
a Weekly journal 0f practical information, art, science, mechanics, CHEMISTRY, and manufactures.
engines while variations occur in the amount of work done by them. It is well known that machiknown that machinery cannot produce its most profitable results without being run at the highest rate of speed consistent with its durability and the production of a perfect fabric, and that no machinery can be run at or near its highest rate when subjected to uncontrolled variations. The ordinary Watt go vernor, though capable of effecting pable of effecting this object with a close approximation to accuracy when the variation in the power is confined within narrow limits, fails in maintaining the speed of the engine when sudden changes occur in the resistance to be overcome. The defect becomes of serious consequence in some cases, such as in the engines driving rolling mills in iron works, where the whole power of the engine has to be exerted suddenly while the iron is passing through the rolls, and the work then ceases, leaving on ly the resistance of the friction of the machinery to be overcome. The object sought for in the peculiar construction of the Allen governor the thorough and sthe thorough and
of steam engines, and especially those with adjustable cutoffs.
This go vernor was invented by R. K. Huntoon, of Boston,



THE ALLEN STEAM ENGINE GOVERNOR.
was awarded grand gold medals, at Moscow, in 1872, at Leeds, England, and at Lyons, France, in 1872, and at Vien na, in 1873.
The construction of the Allen go vernor will be clearly un derstood from Fig. 1, which represents an elevation of the gov ernor when complete, and Figs. 2 and 3, which show sections of the cylinder and frame. With in a corrugated cylinder, A, which has small projecting ribs on its interior periphery and which is partially filled with oil, a paddlewheel, B, is caused to revolve by a spindle (Fig. 1) passing through one end of the cylinder, driven by a belt communicating with the fly wheel shaft.
The tendency of the revolving paddlewheel is to cause the cylinder to move in the same direction. On the opposite side of the revol ving spindle is a trunnion, or short spindle, fixed to the cylinder, attached to which is a wheel C, carrying a set of movable weights suspended by a chain the speed of the engine being regulated by the number of weights. Attached to the wheel and keyed on the end of the short spindle is a pinion, D , revolving with the cylinder and working in a toothed sector, $E$, the arm of which, being fixed on the spindle of the throttle valve, opens or closes it fixed on the spindle of the throttle valve, opens or closes
as the oil cylinder moves with the paddle, according to the as the oil cylinder moves with the paddle, according to the
variation of load thrown on the engine. When used with the variable cut-off engine, the arm is attached direct to the cut-off, as shown in Fig. 1. For other engines, a throttling valve is combined with the governor
From the above description of the Allen governor, it will be seen that the weights are raised and lowered in a nearly vertical line, and, unlike those of other governors, remain
its work, makes an entire circuit, pass ing through $360^{\circ}$.
The peculiar action of this governor allows the use of a valve of large area, thereby admitting to the engine cylinder large boiler pres a large boiler pres. of the piston, of the piston, and this produces, we are informed, excelent results when applied to old engines. in increasing their power or effecting a direct saving in fuel, or both. In running an engine with this governor, with high or low pressure of steam and with all variations of power, the throttle is opened wide in the morning and remains so until closed at night, thus relieving the engiiering the engitime for giving him ther other duties. The governor valve, when the apparatus is not attached to a variable cut-off engine, is constructed with a double disk in a tubular form, and is perfectly balanced, there being no spindle as in the ordinary throttle valve, to ry throttle valve, to equilibrium. The quilibrium. The valve is moved by means of a lever, and is opened and closed by a rocking motion of a steel spindl e, which is covared with brass, insuring durability.
This arrangement we shall prabably illus tratein a future numvariation from the required speed, we are informed the governor can instantly exert, upon the valve or cut-off, all necessary force, up to a thousand pounds, if required.


A large number of highly commendatory reports upon its working are submitted. Further information may be ob tained by addressing the patentee, Mr. Stillman B. Allen, 5 Tremont street, Boston, Mass.

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## AMERICAN PROGRESS---II.---FROM 1820 TO 1840 .

In no era of our country's existence does it appear that greater progress was made than during the twenty years previous to 1840. Early in 1840,Dr. Richard Hare introduced
the deflagrator, a form of voltaic battery capable of giving effects of great intensity, and also another form of voltaic apparatus called the calorimotor, designed to generate, with a low intensity of electricity, an enormous volume of heat.
By means of it large rods of platinum can be ignited and fused in a few seconds, and its magnetic effects are equally surprising ; yet it is hardly capable of producing the faintest spark between the carbon electrodes. During the same year
Henry Burden invented his first cultivator, which was the beginning of a series of splendid inventions. In 1825 he re ceived a patent for a machine for making the wrought spike and in 1835 for a horseshoe machine. Then followed an apparatus for making the hook-headed spikes used on railways, a self-acting machine for reducing iron into blooms rolling for horseshoe making, which is a marvel of mechanical skill. It is self-acting, and produces, from iron bars, horseshoes at the rate of one a second. From these several inventions, Mr Burden amassed an immense fortune. Also in about 1820, Burden amassed an immense fortune. Also in about 1820,
Jordan L . Mott invented the stove for burning small coal Jordan L. Mott invented the stove for burning small coal.
Previously only large lumps had been devoted to domestic purposes, and the small fragments were wasted. During his lifetime he took out more than forty patents connected with coal-burning apparatus, and also instituted the change from blast furnaces to the cupola in making stoves and other light castings. His son carries on the business of his father a the present time in this city on a most extensive scale.
In 1822 James McDonald, of New York, patented an im portant machine for breaking and cleaning unrolled flax and hemp. During the following year, Nicholas Longworth, of Cincinnati, made his first essay in making wine from Catawba the famous Catawba wines. At the same time another great inventor became known in the person of Joseph Saxton. In 1823, he invented the machine for giving the epicycloida form to the teeth of notched wheels; in 1825 he made an as tronomical clock, for adjusting the compensation rod in the
pendulum of which he invented the reflecting pyrometer and comparator. In 1829, he went to London and there invented the magneto-electric machine. Subsequently he devised a
self-registering tide gage, a deep sea thermometer, a dividing engine, and an hydraulic printing press with flexibl platen.

