge of three arches each of 500 feet span.
There is no doubt of the fact that steel is made and sold which is cold-short, and not reliable for use for engineering purposes. This irregularity appears to arise mainly from the difference in the chemical constituents of the metal o res employed, or in the process pursued by different makers Where large castings and metal of great solidity are re quired, as in making large guns, there is the method pur ued by Sir J. Whitworth, whereby the metal is intensel compressed while in a fluid state. The pressure employed is twenty tuns per inch, and its effect in producing solidifica tion is such as to shorten the ingot about $1 \frac{1}{2}$ inches for every foot of length. The treatment by compression is especially important where metal is required in large masses and of great ductility, because the larger the mass and the greater the ductility, the larger and more numerous are the air cells, and the effect of the pressure is to completely close these cells and render the metal perfectly solid. By this process, mild steel can be made with a strength of forty tuns to the inch, having a degree of ductility equal to that of the best iron. The more highly carbonized qualities, whose strength range from forty-eight up to seventy-two tuns per inch show a decrease of ductility somewhat in the same ratio as
the strength increases. As to strin increases.
As to strength and toughness, there are small arms made ntirely of steel, of wonderful range and accuracy, capable of penetrating thirty-four $\frac{1}{2}$ inch planks, which is abou three times the penetrating power of the Enfield rifle. Sec-
ondly, there are the large guns, also entirely of steel, throwing projectiles from 250
 range of nearly six and a half miles is obtained. In both cases the degree of strength and toughness required in the metal is much greater than is necessary for engineering structures. It is unnecessary to occupy more time in mul tiplying examples of the toughness of steel. It is well known to manufacturers, and must also be well known to many others here present, that steel of the strength of thirty-three or thirty-six tuns per inch can be made and is made in large quantities at moderate price, possessing all the toughness and malleability required in engineering structures.
the burleigh rock drill in areat britatn
This drill, like many other excellent devices of American origin, is now extensively used in Great Britain. In a paper read by Mr. J. Plant before the Association, he said that the Burleigh drill has been workingdaily at one of the Cambrian quarries since March, 1872, and during that period had given satisfaction; and with the exception of new piston ring and some trifing repairs by the blacksmith at the quarry, no breakage of any kind had taken place. The quarrymen were not prejudiced against the drill, but on the contrary they had voluntarily made an offer to the company to drill them holes at the same price per foot as they were paid themselves for boring by hand, and deduct the amount due for such boring monthly from their contracts. This was the plan adopted in all the galleries of the quarry. The actua cost of working the drill was most accurately kept, and com parison showed that the work of untopping the slate rock could be done in two thirds of the time required by manual labor. The cost of boring with the drill during the past twelve months had been at the rate of $5 \frac{9}{9} d$. per foot, includ ing steam, oil, attendance, repairs, etc., the same being 24 d d per foot below the cost of the manual labor employed to exe cute the same work. Another important point was the ineased rate of progress.
We shall in our next give extracts from other interesting papers read before the Association.

## RARE CHANCE TO ADVERTISERS.

About one year ago, it may be remembered, we announced our intention of printing, during the month of November 1872, a special edition of the Scientific American, distinct from our regular weekly issue and consisting of 50,000 copies, the same to be devoted to gratuitous circulation Although, at the outset, this large number seemed sufficient we found it in the end to be inadequate for the purpose in view, and accordingly fully seventy thousand papers wer printed and mailed from this office, gratuitously, to manu facturers, machinists, engravers, chemists, and in fact to representatives of every calling whom we conceived would find an interest in scientific, mechanical, or technical intellience.
Many of our regular advertisers, recognizing the advantag of so widely circulated a medium, hastened to secure place fo the announcements of their products; patentees inserted de scriptions of their inventions; while others, comparatively strangers to our columns, followed a like course. As a re sult, so far as we have been able to learn, extraordinary re
turns were obtained by these enterprising business people We intend to repeat the experiment, and as will be see from our advertisement of the fact, elsewhere in this issue we propose, on the 15th of November next, to print anothe of these special issues, the first edition of which will be sixty thousand copies. The paper in itself we shall en deavor to make more interesting and attractive than any w have yet produced
We are now collecting names of all persons engaged in Wanufacturing pursuits, of railroad offcials, contractors,
engineers, mechanics, machinists, chemists, inventors, and men of science generally throughout the entire country; and
or town in the United States, into the hands of some of the nhabitants of which this special number of our journal will not find its way. It shculd be remembered that this is no random list of names selected from publications printed fo the purpose; but in a great measure a category of persons and firms who have come to our notice during our long ex perience and intercourse with the industrial and inventing population of the land: so that advertisers will understand that they reach the very people from whom they can expect the most substantial returns, and to whose combined notic they can hope to introduce their products through no othe medium extant. Our rates, as stated in our advertisement remain the same as for a regular weekly issue, thus com pleting the advantages of an offer, the value of which, we onsider, needs no further demonstration
A few engravings of useful inventions with descriptiv matter will be admitted, subject to the approval of the pubishers, and upon favorable terms, which can be concluded by letter or otherwise. Patentees of novel devices, desirou offecting their introduction to the public at large, wil thus be afforded an opportunity of presenting them in the most attractive form, and to a class which it would unques tionably require no small outlay in time and expense other wise to reach.

## a valuble drafting instrument.

Professor Josiah Lyman, of Lenox, Mass., has recently brought to our notice a very ingenious and accurate mathe matical instrument, in the shape of a protracting trigonome ter, which, he informs us, he has made a subject of stud and experiment for some fifteen years. He considers (and from an examination of his device, we think, with excellen reason) that he has made an apparatus by which all angle and distances may be put down upon paper with accuracy equal to that of the best field instruments; by which even their errors may be corrected and results obtained (in deter mining areas, for instance) reliable to one twenty-millionth part of the whole; and of corresponding exactness in the solution of all trigonometrical problems. Traverse tables and in most cases logarithms will be, the inventor believes, thus rendered
abor saved.
Drawing
Drawing instruments are so frequently imperfect tha here is a clear necessity for a device of this description, and we have no doubt but that draftsmen generally will fin it of great utility and value.

The Most Powerful Gun in the World.
The new reinforced siege guns lately added to the Germa rtillery, of 21,28 , and $30 \frac{1}{2}$ centimeters rifled bore, are said to be the most powerful guns in the world. Their performance are truly remarkable. The last mentioned gun, with 120 to 130 lbs. of prismatic powder of from $1 \cdot 74$ to $1 \cdot 76$ specific gravity, fires a chilled cast iron shell of 600 to 610 lbs . weight with an initial velocity of 1,607 feet per second, which is saic with an initial velocity of 1,607 feet per second, which is saia
to have never been attained before by any rifled gun. At to have never been attained before by any rifled gun. At a distance of 1,200 paces, or 988 yards, it sends the shell
clean through a 14 inch armor plate and backing. The gun clean through a 14 inch armor plate and backing. The gun
is very handy and easily manouvred; it requires one man to handle the breech piece, two to lift up and insert the shell by means of a davit lift, two men to give it its grextest elevation of 17 deg . in $16 \frac{1}{2}$ seconds, or its greatest depression of $6 \frac{1}{2}$ deg. in 11 seconds, and two men to give it its lat. eral direction by means of a chain running over jack pul. leys.