In 1824, the Franklin Institute in Philadelphia was founded and in the fall of the year its first annual fair was held During the same year, Zadoc Pratt established his great tan nery in Prattsville, on Schoharie Creek, N. Y., for the manu facture of hemlock-tanned leather. He probably tanned more sole leather than any man in the world, and, it is said
omployed a capital of over $\$ 250,000$, and continued the business till his death, without a single litigated lawsuit, or the loss of one dollar in bad debts, or having a single hide stolen. He was elected to Congress in 1836, and there proposed the introduction, through United States' consuls and national vessels, of foreign seeds and plants for distribution by the Patent Office, the publication and engraving of all important patented inventions for circulation throughou the country, and the establishment of a bureau of statistics The year 1825 is memorable for the completion of the Erie canal, one of the greatest engineering works in the country It connects the Hudson river with Lake Erie, is 363 miles long, and cost only about $\$ 8,000,000$ to construct. Also in 1825 the first house furnace using flues was employed in
Philadelphia, by Professor W. R. Johnson; and in London Jacob Perkins exhibited steam artillery, which did good ex perimental execution against iron targets, before the Duk of Wellington.
The first signs of the electric telegraph now become ap parent; for in 1826, Harrison Dyer erected a line on Long Island and used frictional electricity to give sparks where with to mark chemically prepared paper. Dr. Nott, of Union College, in the same year, patented his celebrated
stoves, which gave him a worldwide reputation. In 1827, John McClintic, of Pennsylvania, devised the first practica mortising and tenoning machine; and in the same year Mr. W C. Redfield published his "Laws of Storms," wherein by long-continued observation, he showed that storms are vast whirlwinds, having both a rotary motion and a motion of translation on a curved path. Mr. Redfield's discoveries are of immense value, since they afford a knowledge of cyclones which enables navigators to avoid them. The first locomotive trip in America was made on the Carbondale and Hones dale road in Pennsylvania, in 1828. During the same year the first American patent for a locomotive was obtained an thas and hay paper was made. It was in 1828 that now : Bogardus invented the ring flyer for cotton spinning produced invention after invention with wonderful cele rity. In 1829 he invented mills with eccentric grinding plates, which have never been fully superseded, in 183 the dry gas meter, and a machine for transferring bank note plates. In 1836 he devised a marvelously ingenious engraving machine, and in 1840 machines for pressing glass tumblers. He also made important improvements in drill iron building, we believe, ever constructed
We now reach the period when the discoveries of Professor Joseph Henry, foremost of living American scientists, were made known. Previous to his investigations, the means of stood. He was the first to prove by actual experiment that, in order to develop magnetic power at a distance, a galvanic
battery of intensity must be employed to project the current through the long conductor, and that a magnet surrounded by many turns of one long wire must be used to receive this current. He was also the first to actually magnetize a piece of iron at a distance, and he invented the first machine moved by the agency of electromagnetism. In 1829 he exhibited to the Albany Institute electromagnets of power superior to any before known ; in 1831 he transmitted signals by an electromagnet through a wire more than a mile in length, and caused a bell to ring. In 1833, while Professor of Natural Philosophy at Princeton College, he explained the electromagnetic telegraph, but he never reduced the principles described to actual practice. Professor Henry also as early as 1830 demonstrated that the discharge of a Leyden jar consists of a series of oscillations backward and forward a fact afterward by him proved true of lightning. He also made the remarkable discovery that a voltaic current induces an extra current in the conductor in which it is itself con eyed, which, however, manifests itself only on making or breaking connection with the battery. The system of con ductors adapted to the demonstration are flat spirals of copper ribbon,known as Henry's coils; and by these, induced cur rents of the ninth order have been demonstrated, and the possible number is theoretically unlimited
The years 1830 to 1833 were prolific in electrical discovery ollowing so close upon Henry's investigations as almost to be mingled with them came those of Dr. Charles G. Page. He invented ingenious electromagnetic locomotives, two of which pulled a car, weighing eleven tuns and carrying four teen passengers, at the rate of nineteen miles an hour; he ob served that the molecular changes in a bar of iron produced by magnetization are attended by audible sounds; he invented a pole changer whereby a magneto-electric machine may be made a substitute for a galvanic battery in electrolytic and galvanoplastic operations. He also devised the earliest form of induction coil, and made a large number of impor tant discoveries in connection therewith, resulting in the in vention of a spark-arresting circuit breaker.
It was in the autumn of 1832 that Samuel F. B. B. Morse then an artist in painting by profession, embarked at Havre to return to this country. On that voyage, while in casual conversation with a passenger on the recent discovery of the elation of electricity and magnetism, he conceived the ide of the electromagnetic and chemical recording telegraph substantially as it now exists. Before the close of the year a part of the apparatus was constructed in New York; bu the telegraph was not experimentally exhibited in operatio until 1835. In 1837 he filed a caveat and sought,fruitlessly, Congressional pecuniary aid. From this time, the inventor ife was a continued struggle against scanty means and ad verse circumstances, until the session of Congress of 1842-3, when he obtained an appropriation, and in 1844 the experi mental line between New York and Washington was com pleted, and the practicability of the electromagnetic tele raph demonstrated. To Professor Morse is also due the origination of submarine telegraphy, and the first submerged lines were laid by him in New York harbor in 1842. He also made the first daguerreotype apparatus and took the first sun pictures produced in America
In 1832 Edward Evans patented the method of unhairing hides by sweating, without the use of lime. During the same ear, Dr. Samuel Guthrie, of Sackett's Harbor, N. Y., disco red chloroform, although he did not understand its true constitution, and called it chloric ether. At this period also was produced the first lock stitch sewing machine, by Walter Hunt. Hunt made and sold his machines, but wa an erratic genius, too versatile to be successful, and through his sheer negligence lost the opportunity of acquiring the ame and fortune which Elias Howe and other patentee subsequently realized. In 1832 M. W. Baldwin, of Philadel phia, was engaged in perfecting many of his numerous in ventions in locomotive mechanism. He devised the plan of ttaching cylinders to the outside of the smoke box, metallic round joints, and other valuable improvements. His most mportant invention was the flexible truck locomotive, pat ented in 1842. Seth Boyden, of Newark, N. J., had alread iscovered the japan or varnish by which patent leather is produced, and had laid the foundation of the manufacture f that material, which has been successfully carried on a he latter place ever since. He also pursued experiment with a view to converting the hardest laminated iron int soft malleable iron; and these succeeding, he began making malleable iron castings, between 1831 and 1835 . He subse quently invented several important improvements in steam engines, notably the cut-off instead of the throttle valve, and the connection between cut-off and governor. The first prac ical automatic pin machine appeared in 1832 ,and was the in ention of Dr. John I. Howe, of Connecticut. It formed the ead of the pin by dies from a coil of fine wire. In 1833 Hussey, of Maryland, made the first practical harvester. It ad open fingers, with a knife reciprocating in the space. He was followed in 1834 by Cyrus H. McCormick, who invented he reaper, in which a sickel-edged sectional knife was re procated by mechanism from the drive wheel, and finger gathered the grain. This was an invention of great impor tance; and it met with worldwide usage and secured grea rewards to the inventor, who still carries on the business of manufacture on an enormous scale in Chicago.
In 1834 Professor Denison Olmsted, of New Haven, Conn by observations of the great meteor shower of the preceding ear, reached the theory that meteors are portions of a nebu ous body drawn into the earth's atmosphere and inflamed by the heat generated by the resistance of the atmosphere $t^{\prime}$ heir motion. During the next year, Dr. J. W. Draper be gan his magnificent investigations of the actinic rays of the ectrom, which included experiments on the absorption of the chemical rays by solid and liquid media, the decomposi-
tion of carbonic acid by light, the interference of chemical rays, the crystalization of substances by rays of light, the supposed magnetizing properties of light (which he found not to exist), and the effects of light upon vegetation. Dr. Draper was the first to photograph Fraunhofer's lines, the first to take a portrait by daguerreotypy, the first to suggest the relation between the spectra of incandescent lodies and their physical or chemical composition, the first to devise charts of the spectral lines of bodies, the first to explain the mechanical cause of flow of sap in plants, and that the yellow ray and not the violet produces the reduction of carlonic acid therein, and the first to photograph the moon. No one American investigator has made more original researches, or to the general progress of Science, than Dr. Draper.
In 1836, another great invention appeared in the shape of revolving fire arms, which were patented by Colonel Samuel Colt, of Hartford, Conn. These were first used in the Florida war of 1837 ; lut it was not until the outbreak of the Mexican war of 1847 that Colt erected the works in Hartford which have since assumed such immense proportions. Colt also invented a submarine battery of great power. In the next year ( 18337 ), A. A. Wells patented the process now in general use for forming the bodies of fur hats by depositing the material directly on a perforated cone revolving in connection with an exhausting fan. At aloout this time John Ericsson successfully applied the screw propeller to purposes of navigation in England, and immediately thereafter emigrated to this country, to which belongs his sulsequent record, of which mention will be made further on. In 1839 the United States tartic regions. No other explorations of that part of the globe have since been made, and the somewhat doubtful report of an antartic continent, brought back by the United States' vessels,has not been fully verified. During the same year Charles lioodyear made the important invention of vulcanizing india rubber. He had already discovered a method of treating the surface of native india rubber by nitric acid, which allowed a surface of rubber to be exposed on goods, hitherto impracticable owing to the adhesiveness of the material. In the course of experiments in 1839, he found that a piece of rubber, mixed with ingredients among which was sulphur, upon being accidentally brought in contact with a red hot stove, was not melted; but that in certain portions it was charred, and in other portions remained elastic, though deprived of all adhesiveness. More than sixty patents were afterwards taken out by him for improvements in treating also Frastus B on articles manufactured from in ing ingrain carpet. This machine could easily weave from twenty-five to twenty-seven yards per day, whereas the previous hand loom production never exceeded eight yards. The invention was followed later by a power loom for Brussels and tapestry carpets, one of the most ingenious pieces of mechanism ever devised. Mr. Bigelow also invented a machine for weaving coach lace, and another for weaving counterpanes, both of which are in extensive use.
Here we may close the review of a period rema
Here we may close the review of a period remarkable for the number of great inventions made during its continuance. The original types then produced have since formed the foundation of thousands of modifications and improvements, and the end of making such changes seems far from being attained. Progress therefore since 1840, though rapid, is due to development of previous ideas, more perhaps than to origination of new ones.
Our next isssue will contain a continued history of the more remarkable

## reclatming the steppes.

It is a well known fact that there exists in the southeastern portion of the Russian empire an immense basin, depressed below the level of the ocean. In this basin lies the Caspian Sea, and into it also flow the great rivers Ural and Volga, which drain a large portion of central Russia. In the course of ages, the rivers have carried down soil and formed vast deposits which have encroached upon the sea, contracting its dimensions and elevating its bottom in parts, so that for large vessels it is no longer wholly navigable. As the sea diminished in size, so did the supply of watery
vapor in the adjacent atmosphere become less; and moisture vapor in the adjacent atmosphere become less; and moisture
failing, the land near by has gradually changed into a desert, which is steadily growing. It is thousands of years, probably, since the arid wastes or steppes began to form ; but their spread has continued until now an immense region is unfit for human halitation.
To reclaim this desert and restore it to its former state of fertility is the object of a gigantic engineering project, recently suggested by Mr. Spalding, an American engineer resident in Europe. The plan involves the connection of the Caspian with the Black Sea by means of a canal, which is described in detail on another page of this issue. It appears that the surface of the Caspian is forty-eight feet lower than that of the Black Sea. Mr. Spalding proposes to excavate from the Caspian a cutting, 480 feet wide, westward to such a distance that at its western end it would reach a depth of 32 feet. The surface of the earth at that point would be 16 feet below the level of the Black Sea. The remainder of the distance is to be traversed by a narrower channel, 160
feet wide and 9.6 feet deep at the Black Sea end, and 16 feet feet wide and $9 \cdot 6$ feet deep at the Black Sea end, and 16 feet
deep at its junction with the broader cutting. This gives a fall of 6.4 feet between the two extremities of the narrower channel, and the total length of both cuttings is about 166 miles. It is calculated that the water from the Black Sea would flow, along the slope above mentioned, at the rate of ome 7.2 miles per hour, and that, if the channels remaineds
years to bring the Caspian to a level with the Black Sea. As, however, the action of the rapid stream would infallibly ding estimates that in forty years the levels of the two seas
dind ding estimates that in forty years the levels of the two seas
would be so nearly the same that the channel would be navwould be so nearly the same that the channel would be nav-
igable. This new Mediterranean could be traversed by large ships from the borders of Persia to about the fiftieth paralle of north latitude, along the estuaries of the Ural and Volga, and to a much greater distance by ships of small burden.
The importance of the work, judging from the results ex pected, is not exceeded by that of the Suez Canal. The world is none too large for its population; and to reclaim the hundreds of square miles of arid Russian steppes would be to add territory and natural resources of inestimable value, not only to the Russian empire, but to all humanity.