New Field Guns for the Frenck army.
The new French field gun, the canon $d \rho$ sept, which is onstructed by Colonel Reffye, and likely to be adopted as he principal field gun of the army, is, says Engineering, made of bronze, with a bore of 8.5 centimeters, length of barrel $187 \cdot 5$ centimeters, and contains 14 grooves, 1.5 millimeters deep, these being twisted from right to left at an angle of 8 deg . 32 minutes, or of $21 / 2$ calibers to a complete twist. The breech closing apparatys is a screw, which fits in a steel nut that is inserted in the end of the barrel, flush with its end face. Screw and nut have their threads cut out at three sixths of the circumference, so that the former may be inserted in the latter by simply pushing it inwards, when it is fastened in it by $a$ turn to the right of $\frac{1}{6}$ of its circumfe ence. The screw rests in a kind of swing door, similar to the first Prussian model of field gun with piston breech hich supports it when drawn out of the barrel, and facili ins ithe the breech screw has a slightly concave surface, and bears on the side three twist grooves, which arrangement is intended for extracting the grooves, which arrangement cartridge shell, which serves as gas check. This shell metallic cartridge shell, which serves as gas check. This shell
consists of a thin brass bottom, which is provided with a perconsists of a thin brass bottom, which is provided with a per-
forated ignition cup, while the cylindrical part is made of tinned sheet iron. The touch hole is bored at an angle through the breech screw and opens at the center of its inner surface in the gun just where it meets the ignition cup, so that the fire ignites the cartridge centrally. The latter consists of 5 disks of compressed gunpowder, each weighing $0 \cdot 226$ kiloramme, and provided with a central canal of $5 \because 2$ centimeters in diameter ; their total weight is $1 \cdot 13$ kilogrammes. The projectile is an elongated shell, 3 calibers long, weighing 6.9 kilogrammes and is provided with two lead rings as guides. The first trials with this gun, at the Polygon of Vincennes, date back as far as 1870 ; but only in 1872 was it tested again a Calais in its improved form, and its chief merit seems to be its low trajectory, though it may leave something to be desired with regard to range, accuracy, and durability.
An underground railway has been constructed in the city of Constantinople, Turkey, and the contractors are no
finishing up the termini. It will soon be open for traffic.

ONEW BOOKS AND PUBLICATIONS.
Joint. By Dr Charles F. Taylof Disease of the Hip Joint. By Dr. Charles F. Taylor, Surgeon to the New
York. Orthopædic Dispensary and Hospital, etc. Illus-
trated. New York: William Wood \& Co. trated. New York: William Wood \& Co.
In this work, the author describes a number of ingenious devices of his
own invention having for their object the cure of disease of the hip. own invention having for their object the cure of disease of the hip. Dr. Taylor has become quite celebrated for his successful treatment of hip and
spinal diseases by mechanical means. We may state that the appliances indicate considerable mechanical genius, and appear to be of a nature well
dapted to alleviate the suffering incident to that common but very distressing malady. We notice that the apparatus of Dr. Taylor recelved the
an Elementary Course in Free Hand Geometrical
Drawing, for.Schools, etc. With Chapters on Letter ing and on Geometrical Symbolism. By S. Edward of Technology. Price 75 cents. New York: John Wiley
This is a little book especially adapted for beginners, in which the lesson
are arranged in such steady progression that the merest child can follow are arranged in such steady progression that the merest child can follow
them, almost without ald from a teacher.
Illustrated Catalogue and Quarterly Floral Work. 25 cents per annum. Rochester, N. Y. : Briggs \& Bro
ther, Seedsmen. This catalogue contains an amount of botanical information which i
out of all proportion to the price asked for it.
Elements of Physical Manipulation. By Edward C Pickering, Thayer Professor of Physics in the Massachu-
setts Institute of Technology. New York: Hurd \& setts Institute of Technology. New York: Hurd \&
Houghton. Cambridge: The Riverside Press. The author of this book has given the world the results of a practical
experience of the very highest order. The chapter on the graphical method experience of the very highest order. The chapter on the graphical method
of teaching pyssics (which, the author believes, , has not attracted the atten-
tion it deserves) will interest every one whe is concerned, either as teacher or pupil, in the great work on technical education.
On the Arrangement, Care, and Operation of WoodWorking Factories and Machinery, forming a Com
plete Operator's Handbook. By J. Richards, M. E., Au pleto of "A Treatise on Wood-Working Machines."', E. \&
ther N. Spon. New York: 446 Broome Street. London: 48 Charing Cross.
The author, of the firm of Richards,London\& Kelley, of Philadelphia, Pa., is well known, by his mechanical productions and his previously published
writings, to be a constructive engineer of the highest class; and the very Writings, to be a constructive engineer of the highest class; and the very
numerous woodworkers of this country will find his new book to be full of sound, practicalinstruction on all branches of the trade, from designing factory to the use of the simplest hand tool
Workshor Receipts, for the Use of Manufacturers, Mechanics, and Scientific Amateurs. By Ernest Spon.
L. \& F. N. Spon. New York: 446 Broome Streei. London: 48 Charing Cross.
Thisbook contains an extensive collection of recipes and directions for
manipulation in every branch of the industrial arts. The value of such a manipulation in every branch of the industrial arts. The value of such a this volum
complled.
The Theory and Practice of Linear Perspective, applied to Landscape, Interiors, and the Figure. Trans-
lated from the French of V.Pellegrin formerly Professor lated from the French of V. Pellegrin, formerly Professor
of Topography at the Military School at St. Cyr, etc.
New York: G. P. Putnam's Sons, Fourth Avenue and Twenty-third Street.
This concise and lucld treatise was selected, in 1870, by the French gov.
ornment for circulation in the public schools and libraries of France, ernment for circulation in the public schools and libraries of France
a tribute to its merit which the work deserves, apart from the reputation a tribute to its merit which $t$
of its distinguished author.
The Tanite Company of Stroudsburg. Pa., have recently issued a
handsomely illustrated pamphlet, describing their excellent emery wheels hards osides, containing a large amount of useful information regarding the proper employment of the same. The emery wheel has sprung into universal favor, and has proved itself a valuable addition to the re
sources of the shop.