## FRENCH ARTISANS AT THE CENTENNIAL.

It is to be regretted that a meeting, recently held in Pari for the purpose of raising a fund to enable one hundred and twenty French artisans to visit the Centennial, should have been made the scene of wild communistic harangues by such firebrands as Louis Blanc and Victor Hugo. The circumstance tends to put the workmen, who may be sent here with the funds obtained through such arguments, in the light of representatives of a cause which is the embodiment of dema goguery, and with which American workmen, proud as they are of our repullican institutions, have no sympathy. We during the strike of 1872 ; and to the credit of our working men be it said that, even when partisan feeling ran highest they turned away in contempt from the blatant incitors who prated of "blood and bayonets" and denounced the author ity of law.

If the French artisans come here simply as workmen seeking to learn, they will find their fellow craftsmen ready to welcome and to instruct them. If, on the other hand, they visit us as apostles of the doctrines of Rochefort, Hugo, and Blanc, while no one will challenge their right to their opin ions, any attempts on their part to inculcate them will en-
counter a rebuff so emphasized as to leave no doult as to its counter a reb
signification.

## THE OPENING OF THE CENTENNIAL.

The simple but impressive ceremonies which marked the opening of the Centennial passed off in a way that must have satisfied the most sanguine anticipations. In the hurry of preparation some things are forgotten, and others are apt
not to fall in their proper places at the specified time; but on not to fall in their proper places at the specified time; but on precision. The day in Philadelphia dawned wet and cloudy During the previous twenty-four hours there had been heavy rains, and many remembered with some dismay the depressing effect of the drenching showers which fell during the opening of the Vienna Exposition. Long before the appoint ed hour, however, the clouds broke away and the sun burst forth, and the predictions of the "probabilities" that fair weather was at hand, to the relief of all concerned, were verified. As early as nine o'clock the gates were opened and thousands of people surged into the grounds, flocking to the front of Memorial Hall, where every inch of space com manding a view was in a few moments occupied. By the time the ceremonies legan, over one hundred thousand per sons had assembled, packing an area fully half a mile in length by 250 yards in width. While the people were
thronging in at one portal, the orchestra of two hundred muthronging in at one portal, the orchestra of two hundred mu-
sicians and the nine hundred singers were admitted at other entrances. Later, the invited guests began to arrive and as the dignitaries, both national and foreign, took their places, the expectant throng vented its enthusiasm in prolonged cheering. A tempestuous burst of applause greeted the Brazilian Emperor, who, with the Empress, occupied seats on the platform ; and when the President, accompanied by his military escort and by his cabinet ministers, arrived, the shouts were deafening. Quiet was not restored until the famous Centennial March, written by Richard Wagner. Musical critics speak highly of the composition; but it was generally conceded that it was not adapted for outdoor per
formance, as it contained very many passages wholly in formance, as it contained very many passages wholly in audible except to the few hundred in the immediate vicinity
of the performers. This being over, Bishop Simpson of the performers. This being over, Bishop, Simpson advanced to the front of the platform and delivered a lengthy prayer, the immense throng, though but few could hear magnificer, maintaining perfect stillness and decorum. voices, accompanied by organ and orchestra, sang Whittier's Centennial Hymn, in the last portion of which nearly the whole audience joined, producing a volume of sound of indescribable grandeur. Hon. John Welsh, President of the Board of Finance, then formally presented the buildings to the Centennial Commission. The cantata written for the oc casion, by Sidney Lanier, was next sung. The senseless words of this production were happily compensated for by
the superb musical setting given them by Mr. Dudley Buck. These preliminaries concluded, the first important speech was made, by General Hawley, President of the Centennial Commission. After reviewing the inception of the project
of an international exposition, and briefly referring to the of an international exposition, and briefly referring to the
labors of those charged with its preparation, he concluded as follows:

It has been the fervent hope of the Commission that, during this festival year, the people from all States and sections, of all creeds and churches, all parties and classes, birthplace of our liberties, to study the evidence of our re sources; to measure the progress of a hundred years; and to examinato nur profit the wonderful pmincte nf other land to
but especially to jain hands in a perfect fraternity, and to promise the God of our fathers that the new country will surpass the old in the true glories of civilization. And furthermore, that, from the association here of welcome visitors from all nations, there may result not alone great benefits to invention, manufactures, agriculture, trade, and commerce, but also stronger international friendships and more lasting peace.
'Thus reporting to you, Mr. President, under the laws of the government and the usage of similar occasions, in the name of the United States Centennial Commission, I present o your view the International Exhibition of 1876.
On the closing of this speech, President Grant began the reading of his address. It very briefly referred to the objects of the Exposition, and to the vast progress of the nation during the past century. At the words " I declare the International Exposition now open," the signal was given, and the tional Exposition now open," the signal was given, and the
national flag was run up on the great tower of the main national flag was run up on the great tower of the main
building. The bells and steam whistles all over the city building. The bells and steam whistles all over the city
burst into a chorus of noises, with which were mingled the burst into a chorus of noises, with which were mingled the
thunder of the saluting latteries. The orchestra, organ, and thunder of the saluting batteries. The orchestra, organ, and
singers pealed forth the Hallelujah Chorus, and the prosingers pealed forth the Hallelujah Chorus, and the pro-
cession of invited guests, headed by the President and Emperor, was then formed, and the march through the Main Building legan
During the morning, the two great engines had been start at intervals, and every bearing had been freshly oiled so that no possible obstacle could exist to prevent their formal beginning of work at the proper time. Mr. Corliss stood by his gigantic offspring, waiting the arrival of the President. As the head of the procession reached the en pines, General Grant and Emperor Dom Pedro stepped for gines, General arant and Emperor Dom Pedro stepped for-
ward ; and instructed ly Mr. Corliss, each grasped the bright lever of a throttle valve. There was a moment's delay for lever of a throttle valse. There was a moment's delay for
the dignitaries to gather, and then, at 1.20 o'clock, Mr. Corthe dignitaries to gather, and then, at 1.20 o'clock, Mr. Cor-
liss waved his hand, the signal for admitting the steam to liss waved his hand, the signal for admitting the steam to
the cylinders of the gigantic machines. It was a scene to be the cylinders of the gigantic machines. It was a scene to be
remembered ; and perhaps for the first time in the history of mankind, two of the greatest rulers in the world obeyed the order of an inventor citizen.
The Emperor, with his characteristic energy, was the quickest to move his lever, but the President was but a sec ond behind ; and as the motion was completed, the steam hissed into the great cylinders, the mighty arms of metal slowly began their movement, pulleys answered to the strain of belts, and the mechanism of the vast building started into life and activity. The Empress of Brazil meanwhile visited the Women's Pavilion, and there pulled a golden cord which set in motion the engine that drives the looms Thus ended the ceremonial part of the opening, and the Thus ended the ceremonial part of the opening, and the
people scattered themselves over the grounds and through the buildings, while throngs visited the restaurants, and literally devoured every ounce of food which had been superally devoured every ounce of food which had been sup-
plied; and by four o'clock, when President Grant and the plied; and by four o'clock, when President Grant and the
Emperor returned to the grounds and sought to dine at the principal restaurant, they found several thousand hungry American sovereigns had been there before them, and they were obliged to go elsewhere for their dinner.
The interiors of some of the buildings, by dint of day and night work of a multitude of workmen during the pas wreek, have been partially reduced to order; but here and there, and almost every where, a wilderness of packing boxes and rublish is to be met with, and it will be some time yet before every department will be in perfect order.
It is impossible, at the present writing, to form any ade quate idea as to the variety and novelty of the exhibits. The oljects are there, but they are yet to be arranged and classified; and until this is done, a description of them, and a comparison with what we are used to seeing, must be deferred.