## gecent ghericau and forcign eqatents.

## Improved Metallic Roof Isaac s. Mettler, Jersey City, N. J.-This invention r

Isaac S. Mettler, Jersey City, N. J.-This invention relates to the construc-
tion of roofs of buildings, and consists of channels or openings formed beneath the outer covering of the roof, by interposing a layer of corrugated inn, or other sheet metal, between such outer covering and an inner layer,
sald openings or channels befng designed for the passage of currents of air
from the eases of the roof to the ridge or cornice. The channels or openings formed by the corrugations may be connected with a pipe for admit ting and conducting steam for melting snow or ice from the roof in winter
if desired.
Machine for Forming the Hooks of Machine Needles.
Nathan Paine, Mifford, Mass.-The object of this invention is the improve Nathan Paine, Mifora, Mass.-The object of this invention is the improve ment of machines for making the hooks of needies used in machines for
sewing or stitching leather, also to improve the quality of the work. The
prevalling fault of the machine made needles now in use is a too angular form of tne inner side of the hook through which the thread passes, which
Impedes its passage and often chafes the thread and causes the breaking of impedes its passage and often chafes the thread and causes the breaking of
the needle by the strain of the thread when obstructed by the edge of the oompound motion while the hook is betng cut, by which the required
surved form is secured instead of the angles.
Philip Corrigan, New York city.-This invention, a
also been obtained in England, has for its object to furnish an improved valve so constructed that the valve plug may be conveniently ground to tts
seat without detaching the valve from its connections. The invention ceant without detaching the valve from its connections. The invention threads cut upon their outer surfaces. With this construction, when the
valve plug requires to be ground into its seat, the cap nut is screwed out and the valve stem screwed back as far as it will go. The valve stem is then
pushed forward, carrying the sectional nut with it, which sections drop off. The cap nut is then screwed back into the screw hole of the body and into its eat. The cap nut is then removed and the sectional nut replace
and the valve1s ready for use. I
$\underset{\text { Willimantic, Conn.-Upon the up }}{\text { un }}$
Luman D. Bennett, Willimantic, Conn.-Upon the upper side of the draw-
head is formed a flange, passing around the pin hole and extending to the head is formed a flange, passing around
cap to keep the end of the pin always in place upon the upper side of the
coupling block, the stop in the lower end of the outer arm of the couplin coupling block, the stop in the lower end of the outer arm of the coupling
pin being so arranged that the end of the shorter arm ot sald pin can never pin being so arraanged that the end of the shorter arm of sald pin can neve
rise above the sald flange. Upon the upper part of the shorter arm of the
pin is formed a collar, which rests upon the flange when the coupling pin s in working position. In adjusting the pin for automatic coupling pine
end of the pin ts allowed to rest upon the block. As the link enters. end of the pin is allowed to rest upon the block. As the link enters, it
pushes back the block and the pin drops through the link. To uncouple pushes back the block and the pirs the pin is raised, and its lower end is placed upon the upper side the inward movement of the block causes the block to move outward,
pushing the pin forward to the pin hole, through which it drops, coupling the inward movement of the block causes the block to move outward,
pushing the pin forward to the pin hole, through which it drops, coupling
the cars.
 mprove the construction of the ears of that class of tubs known as return Th the same time allow said covers to be readily and conveniently detached The invention consists in securing the cover of a tub by means of two palrs while a
Improved Stove Pipe Joint.
Jacob Weaver, Tipton, Iowa.-This is a revolving stove pipe, which may be adjusted or twisted to any desired position to be used without delay on
putting up the stove, avolding thereby the annoyance arising from badly Atting or Imperfect jolnts. The stove pipe connection is comp
sections having elliptical joints, on which they are adjustable.

Improvement in Securing Wheels to Axles.
Robert J. Lessor and in b. Shat whic is driven into the hub in the ordinary manner, is secured in place by a
nut screwed into its outer end, and which overlaps the end of the hub. The nner end of the axle box projects beyond the inner end of the hub, and has a ring groove formed in its outer surface. A lever is plvoted to ears formed
upon the axle or clip yoke. Upon the inner end of the lever is formed a lip or straight hook, which fits into the ring groove of the axle box. The lip o the lever is held in the groove of the axle box by a spring, which is secured
to the axle by the yoke, and the.free end of which presses against the outer end of the said lever as shown in the figure, By this construction the whee wheel may be easily and quickly detached when required for olling the
Lmple or other desired purpose.
1mire Escape Ladder.
Walter W. Parsons, Stanstead, Canada.-This is a pair of suspending
oopes, with cross bars at intervals, constituting a rope ladder. At the lowe ropes, with cross bars at intervals, constituting a rope ladder. At the lowe and has a crank for turning it by hand to wind the ladder on or off. The roller constitutes one of the bars of the ladder, and another roller of the
frame constitutes another bar; and this roller has hooks, by which to attac rame constitutes another bar; and this roller has hooks, by which to attac
the ladder to the building. The crank can be folded down in the roller com pactly for soring the ladder. For securing the cross bars to the ropes the ends to said holes. so that the latter can be contracted a little to bind the rope so as to be held fast. Slightly conical ferrules are driven on the bars, which are slightly tapered from the holes to the ends to so bind the
bars upon the ropes, whereby the said bars will be firmly held in their places Apparatus for Cleaning Cesspools, Sinks, etc.
J. P. Florimond Datichy, Brooklyn, N. Y.-The object of this invent o empty and clean sinks, privies, cesspools, sewers, marshy lands,
tc., in a perfectly edorless manner, so that the work can be done in day time without the least discomfort and annoyance to the occupants of the dwellings, and without the use of separate machines by which the vac-
uum in the tank is created. The invention consists of a tank of suitable uum in the tank is created. The invention consists of a tank of suitable necessary appurtenances to insure the efficient working of all the parts.
The tank is carried on a four wheeled truck of suitable strength, and the vacuum is created by the hind wheels working the air pumps by eccentrics, sald action to be discontinued by the application of a regulating gear, which frees the piston from its shaft, according to a gage placed on a cupola con-
nected with the tank, which assistsalso the perfect working of the machine From the model which we have examined we should think this a very use
ful improvement over the ordinary machines used for emptying and cleans ing cesspools and the like.
Improved Windmill.
Ovett B. Knapp, Brandon, Wis.-This invention lass of in a direction at right angles, or nearly so, to the direction of the wind at ny given time. A spiral wind wheel is mounted on the end of a horizon-
tal shaft, which is mounted on the top of a turntable and gears with a ver Hical shaft through which power is communicated to the pump or other apparatus. The turntable is supported on and secured to a bevel gear
which meshes with a pinion on the same horizontal shaft as the pulley. A belt connects the pulley with the axis, which is to be turned by a weight, for acting in conjunction with the vane, for controlling the wheel, the vane heel or nearly so, so that its tendency is to turn the wheel out of the wind -that is, edgewise thereto-so as not to work, while the tendency of the
weight is to turn it into the wind. This weight is connected with the a a is y a rod engaging with the curved teeth of a disk. To start the wheel, the
weight will be put on the disk at about the middle of its hight, vertically, in case it is desired to obtain the full power. This will cause the wheel to
turn about one fourth of a revolution into the wind, in case the latter is turn about one fourth of a revolution into the wind, in case the latter is
not so strong as to prevent the weight from turning it too much. If it is not des
high.