## Government Provision Tor Mechanics at the

vision for M
Centennial.
We learn that a bill has been introduced in the House of Representatives, directing the President to appoint six skilled mechanics from each Congressional district, " whose duty it will be to attend the Centennial International Exposition a Philadelphia, carefully study the arts, industries, and pro lucts there exhibited, and make full report in writing of al hat, in their judgment, is important and useful to the prac tical and scientific industries of this country." It is further provided that they shall be paid for their work "such sum as the Secretary of the Treasury shall deem a fair compensation." There are 292 Congressional districts, so that the corps of skilled mechanics will number over 1,750 persons. If they all attend the exhibition every day, a very comfortable addition will be made to its daily receipts at the expense of the government.
The constitutional authority to incur this expenditure will probably be found, says the Evening Post, just where the athority to establish a department of agriculture and an education bureau was found. Most persons will agree,how ever, that, if the enlightened people of this country do not take the trouble to learn for themselves what there is im-
portant and useful in the exhibition, they do not deserve to portant and useful in the exhibition, they do
have a paternal government do it for.them.

## Publishing the English Patents.

The London Patent Office is about to adopt our Patent Office system of producing copies of drawings of patents by the photo-lithographic process, in place of the large litho graphic sheets which now accompany the printed specifica tions of all English patents. Considerable opposition to this change was made by the London patent agents; but we believe it only arose from abhorrence of change, which is
the national characteristic of the Englishman. But the British public will soon find our mode of producing copies far better than their old plan of lithography.

THE CENTENNIAL INTERNATIONAL EXHIBITION.
We resume our description of the buildings erected for the Centennial Exposition, the most important of which were illustrated in our last issue. The above engraving represents the pavilion erected by the State of New York, a building in the villa style, with a verandah all around it. It is the headquarters of the New York commissioners, and will, no doubt, like the other State buildings, be a meeting place for exhibitors and visitors, from the Empire State.
A very attractive feature of the Exposition will be the various restaurants, which will represent the culinary art of of floor of a cross, 360 by 300 feet, and the 81,600 square feet
n these columns; and there is a Turkish café, where the tiny cup of Arabian coffee, with a long pipe of the Persian pattern
or the Turkish nargilyeh, through the perfumed water of or the Turkish nargilyen, through the perfumed water of
whe sme is drawn, may be enjoyed for the first time, probably, by most of the visitors.
Our next engraving represents the United States Government Building. It contains collections of objects sent by the various government departments, those from the army the form of a cesialy interesting. 360 by 300 structure is of floor space are appropriated as follows: To the war de-
manufactured articles. The display of artillery and projec iles, maps, charts, etc., as well as of documents and papers, $\mathrm{i}^{\text {s }}$ likely to attract much attention; and machinery in motion will be employed to illustrate the manufacture of small arms, cartridges, army clothing, etc.
Photographic science will be shown not only in the build ing described and illustrated in our last issue, but in one erected by a company especially organized for the purpose of taking photographs in the buildings, and for selling them in the Exposition, to which privilege it has the exclu sive right. The building is admirably constructed and ar


## THE NEW YORK STATE BUILDING.

many nations. The largest of these is specially dedicated partment, 11,200 ; navy department, 10,400 ; interior departto American cookery. It is situated near the Agricultural Hall, and encloses three sides of a quadrangle, giving the visitors an opportunity of dining in the fresh air or on the
shady piazzas with which the building is surrounded. A large hall and several private dining rooms are also at the lisposal of guests. Mrivate dining rooms are also at the disposal of guests. Messrs. Delmonico are, we believe, to have a building, and the owners of Les Irois Freres Provenfeaux,
of the Palais Royal, Paris, which for sixty years has held the highest rank in Europe for the excellence of its cuisine and wines, are to exhibit to the visitors the gastronomic science of the city of good cooks. Mr. Edward Mercer, of Atlanta, Ga., has erected the building shown in our second illustration; it is 185 by 96 feet, and contains four large dining rooms. A band of " genuine plantation minstrels" is to divert the diners during the repast, and the bills of fare are to be thoroughly representative of the manners of the Southern States. There is also the Vienna bakery, already alluded to
ment, 20,600 ; treasury department, 3,000 ; post office de partment, 3,800; Smithsonian Institute, including fish com mission, 26,600 ; agricultural department, 6,000
The main stem of the building and its transept are traversed centrally by walks, which cross in the center under the rotunda or lantern, crossing the intersection. The principal area of the cross consists of three aisles, which have ide lights beneath the eaves, the central aisle rising above he side aisle and having ventilators at the comb. The tran sept has a single aisle. Each of the departments has drawn upon its own stores for articles to exhibit, the objects having in many cases great historical interest, appertaining to the aboriginal inhabitants of the country, the settlement,
 parcess, surveys, inventions, scientific expeditions and re and other minerals, animal and vegetable productions, and
ranged ; and the company numbers among its members pho tographers from all parts of the country and Canada. Mr Edward L. Wilson, editor of the Philadelphia Photograph $e r$, is the treasurer, and Mr. John A. Fraser, of Toronto, is the art superintendent of the company.
The next and last building in our present series is one rected by private enterprise; it is called the World's Tickt and Inquiry Office, and is built by Messrs. Cook, Son, \& Jenkins, the renowned agents for pleasure tours in all counries. It is a well built, elegant pavilion, with offices for the sale of tickets, hotel coupons, etc., and the affording of inormation and facilities for traveling to and from all parts of the world; but in addition to the utilitarian purposes of this firm, they provide one of the most attractive features of the Exposition in the display of their celebrated Palestine camp, illustrating their method of caring for travelers in that interesting country; besides which they illustrate a number of other most interesting facts connected with travel

"THE SOUTH" RESTAURANT


THE UNITED STATES GOVERNMENT BUILDING
and life in distant countries. Among these attractions is these, a considerable quantity of combined mercury was pre- fession of their fathers unlessadopted intoa family pursuing the boy Selim, \$o famous in Mr. Stanley's tour of search after the late Dr. Livingstone.
There are many attractive features in the grounds which surround the buildings. North of Machinery Hall is a pretty little lake covering about five acres of ground, with sloping banks covered with grass and shrubbery. The spacious grounds in front of Horticultural Hall are dotted with parterres of flowers and traversed by a sunken garden leadin up to the portals of the Hall. The grassy expanse of flowers and turf is bordered by a fringe of fine trees; and the cool valleys of Lansdowne and Belmont, on either hand furnish denser masses of shade to relieve the brightness of the scene. The esplanade adjoining the main entrance to the grounds has also been prettily ornamented with flow ering shrubs; and in the center is Bartholdi' large bronze fountain, representing Light and Water, " the twin goddesses of cities. West of the Machinery Hall stands the great fountain of the Catholic Total Abstinenc Society, which, next to the Centennial foun tain, is much the most costly work of the kind in America. The center figure repre sents Moses smiting the rock, and the fou subordinate ones are statues of Father Ma thew, Charles Carroll, Archbishop Carroll and Commodore Barry.

## Dr. W. W. Hall.

We learn with painful regret of the sud den death of Dr. William W. Hall, the well known editor of Hall's Journal of Health Dr. Hall was born in Paris, Ky., in 1810 After completing his education he entered the ministry, and while performing missionary labors found a knowledge of medicine so indispensable that he began systematically to study the healing art. Subsequently he devoted himself to that profession, practis ing successfully first in Cincinnatiand New Orleans, and latterly in this city

Dr. Hall possessed an extraordinary faculty for popularizing medical knowledge. He was the first to start a popular journal devoted to the inculcation of the laws of health and correct living, in which the articles were written in so clear and plain a style as to be comprehensible by any one The fact that the Journal of Health, which was issued first
in 1853 , soon attracted a circulation of 25,000 copies, shows in 1853 , soon attracted a circulation of 25,000 copies, shows the favor with which the public regarded his labors. Dr. Hall prided himself on writing his whole paper unaided ; and as he was master of a concise, epigrammatic way of expressing ideas, it was rarely that a copy of the journal could be perused without some useful suggestion being fixed in the mind. Besides his editorial labors, Dr. Hall found time to which have added to his general reputation

It is a remarkable fact that one so well laws should have died through the vi died through the violation of precepts which he persistently urged upon others. It seems that for some years past. Dr. Hall has greatly overtasked himself in his literary labors, rising at 5 in the morning, and working almost continuously until 10 at night. The physical results of mental overwork are fully known, and perhaps few under them better than Dr. Hall himself. Ye he fell dead in the street, and subsequent examination has revealed the cause of his death to be degeneration of the heart, one of the commonest results and, according to recent investiga tions, an almost ne cessary consequence


THE CENTENNIAL PHOTOGRAPHIC COMPANY'S HALL.
some other vocation
The paper mulberry, of which the paper is made, is propagated by cuttings from the roots, which are planted on the borders of rice fields, and mature in five years. In Novem ber the reeds are eut and sold to the papermakers; and the roots are left to send up new shoots. The shoots are cut in pieces two feet long, piled up and allowed to ferment, which loosens the bark so that it can be stripped off, after which they are dried in the open air, or scraped at once. The scraping removes the brown epidermis, which can be used for inferior wrapping paper. About 33 lbs . of the bark is boiled at one time for two hours in a strong lye made from wood ashes. It is then put in bags and left in a running stream until the alkali is washed out completely. It is next beaten, 2 or 3 lbs . at a time, on a wooden block with heavy sticks, for 15 or 20 minutes. This pulp is now mixed with a little rice paste, or a paste from a species of mallow. A thin pulp is obtained by stirring 4 pound of this mass into 40 or 50 gallons of water. The web or mat on which the paper pulp is col lected is made of slender strips of bamboo, only the thirty-sixth part of an inch in di ameter; several hundred of these are bound together with silk threads; the rods all run lengthwise of the sheet and hence the mats can be rolled or folded up in one direction. A branch of the nobility monopolizes the manufacture of these mats. For coarse paper, reed mats are employed. The process of manufacture is essential the same as in making handmade paper elsewhere. A woman sits in front of the tank and stirs it vigorously, then dips a mat and frame into the vat, takes up some of the pulp and shakes it so as to arrange the fibers parallel. A single dip makes a very thin tissue paper; most paper is made by dipping twice, and draining each time. After the second dipping, the mat is stood up edgewise by the side of the tank to drain, and the frame put on a second mat which also receives its first dipping.
prepare a number of valuable works on sanitary topics,