Improved Revolving Fire Arm.
opening through the front end of Ira C. Winsor Coventry, R. I.-The opening through the front end of the inclosing case,
through which the cartridges are introduced, is closed by a cap which is held by a spring joint. The cartridges are, by the rotation of the chamber barrel, the flanges being engaged by a catch. The pusher sildes of the barrel, the flanges belng engaged by a catch. The pusher slides forward
and pushes the cartridges out of the chambers into the barrel, to be exploded therein. It is moved forward by a sllde. When the pusher withdraws from the chamber, it draws the expended shell into it , and the shell is retained in the cylinder until it comes around to the opening, when it is expelled
through a passage by the next cartridge put in. The firing rod is arranged tolde of the pusher, which is made hollow for the purpose, and has a spring cartridge shell will be withdrawn from the barrel, the hammer will be cocked, the cylinder revolved, and another cartridge introduced into the
barrel ready for firing. barrel ready for firing
Improved Brick Machine.
Peter K. Dederick, Albany, N. F.- By a weight and the screw a tripping
latch and bar are so adjusted that the requiste force for pushing out the latch and bar are so adjusted that the requisite force for pushing out the rease, such as will be caused by the binding of the mold boxes by a stone or the like wedging in between them and the press box, will instantly cause
the tripping of the latch, and thus save breaking the machinery. The de vice on the mixershaft, by which the clay can be at the same time work along the mixed clay holder laterally and discharged, and still be of the rms on the mixer shaft with their planes oblique to the axis of the shaft arms with their planes parallel with the axis of the shaft; oblique vanes on
the arms next to the screen; and discharging blades on the ends of the arms, the said blades being slightly spiral to the shaft, also tangential to a circle about two thirds of the size of the one described by the outer edges
of the blades. The oblique or spiral inclinations of the arms, vanes, an of the blades. The oblique or spiral inclinations of the arms, vanes, and
blades are all, of course, in the direction required for working the clay across he mixed clay holder from the screen, while the shaft turns in the direc
ton for pushing the mixed clay out through the throat. The lower part the side of the case of the mill, whereon the press box is arranged, is con-
ructed so as to incline inward as much as possible into the angle of the ower part of the case cut off by the circle described by the discharging blades, and construct the press box on the same inclination and attach it to
the said part, and so considerably lessen the waste space through which the clay has to be pushed, and also lessen the mass of clay to bemoved, and ereby economize powe

Improved Harvester Cutter.
les, Sherburne Four Corners, N. Y.-T
Whilam E. Sinaales, Sherburne Four Corners, N.Y.-This invention perfattachment to the finger bar. By moving the bar until the end of the
raised and withdrawn. In this way any desired section may be detached
and replaced without disturbing the others. By this construction, also, the cutters will operate with a shear cut, and, the rear ends of the shanks being pivoted, the cutters will have a greater movement than the bar, so that the
pitman crank may be made shorter than is necessary when the cutters are ritman crank may be made shorter than
connected with the cutter bar.

Improved Railway Car Brake.
Gadsden, Ala. - This Invention has for its
Wille D. Pope, Gadsden, Ala.-This invention has forits object to furnish eously adjusted to give a greatly increased power. To the shaft, to which the brake chain is attachec, is rigidily secured two gear wheels, one wheel
being considerably larger than the other. There is another shaft placed with considerably larger than the other. There is mentioned, and to which are attached two gear wheels of different diameters, and in such positions that when the second shaft raised or lowered to bring one or the other of the wheels into gear, the
other of said wheels will be free. A lever, which is swiveled to the shaft and pivoted to a ring bolt, is attached to the platform. The other end is held up by a spring strong enough to support the shaft and its attached
wheels. To the upper end of the shaft is attached a hand wheel. By thls construction, when it is necessary to apply the brake with increased pow throws the one set of wheels out of, and the other set of wheels into, gear with each other, which gives a greatly increased leverage.

Improved Spring Bed Bottom.
Charles H. Dunks, New York city.-This invention oonsists in the oom.
bination, in a bed bottom, with longitudinal slats, of transverse plate Ination, in a bed bottom, with longitudinal slats, of transverse plate
springs, supported upon coiled springs, arranged between the slats. Two slats are arranged to each spring over the sides, so that the thln oross strips of steel will not be bent between them and the top of the
slats are permanently attached to the cross slats by rivets.

Improved Loom Shuttle.
Joseph Brown, Brooklyn, E. D., N. Y.-A wheel is used for the bobbin, and is fitted on a hub, having a series of tension springs between it and the
wheel. The hub having a limited rotation in the direction for reeling off the thread, the bobbin turns on the springs, which thus produce the regular tension required. This hub is made hollow, provided with a volute
spring. The spring will turn the hub to wind on the thread whenever there is any slack, and thus prevent the Jerking which is lable to take place
whenever the slack of the thread is taken up by the motion of the shuttle
Improved Slings for Loading and Unloading Hay, etc. George W . Long, Delaware Center, Iowa.-The object of this invention
is to provide efflicient means for the rapid unloading of hay. corn fodder, sugar cane, manure, and other farm products, by which the whole load is packed and hoisted up directly from the wagon and conveyed and stored
at the place of destination. The inventlon consists of two strong pieces of wood, which may be connected and disconnected by means of lever ropes, in connection with a double hook for hoisting. After conveying
and hoisting the load to the point desired, it is detached by disconnections and hoisting the loa
of the main pleces

Improved Gage for Gang Saws.
oody, Manistee, Mich.-This invention cons
 the gage blocks, used for gaging the distance of the saws ot a gang of saws readily swung into the spaces between the saws and out of them, and be put on and taken off without having to remove the saws.

Improved Corn Planter.
t, Dublin, Ohio.-The drive wheel
George W. Starrett, Dublin, Ohio.-The drive wheels are made broad to cover the seed, and revolve upon the axle attached to the frame. To the
ends of a cross bar are secured the forward ends of the openers, which are ends of a cross bar are secured the forward ends of the openers, which are
made something like a sleigh runner, and the rear ends of which are widened and made open to receive the conductor spouts, so that the $\varepsilon e e d$
may be deposited in the bottom of the furrow before it becomes partial. ly filled by the falling in of the soll. To the dropping side are pivoted the outer ends of two rods, which are pivoted to the forward arm of a three
armed lever. By adjusting the ends of the said rods the movement of the dropping slide may be regulated. To the side arms of the three armed lever are pivoted the connecting rods, by adjusting which the throw of alder may also be regulated. The rear ends of the rods are plovoted
to the lower ends of the treadles, which are so arranged that by working his feet the driver can operate the dropping bar to drop the seed. To one of the treadles is attached a rod which projects upward into such position This rodhas a weight attached to its upperend to adapt it to serve also as a balance to the treadles. The barcan also be operated to drop the seed by means of $a$ hand lever.