## THE WORLD'S TICKET AND INQUIRY OFFICE.

ozs. of this beef, but is uncertain whether mercury was the eal cause of the affliction
separation of bismuth, cadmitm, and copper in QUalitative analysis
formed the title of a paper by M. W. Iles, Ph. B. The substance of this discovery has already been published in the Scientific American Supplement. The three metals are precipitated by ferricyanide of potassium; the copper and cadmium are redissolved in excess of cyanide of potassium. Cy, and tested for in separate portions of the filtrate, the sulphide. from the first sheet, so that only two mats are necessary. When 500 or 600 sheets, which form a day's work, are comsharp knife with the blade at right angles to the handle While the second sheet is draining for the first time, the mat with the first sheet is laid face down on a pile of finished sheets with a rice straw between them. While the second sheet is draining a second time, the mat is taken off pleted, they are pressed for some time with heavy weights, then taken up one at a time, by means of the rice straw, and placed by old men on smooth boards to dry in the sun. When dry, the sheets are stripped from the board by a like a sickel. The finished paper weighs about one half as much as the bark employed. Professor Munroe exhibited various kinds of fancy and another Japan, and another member exhibited a Chinese book, said to be a translation of Professor Tyndall's work on sound, illustrated. At the close of the regular meeting, Professor A. R. Leeds was elected chairman of the chemical section and a committee and a committee consider the subject consider the subject of having a course of public lectures on Science, next season.
minerals.
Professor A. E Foote, of Philadelphia, exhibited through Mr. Hallock some fine specimens of rare minerals, including petzite, molybdenite embolite, amazon
stone, and titanium.

Professor Henry S. Munroe, E. M., exhibited a number of specimens of Japanese paper, and described minutely the curious material. The Japanese paper, said Professor Munroe, is all made from the inner bark of the mulberry, and is never bleached, although made as clean as possible: hence its faint yellow green or pinkish color. Paper is made in small villages where all the inhabitants are papermakers, just as other small villages consist entirely of blacksmiths, and so of other trades. The sons of papermakers follow the pro-

The meeting was adjourned to June 12, 1876.

## A New Test.

To detect nitrobenzol in oil of bitter almonds; Take a so ution of chloride of tin, and add excess of caustic soda until the precipitate dissolves, then add a few drops of the substance to be tested, and heat. If nitrobenzol is present, it will be reduced to aniline. Next, add a few drops of carbo lic acid and some hypochlorite of soda (Javelle water), when the peculiar purple color is produced.

## Correspondence.

## A Pieno-Hydrometer

To the Editor of the Scientific American:
I send a description of a new scientific instrument of my invention; it may perhaps interest the scientific public. It is for determining the $s^{-}$.ific gravity of fluids as well as of solids. Its construction :s: 'ased on the combined principles of the picnometer or speeiiic gravity glass and the hydrome ter. It is especially adapted to the determination of the gravity of fluids when only small quantities can be obtained when they are of such a nature that they can only be kep in glass vessels, such as strong acids and the like.
A is a spherical glass vessel to which a long neck is at tached, corresponding to the stem of the common hydrome ter. B is a smaller closed bulb that contains shot, mercury, or other heavy object. This may be dispensed with if the bulb, A, is made of heavy glass. Around the stem or neck of the vessel, A, just above that vessel, there is blown another bulb, C,
which serves as a float. The which serves as a float. The upper end of the stem is open. The instrument, instead of floating in the fluid the specific gravity of which is to be determined, is filled with a fluid to a mark, D, on the neck, and put in water. The degrees are water. The degrees are
marked on the glass by etching with hydrofluoric acid, or a paper scale may acid, or a paper scale may
be used, as shown in Fig. be used, as shown in Fig.
2. The paper can be in 2. The paper can be inserted in the space be-
tween the two tubes, and tween the two tubes, and the upper edges sealed to
gether. gether.


If we fill the instrument with water and let it float in wa ter, the proportions of the instrument being such that it sinks to $a$, it will serve for determining the specific gravit of fluids heavier than water. If it sinks to $\mu_{10}$, then $\pi_{1}$ will be 1.000 of the scale, and will serve for fluids lighte than water. In the first case, a being $1 \cdot 000$, if we fill the in sink in farther than $a$, say to $a_{1}$, being $1 \cdot 250$. As the volume of the fluids to be weirhed is always the same, it will be readily understood that a similar addition to the specific gra vity (as from $1 \cdot 000$ to $1 \cdot 250$ and from $1 \cdot 250$ to $1 \cdot 500$ ) will re quire equal additions to the volume of water displaced. In other words, the distances of the marks $1 \cdot 000$ to $1 \cdot 250$ and $1 \cdot 250$ to 1.500 will be equal, provided the stem is cylindrical. This is the only instrument having a specific gravity scale o which the degrees are equidistant. Further, if the instru ment be so made that the volume of the inner vessel b known, such as 10 cubic centimeters, it can be used to weigh off any quantity of a fluid or solid substance (which must be in pieces small enough to enter) from 10 to 20 grains, or as far as the scale goes. The instrument may thus serve as a balance for preparing solutions of standard strengths. It may be also used for determining the specific gravity of sol ids. The method is nearly the same as with the usual spe cific gravity glass or picnometer soluble in water, the specifi gravity of which is $x$. If we put enough of it into the in gravity of which in in we put eng in strument to make it sink in water to $1 \cdot 250$, and fill up with water to the mark, and immerse again in water, it will sink
now to, say, 1.750 . Then calling the absolute weight of the now to, say, $1 \cdot 750$. Then calling the absolute weight of the
water which the instrument will hold $v$, the absolute weight water which the instrument will hold $\tau$, the absolute weight
of the substance will be $n \times 1.250$. The weight of the contents of the instrument, after filling up with water, will be in $\times 1 \cdot 750$, and the weight of the water added will be $n$ ( 1.75 $-1 \cdot 250$ ), and the weight of the water displaced by the sul stance $n-v(1 \cdot 750-1 \cdot 250)=n(1-1 \cdot 750+1 \cdot 250=\sim \times 0 \cdot 5$ By dividing the absolute weight of the substance by the weight of the water it displaces, $\frac{n \times 1 \cdot 250}{m \times 0.5}$
gravity, $2 \cdot 500$.
The results of the determinations with this instrumen are not influenced by variations from the mean temperature as the gravity of the fluid is always compared with water of the same temperature
Your readers will doubtless find many uses to which this little instrument can be put

Hermann Wiegand.
St. Louis, Mo.