Improved Heat Regulator.
Henry Boyle, London, England. This invention is an ingenious self-act-
ing apparatus for maintaining an equable temperature, chiefly applicable ng apparatus for maintaining an equable temperature, chlefly applicable
for the purposes of incubating, forcing, etc. The regulator consists of a closed cylindrical vessel, flled with water and wholly or partly surrounded by a jacket, also filled with water but having no communication with the vessel. In connection with the upper part of this vessel is a $U$-shaped
tube of glass, one leg being connected to the vessel, and the other and shorter leg terminating in a contracted neck, to which a long slender
glass tube is connected by a fiexible joint. This latter tube is disposed in a horizontal or nearly horizontal position, and is suspended at the other end from one end of a counterpoised arm or balance. The vessel
and tubes having been first filled with water, mercury is poured !into the open end of the balanced tube, and, displacing the water, ills the shorter leg and so much of the slender tube as will cause the latter to balance the
counterwelghted arm when the water in the vessel Is at the temperature it is desired to maintain. Heat is applied, either directly to the vessel, by which it is transmitted to the water in the jacket, or the jacket is heated, and the heat transmitted to the water in the vesselt

Improved Metallic Piston Packing.
James Massey, Chester, Pa.-This invention is designed to furnish an imthe wear, and thus be always steam tight. In the face of the piston head in the celinder. A cast iron epring or cell is placed upon the pston hed, by the elasticity of which the open rings are held out against the cylnder. The open rings have inwardly projecting flanges formed upon their
nder outer edges, which rest upon the edge of the spring. The rings are beveled
upon their inner sides, from their outer to their inner edges, to allow the spring to be made heavier in its middle. By the follower of the piston the spring and open rings are held down upon the stationary edge of said pisother end and keep it in place.
Improved Spring Hinge.
Stephen Joyce, New York city.-This invention is an improvement in the class of hinges specially adapted for use on doors which swing in either
direction and are self closing. It consists in the construction and ar: rangement of a tubular pintle provided with heads or plugs connected by a spring, and having a series of holes to adapt them to receive stop screws for regulating the tension of said spring, and the pintle betng enclosed by William Warinner, Creelsborough, Ky.-The brater the front end of a morn the rear end being cochain is attached to pring to assist and accelerate the release of the brakes after use. To tween which move the ends of levers. A tongue in the shape of a cross forms the extreme end of main bar,being pivoted to the pronged front end
and connecting with links pivoted to the inner ends of the levers. The se and connecting with links pivoted to the inner ends of the levers. These
levers are placed under the truck frames and connect with the brake beams levers are placed under the truck frames and connect with the brake beams
hung at suitable distance from each pair of car wheels from the truct rames. On putting on the to the levers. The later again, by means of lever rods, force the bra e beams on the wheels, so that the powerful friction exerted thereon wia
soon stop the car.

## Wusiness and zersomal.






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Thing, strong and cheap. All Hardware and Tin

Peck's Patent Drop Press. For circulars, Boring Machine for Pulleys-no limit to
capacity.
T. R. Bailey \& Vall, Lockport, N. Y.

A Partner Wanted-In the mannf facture of Linsee doll, allos,
Des Molnese Iowa.
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For Sale-Machine Shop \& Foundry. Only Ladd $\&$ Parker, Elmore, Ottawa County, ohio.
At American Institute a ad Chicago ExposiAt American Institute and Chicago Exposi-
tion-Boultit IUrivaled Paneling, Variety Molding and
Dovetalling Machine Machinery Company, Mic
Estimates Wanted-For furnishing com.
piete, a steam Laundry, capable of working for one thousand persons. Address, with full descriptions,
Laundry," Key Box 186, Charleston, S. C

## 

A. D. asks: Is there a remedy for snails
V. E. asks: How many minutes, and what rubber, $3-32$ of an inch thick, to the greatest possible D D. E.R. asks for a remedy for a strange Texas "Up to a fow days before they die, I do no notice uny change in their appearance, except that the

comb and wattues become pale, witha a slight puftle ess around the eyes. Thay have a great increase of hea!, | are very thirsty, and still continue to eat heartily up to |
| :--- |
| 12 hours beforethey die. I have opened $\begin{array}{l}\text { a number and }\end{array}$ | find in all an enlarged liver and distended gall bladder him, and his liver and gall bladder welghed nearly 6 ozs I have tried every remedy I could think of to act on the

11ver. Calomel prolongs their lives a few days c cayenne Wer. Calomel prolongs ther lives a few days; cayenne
pepper braces them up for a while, but soon ceases $t \mathrm{to}$ nave any efficect. Otther remedies doo only temporary
zood, as the all die that become

 that, when diverged to their fullest extent, they describe
a circle of 6 feet diameter, and that the longer amm of

center of bail, a, to c, is 39 inches: How much pres
ure will be exerted
 airing the application of the principles of centrifuga
orce and of the lever for its solution we welleve tha orre and of the lever for its solution. We belleve that
some of our readers take an interest in such matters, and we prefe
tion. - Ems.]

C. S. D. will find a recipe for ink on p. 106 ,
ol.27.-A. D. can trypowdered borax as a remedy for
 for cement for leather on p. 119, vol. 28.-J. w. E. will on p. 155, vol. 26.-W. E. L. will tind the wheel questio answered on p. 862 , vol. $28 .-\mathrm{D}$. S . W.'s solution of the F. S. D. asks: Is gas formed by passing a
current or air through naphtha or benzine lighter or eeavier than arr, and what is the chemical reaction
Answer: Answer: When ari is pasee through or over rapitha
benzine, it carries off, mecnanically suspended in it, a portion of the vapor of the hydrocarbon. There is in
chemical compound formed ; snd as the vapor of naphtha or benzine is heaviler than the air, the air charged with ther r vapors is of
han air not so charged
C. H. K. asks: How can I remove fly spots
rom a picture? $A$ nswer: Try a strong solution of fine soap in
cloth.
C. W. asks: What is the cause of the east erly current by which Professor Wre proposea to cros
the Atlantic? Ans wer: The existence of this curren is not an established fact, and the object of the transat
antic vogage wha to lantlc voyage was to thvestigate the matter. Of late
nany arzuments have been advanced pro and con; and seems to us that, as
is
Is an open question
 iquid glass? 2 . Will you describe a simple process rickel plating? Answers : 1. Fuse together 1 part ate of potash. 2. To plate with nickel., obsierve the foll
lowing directions : In a euvical glass or earthen ware vessel, suspend by means of a brass rod, the articles to nch from the other, as many plates of pure nickel a there are articles to be plated, each plate of nickel op.
posite one artcle. Fill the vessel contanning these poste one article. Fill the eessel contaning these
witha a solution of the double sulphate of nicker. and mmonia. Now connect the rod on which the article
to be plated are nung ath the $z$ inc pole of a galvanic battery and the rod holding the nickel plates with the
$\xrightarrow[\text { Wha finet for steam is set } 400 \text { feet fromine the botler, with }]{\text { W. . . }}$ 61 1bs. pressure, will the engine get hotter steam by a
oteam plipe of 1 inches diameter than by one of 2 inche diameter? 2. Is it economy to lay a steam lline 400 fee Iong in a box underground? Answers $: 1$. A plpe just
argeenough to supply the engine will probably be the best, as there will be e eess radiation. 2. Yes, if you mean
to compare this method with that of having the 1 tp
P. B. H. asks for an expression of our view
on the subject of slow $v \approx$ quick motion in the speed of stationary engines. "I quate the follo wing assertion
Probably one half the engines the the country wold do thetr work with one third less fuel if thetr speed were
 gines go to the class that have a very short stroke wit sped of 1,000 feet per minute." Answer: We incline to
 piston spe
structed.
T. W. asks: 1 . Why is it that a person in the water, by throwng himsieli on his back and exten ing his limbs, can maintain his position on the surface,
while in an a yother attitude the body sinks? Is not the displaceninent the same whatever attitude is assumed
2. What is the scientific explanation of the motion of snake's tall after apparent death? Answers 1 . When
person is in the opostion described, he displaces the mosi water possible without being fulls sub bmerged, as only slight portion of his face is out of water. 2. It is sup. posed to be due to unconscious nerve action, which ap igence.
J. H. W. asks: What is the alcoholic
strength of th prof brandy and what is the origin or
 origin. Proof spirit contains about 50 per cent of pur aiconoi, and any mixture above or under th1s amount 1
sald to be over proof or under proof. Formerly spirit
 was meant that 1 gallon of water added to 3 or 4 gallon
of such spirit would reduce it to "proof." This is as ear as we can come to the elucidation of yourquestion
he expressions in which may have been due to some C. E. C. asks: What is French polish com
posed of, and how is it applied to furriture and to under the name of French polish. One is pale shellac
und ilsh may be colored to modify the character of the wood. A reddish tinge is given with dracon's hlood
alkanet root, or red sanders wood; yellow, by turmeri
 as possible with glass paperand placed opposite thelight A rubber is made by rolling up a strip of thick woolen
cloth (list) which hasbeen torn off, so as to form a soft
 diameter. The workman moistens the midale of the
fat face of the rubber with the polish by laying the rub ber on the mouth of the narrow netceed bottce contain.
ing the varnish and shaking up the varnish against t Ing the varnish and shaking up the varnish against it
once. Therubber is next enclosed in a soft linen cloth
ond once. Therubber is inex enclosed In a shoft linen clion
doubled, the rest of the cloth being gankered up at the back of the rubber to form a handie. The face of the
linen 1 now moistened wth a litle raw linsee oin ap
pile piled with the finger to the middle of t , and the opera-
tior of pollshng commenced. For this purpose the
 becomes dry, or nearrly so, when he eagaln changresen his
rubber as before, omitting the oil, and repeats the rub sng antit three, eoatse are latid on. He He now ape applies
ittle onl to the rubber and two coats y ylven. As soon as the coating of varnish has acquired some thickness, he wets the instde of the linen cloth,
before applying the varn sh with alcohol or wood naph before applying the varnish, with alcohol or wood naph-
tha and gives a quick. light and unif form touch over the hole surface. The work is lastly carefully gone ove Tht the linen cloth, moistened with a 1 little oil and ree
ffied spirit or naphtha without varnish, and rubbed before until dry.
J. C. P. asks: In your article on page 133 o
sour current tolume, vou speak of the albumen of egs your current volume, you spenk of the alibumen of eqgs
being converted into blirin. Do you mean the yolk at itl as the white? Will any vegetahe ean bulty increased in welght or bus, as in the
st Creole plan of converting milk into butter by addition of a little butter to begin? (Thave sen two pounds of
butter made from a quart of milik by this process,) Does tall become fibrin, eggs, water and all? If so, it would ive us cheap living. Answer: The article referred to eems to have given rise to some misapprenension Which its statements do not seem to justify. It is no
daimed that the albumen of the eggis converted int ibrin, as this is not the case. Albumen and fibrin ar chemically different, though both contain many of the ame constituents, and are probaaly mutually convertu
hie by the organtc forces in the animal body. The witte the egg is pure albumen (dissolved in certain qua in the preparation of the artilicial florin. The eggs probably increase both in weight and bulk by the engy
digestion in cold water, by absorbing a certain quantity; ut no chemical change takes place in the egg materia) but only a molecular one, shown by the snowy whiteness
of the albuminous parts. Vegetable and animal albu nen are Identical in composition, and our correspond
W. H. J. asks: What tis the proper diame-
ier and length of beartng of the crank pin of a steam ngine, in proportion to the dameter of the cylinder
nswer. Let $D=$ diameter of cylinder in inches. $d=$ diam eter of crank pin in inches. I=length of crank pin in inchos. $P=$ maximum steam pressure in cylinder, in pounds
per square inch. $n=$ number of revolutions of engine shaft per minute. Then, according to Mr. Van Buren's formu 1as: $1=\left(\mathbf{P} \times \mathbf{D}^{2} \times 0.7854\right) \div 850,000$, or the least allowatotal steam pressure divided by s50,000. Having settled upon the length of the pin, the diameter may be found by the following rule: $\mathrm{D}=\sqrt[3]{\left.\sqrt{\mathrm{D}^{2}} \times \mathrm{P} \times \mathrm{I}\right) \div 1690 \text {, or the di- }}$ meter of the crank pin is found by multiplying the teare pressure per square tinch and by the length of the n, avang the prodact by 1990, ana taking the cub
E. W. asks: What makes water and some Alllquids descend a slope by the foree of gravity ; and
any divergence from a straight line is caused by the
H. M. P. asks: Can a small skiff be pro ttached to the stern of the boat beneath the water, and aving this cylinder arranged so you can pack it full o 1bs. to the square inch? "I propose to have a valve in the end of cylinder half as large as the cyllinder itself;
and when the pressure is at its hight, to let go the and When the pressure is at its hight, to let go the
valve. Would the amount of pressure escaping instanta-
neously exert
ste direction? If so, how much? Answer: The pla
s practicable: You will find much valuable informa tion on jet propulsion in stan
engine and steam navigation
J. . C. C. asks: What advantage is an a
pump to does it give to the engine in proortion to the powerit
takes to drive it? Answer: We will give you an ex takes od orive it? Answer: We will give you an ex-
ample of an actual case. $A$ pair of high pressure en. ample of an actual case. A pair of high pressure en
gines, of 200 horse power, were fited with a condenser qnd air pump. The mean pressare per square inch was

 pump had to do the work required to 1 1ft $2929 \cdot 19$ pounds
of water 14 feet high perminute $=2792 \cdot 19 \times 14+33,000=1 \cdot 18$
 horse power, and indotigt this, exerted an efficiency of
448 g per cent, so that the actual power required for the
 lent to a pressure of $2.68 \times \cdot 0 \cdot 1155==042$ pounds per square
nch. Before the condenser was attached, there wa
 the condenser, the mean pressure due to a vacuum wa -14 pounds per square inch: so that the gain from 4 $7 \cdot 388$ pounds per square inch, or $7 \cdot 887 \times 100 \div 31=23 \cdot 83$ pe
J. T. S. asks: If I sell a horse for $\$ 40$ and
gain thereby as much per cent as the horse cost in do gain thereby as much per cent as the horse cost in dol
ars, what would be the price of the horse? Answer Let $x=$ the cost. Then $x+x$ per cent of $x=40 . \quad x+\frac{x^{2}}{100}=$ $\sqrt{60.100 x+x^{2}=4000.100 x+x^{2}} \sqrt{6 \cdot 50}=80 \cdot 65-50=\$ 30 \cdot 65$, nearly
G. W. S. Says: D. should make his lemon
sirup as follows: Take pulverized citric acid $2 \% / 4$ drams il of lemon, 5 drops simple sirup 1 quart. Cut the o with h 1.tile alconol, then strir the whole together ; and
J.L. says, in answer to thequeries of R. C.G.
and C. F. C.regarding steam yachts:
R. C. G.'s engine s far too large for his boat, and moreover condensing In fe
Inerti He will put his 20 sauare feet of heating surface int
vertical tubular boiler $3 \% /$ feet high and 20 inches in lameter, capable of withstanding safely a pressure of 30 or 100 ibs. to the tinch, and use a direct acting engin
$\times 6$ inches, running at 300 revolutions per minute, with
 will probably make about 7 milies per hour. C. F. C.'
engine is also larger than is necessary. A cylinder 4 x engine is also larger than 18 necessary. A cylinder $4 x$
nches would be large enough; for which he will need a 5 square feet of heath and 22 ncheces in diam With this he may ob tain a speed of 8 miles an hour, more or less, according the shape of his boat. It will wost likely be difficu",
oo get a much greater spead in either of theese cases ", hink your allowance of 18 to 20 square f eet heating sur. face per horse power is unnecessarlly large, and would einconvenient for this purpose. Forsuccessful stean achting is required a wel proportioned boat, smal which rapld combustion and a high degree of heat are maintained ; a well constructed eng ine with small cyl
inder and rer larg steam passages working somewha inder and very large esteam pasaages, working somewha
expansively at a high rate of speed with considerabl expansively ata high rate of speed with considerabl
steam pressure; engine and boiler protected from radi

Minerals, etc.-Specimens have been re eived f̂rom the following correspondents, and examined with the results stated
R. R. R.-This material is a slicteate of alumina, con Reaves. It 1 s a blue clay, not the kind of usually emplosed or fire brick.
A. D.- - Your tripooli seems to be of good quallty, but
he best plan is for you to send large samples to differr dealers and have it well testea.
F. M. S. -This is 1 lignite or brown coal. It migh prove serviceable as a fuel if found in sufficient quan
ities, and if coal be expensive. Its presence is no cer tain indication of the presence of true coal, as lignite
belongs tothe recent formations of sedimentary rocks, elongs to the recent formations of sedim

## communications received.

## The Editor of the Scientific American

 ind of ges, with much pleasure, the reupon the following subjects:On a Lightning Freak. By L. G. F.
On Decimal Weights and Measures. By C. A.

On Transmission of Power by Belts. By W. A.

On the Bisulphide Engịine. By J. T. H.
On the Variable Star Algol. By J. M. B
On Crude Oil for Fuel. By A. L. S
On Water Pipes. By M. S.
On Gold Pens. By W. V. R.
On the Divisibility of Matter. By W.S
On the Devil Fish. By T. L. P.
On the Hair Worm. By J. S.
On Crude Petroleum as Fuel. By H. L. A
On Paper Making Statistics. By A. S. G
On Water Coolers and Filters. By S. E. G.
Also enquiries from the following
W.E.W.-J.C.E.-A. G. G.-A. Y. H.-W. R.-P.W

- E. F. L.-B. C.E. C.-A. B.C.

Correspondentsin different parts of the country ask
Where can I obtain machinery for spinning cotton dapted for small powers? Who makes brick machines? ho makes wool carding machines? Who sells rice nd ailantrus-feeding silkworms be obtained? Where can I obtain a folding clothes rack, to frasten sgainst the
wall? Who makes peat-compressing machinery? Mawall? Who makes peat-compressing machinery? Ma-
kers of the above articles will probably promote their kers of the above articles will probably promote thelr
interests by advertising, in reply, in the Sorentrific interests by
AMERIOAN.
Correspondents who write to ask the address of certaln anufacturers, or where specified articles are to be had,
liso those having goods for sale, or who want to find artners, should send with thelr communications an the head of "Business and Personal", which is speeiall $y$ the head of " Bussness and
devoted to such enquirres.

## Index of Inventions <br> FOR WHICH

Letters Patent of the United States wree granted for the week endina September 23, 1873, and each bearing that date [Those marked (r) are relssued patents.] Acid, sulphuric, Thomson
Adding machine, S. Pool
 Auger, hollow, Fawcett, Sil
Auger, well, W. L. Payne.. Bag holder, G. W. Stricker...
Ball ear, metallic, T. Evans Bale tie, cotton, T. Cromer....
Battery, galvanic, T. A. Ediso Bed bottom, W. W. Skaats.................
Beer cooler tap holder, J. H. Fisher... Boats, disengaging, Wygant et al............................. Boller, sectional steam, J. K. Abbott....
Boller feed and blow off, Garsed \& Buck Bolt threading machine. M. H Book, Indexing, J. S. H
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Car coupling, G. E. Knox .........................
Car coupling, schorg \& Van Valkenburg.
Car coupling, schorg \&
Car coupling,, Zeigle
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oal scuttle, J. J. White
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Elevator, G. W.Hubbard..
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Engine cylinder, steam, H. Gerner.
Engine, rotary steam, J. v. Beekma
Engine, traction, L. Perki
Envelope, L. Giebrich
Fabrics, fur coated, H. Kellogg
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Faucet attachment, J. Church
Faucet, self-closing, J. W. Traf
Feather renovator,
Filter, C. Anderso
Fire arm, breech loading, H. H. Hopkins
Fire escape, LL.E.AInsworth....
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Fire kindler, J. C. Crompton
Fork, horse hay, J. W. Lowe
Fork, horse hay, I. E. Snyde
Fruit basket, J. K. Parke....
Furnace, Iron and steel, G. E. Harding
Furnace, smoke burning, S.
Gaiter, W. E. Putnam
Game, West \& Lee................
Gas bracket, J. F. Goldthwait.
Gas fittings, etc., tapping, A. D. Laws..........
GImlet handle, C. L. Griswo
Gimlet handle, C. L. Griswol
Grate bar, H. E. Kerstine
Grate, rocking, J. Seddon.
Gun cleaner, C. G. Gould.
Garvester, T. Yates...
Heater, feed water, J. V. Beekman.
Heel trimming machine, c. C. Ballou
Hemp machine, J. E. Neill
Hoisting machine, J. M.
Hook, bench, D. Boyce
Hydrocarbon, etc., burning, C. Carpenter, $J$
Insect destro ying compound, w. C. Bibb. Iron and steel, annealing, etc., A. F. Andrews
Jeweler's drilling device, J. K. Laudermilch.. Jeweler's drilling device, J. K. La
Jeweler's hand press, J. McWilian Knobs to latches, attaching, L. Michaels Ladder, fire escape, J. S. Pierso Lamp, street, J. H. Eyrse
Ieather, imitating, H. A. Clark
Lock, seal, J. E. Tho
Mrngle, R. A. Duncan

Meat mangle, S. D. Ingham. Medical compound,J. Fehr.........
Medical compound, U. H Kellogg Mill, fanning, L. D. Decker.....
Mosquito canopy, W. Bourgnig Mowing machine, H. Michaux..... Musical wind instrument, I. Fiske
Nail plate feeder, J. McNeely....... Nut lock, D. Sawyer Organ reeds, tongue for, M. Procopé. Yacking, piston, J. E. Budd..............
Picture frames, hanging, T. C. Barnard. Pleture frames, hanging,
Plane, bench, C. H. Hard Plane, rabbet, F. Smith ...........................
Plandng machine, metal, Kichner \& Odenatt.
Planter, corn, A. N. Smith................... Planter, corn, A. N. Smith........................
Planter, cotton seed and guano, C. G. Wilson.. Plow, snow, W. J. Roberts..
Plow, wheel, J. Harrison
Pot, coffee, M. J. Stubbings...
Potato bug destroyer, w. H. My.....
Pruning in strument, W. H. Colling Pruning instrument, W. H. Collings
Pruning shears, W. E. Ball.........
Pulp, pigments, etc., P. C. Tiemann Pump, barge, C. P. Gaver..
Purifier, middlings, F. Blec Purifiers, screen for middlings, Railroad rail joint, H. Decker..
Railroad time signal, H. H. Ford Rake and tedder, combined, c. ..............
Reapers, etc., coupling joint for, G. W.Sy Refrigerator, C. Camp.......
Rein holder, Grannis \& Fitch Rein holder, Grannis \& Fitc
Sash fastener, o. W. Noble. Sash holder, F. M. Davis
Saw hand, T. S. Disston
Saw shor Saw sharpening device, J. B. Drake
Sa wing machine, G. T. Riddle... Scales, weigning, W. Z. Conne
Scraper, w. E. \& F. A. Jacobs. Separator, grain, J. Koons....
Sewing machine, J. P. Noyes.. Sewing machine fan, R. Jac kson...
Sewing machine hemmer, J. F. John
Sewing machine quilter, w. H. Null Sewing machine threader, T. Schofleld
Sewing machine shuttle, W. H. Sewing machine shuttle, W. H. Thayer
Sewing machine thread cutter, A. Webb Sewing machine thread er,
Shing machine gatherer,
Shaft, tumbling, D. Snell.

$$
\begin{aligned}
& \text { Shirt, W. . . Watson. } \\
& \text { Shirt bos. } \\
& \text { Sin an lung }
\end{aligned}
$$

$$
\begin{aligned}
& \text { Sirt osom \&nd ing protec } \\
& \text { Shoe fastening, G. B. Hart. } \\
& \text { Shovel, fire, F. M. Ketcham }
\end{aligned}
$$

Shutter fastener and bo wer, R. Ruhlman Shutter, fireproof, T. Hyatt.
Shutter, fireproof, T. Hyatt... Shutter worker, J. W. Jedkins sifter, sand, D. Br
Skirt, W. S. Taylor
Skylight, G. Hayes
Skylight, G. Hayes
Skylight, G. Hayes......
Skylight cover, G. Haye
Skylight turret and cons
Sled, boy's, S. D. Mott..
Spoon, trolling, Harper \& Smith Steering apparatus, H. Keen. Steering apparatus, W. E. Thomas
Stove pipe connection, G. F. Brin Stove pipe connection, G. F. Brinkerhoff.
Strainer, cream, R. W. Barnard.......... streets of snow, clearing, w. E Sword blades, rolling, J. C. Richardson Table, work, J. P. Wilson.......... Tent, J. B. Smith.
 Toy dancer, automatic, H. L. B. Brower Toy dancer, automatic,
Toy whistle, J. Waters
ryre heater, R. F. Thompson
Valve, balanced, J. H. Stombs
Valve, governor, H. B. Weave
Vehicle spring G. W. Lewis...
ehicle wheel, R. R. Jones.
Vhicle wheel, R.R. Jones
Vehicle wheel, T. W. Porte
Vessel, covered, W. Bates............
Vessels, propelling, L. Murdock
Vest, lady's under, O. P. Flynt
Violin, J. Belknap..

## Wagon, T. W. Porte

Wagon body, B. Bur
Wagon boxes to bolster, holding, H. L. Anders
Washing machine, A.
Washing machine, Colvin \& Patche
Washing machlne, D. B. Myers.
Washing machine, F. M. Widerm
Watchmaker's chain clamp, C. E.Eva
Water cooler, I. Brach.........
Water cooler, J. E. Cammeyer
Water wheel, J. Taney
Wheel, fly, H, Gerner
Whip, E.P. Cothe
Wick raiser, Hallas \& Weeden.
Wind mill, J. Q.\& H. R. Allams
Windmill, J. Hoag..............
Wind wheel, N. \& D. Sheplar.
APPLICATIONS FOR EXTENSIONS. Applications have been duly fled, and are now pending
for the extension of the following Letters Patent. Hearings upon the respective applic
the days hereina fter mentioned
$22,590$. -Clarifinge Cane Juice.-R.A.Stewart. Dec. 10 26,584--Planing Curves.-J. P. Grosvenor. Dec. 10 . 26,6627 -CUTTING Venerss,-B. F. Sturtevant. 26,679.-Seaming Machine.-L. T. Hulbert. Dec. 17. 26,822.-Cutting Round Tenons.-L.A.Dole. Dec.

EXTENSIONS GRANTED

25,569.-BEDSTEAD SLAT.-T. Howe,
25,57.-CAR Couder - E. C. Knight.
25,572--MOLDing Water Trapg.-J. A.Lowe
25,586.- BURGLAR ALARM.-A.

## DESIGNS PATENTED.

6,990.-TYPe.-E. C. Ruthven, Philadelphia, Pa.
6,891.-FTrNITURE.-D. Shales et al., Boston, Mass.

## 6,892 \& 6,893.-TyPe.-R. Smith, Philadelphia, Pa 6,894.-CHAIRS.-J. M. Waters, Cincinnati

TRADE MARKS REGISTERED
1,461.-Silik Fabrics, etc.-Bernsteln et al., N. Y. ctty
1.462.-Hard Soap.-O.Cutts \& Co.,Port Au Prince,Hayti
 1,464--SAWs, ETC.-H.Disston \& Sons, Philiadelphia, Pa.
1,465.-SHIRTM.-FInlay et al, New York city. 1,465.-Shirts.-Finlay et al, New York city
N. H.

1,468.-Liquors.-G. W. Kidd \& Co., New York city.
1,469.-Crothing.-M. Newman et al, New York city
1,470.-Teas.-Newton \& Co.,San Francisco, Cal.
$1,471 \& 1,472 .-L E A F$ Tobacco.-Welss et al., N. Y. city

## SCHEDULE OF PATENT FEES:

On each Caveat........
On each Trade-Mark..
On fliling each application for ra Patent (17 years)
On issuing each original Patent....
On appeal to Examiners-In-Chief........
On appeal to Commissioner of Patent
On application for Retssue.................. On granting the Extension.
 In an application for Design ( 7 years
In an applitation for Design
On an application for Design (14 year

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efforts of the inventor to do all this business himself are efforts of the inventor to do all this business himself are
generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons expe-
rienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at
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patentable, and will give him all the directions needf
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the cost of an application for a patent.

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