## A Thread Telegraph.

To the Editor of the Scientific American
A cheap telegraph, useful for certain purposes, can b made in this way: Take two tin cylinders about the size of a small dice box, say 3 inches long by $1 \frac{1}{4}$ inches diameter

the two cent telegaraph.
cover one $\epsilon$ nd of each with parchment or bladder, forming a drumhead. Pierce the center with a pin and insert a strong thread, and make a knot to prevent its being with-
drawn. With the other end of the thread (which may be of any length, say 100 yards or more) do likewise with the other cylinder, and the telegraph is complete. By keeping the thread tightly drawn, in order that the vibration may be perfect, a person speaking or even whispering in one cylinder can be distinctly heard by another holding the other cylinder to the ear
Would not such home-made pocket telegraphs be very use ful in factories, on farms, in the army, and in many other situations too innumerable to mention? An enterprising person might realize a handsome sum by making them as scientific toys for the Centennial Exhibition. The tubes could be made of cane pole, and I would suggest that they be made to fit one within the other so as to be easily carried Stronger ones can be made with small cord, but would be Stronger one
more bulky.
ieo. Quincy Thorndike.
Mentone, Alpes Maritimes, France.

## SETTING ENGINE GUIDE BARS

Several of our correspondents are troubled with the diffi culty of setting the guide bars upon the bed of a horizontal engine so as to ensure that the piston head has an equal mount of clearance, from the cylinder head, at each end of the stroke, and at the same time so that the guideblocks will ravel to an equal amount over the recesses at each end of the guide bars. Below we give a practical method of obtain ng this result.
Our first operation is to ascertain the length of the bore of the cylinder, measured from inside face to inside face of the cylinder covers, which we may do by subtracting from the whole length of the bore the depth to which the cover enter it at each end; then from the remainder we subtrac the thickness of the piston head, exclusive of the bolt heads if they project ; and the last remainder will be the length of the bore of the cylinder (allowed for the stroke of the piston) plus the clearance between the cylinder covers and the piston head when it is at each end of the stroke. From the remainder so obtained, we subtract the length of the engine stroke that is to say, twice the length of the crank from the cente of the shaft to the center of the crank pin ; and this last re mainder will be the amount of length of the bore of the cyl nder allowed for clearance, which, divided by 2 , will give the amount of clearance at each end of the stroke. If, then we add the amount of this clearance to the depth to which one cylinder cover fits into the cylinder, the sum will be the distance from the face of the piston head to the end face of he cylinder. Then we may carefully clean and oil the cyl inder bore, piston rod, and piston, and then put the latter in its place in the cylinder, taking care that the distance from the face of the piston head to the end face of the cylinde end is that ascertained as above; and then the piston wil be at one end of its stroke, and will allow amounts of clearance, equal at each end of the cylinder.
Our next operation is to find the exact position of the crosshead when it is at that end of the stroke which corre ponds with the position of the piston ; and we proceed as follows: There should be upon all guide bars a recess a each end of the working face, so that the guide blocks will t each end of the stroke, travel over these recesses, and this prevent the formation of shoulders on the guide bars The distance, then, on each bar, between these recesses will less than the length of the stroke; and we therefore sul ract the distance from recess to recess, on a bar, from th length of the engine stroke, and the remainder will be the amount allowed for the guide bars to travel over the re cesses, which, divided by 2 , will give the allowance fo vertravel at each end ; and we mark such allowance upon the guide bar at the end corresponding to the end of the stroke at which the piston stands. We now place the cross pon the the piston rod, and then put the gurde the en ine bed, so that the and ads even with the mark above referred to, and the operation is complete. New York city. Joshua Rose.

## A Great Explosion.

A tremendous explosion of the nitroglycerin compound known as rend-rock powder recently occurred on Bergen Hill, New Jersey, directly opposite New York city. The material was to be employed for blasting in the new tunne of the Delaware, Lackawanna, and Western Railroad Com feet in was stored in a brick magazine some tes amount of and nine blew up at about four hundre pounds. The concussion was terrific, and the effects were felt over a radius of some ten miles. Thousands of sashes and doors in the vicinity were forced in, and even across the river in New York the glass in edifices along the water front was shattered. Houses at a distance of nearly five miles were perceptibly shaken. Fortunately the building in whic the powder was stored was located in a large empty lot and on the brow of the hill; and the force of the explosion
spending itself eastwardly, most of the fragments were spending itself eastwardly, most of the fragments were hurled harmlessly into the marsh below. The great damage which must have ensued had the locality been thickly buil up was thus avoided; and the injuries were confined to the wholesale destruction of doors, windows, and ceilings in the neighborhood.
The cause of the disaster is unknown. The acciden points to the necessity, however, of the enforcement of stringent laws, preventing the storing of any of the new and powerful explosives, in large quantities, in the vicinity of any populated district, and also regulating its transport

Influence or Light on the Color of Flowers.
Dr. Askenasy, in the Botanische Zeitung, records the re绪s of some experiments instituted by him to ascertain the main, his results agree with there but if he different plants he employed to test the derree of intlu ence exercised by light can be regarded as of equal value, hen the degree of influence is very divess in different Scarlet and white,scarlet and yellow, and wholly yellow flowered sorts of tulipa Gesnerianu, grown in absolute darkness, exhibited no appreciable difference in the shape or color,or intensity of color, of the flowers from those of the same varie ties grown in the full light. Blue and yellow flowered varieties of crocus vernus developed their proper colors, but the flowers were very much drawn up, as gardeners express it. The effects of light on a dark violet blue variety of hyacinthus orientalis were of a double nature, with the same temperature. Those grown in the light were at least a fortnight in advance of those grown in the dark, and much more highly colored, though those grown in the dark were not absolutely colorless. To prove this, Dr. Askenasy cut off the upper portion of the spikes of several of the plants growing in the dark, and placed these portions in water, fully exposed to light, on the south side of a greenhouse. In three days the expanding flowers were of as deep a hue as the normal ones, proving also that the change of color so effected was entirely independent of previousformation of chlorophyl. The flowers of pulmonaria officinalis formed less color ac cording to the stage of their development when darkened, and those in a very young state were quite white. The Howers of several other plants were affected in the same manner; hence it appears that those cases in which the colors are not influenced by light must be regarded as ex-ceptional.-Academy.

## Union of the Caspian and Black Scas.

The present century has witnessed several remarkable chievements in marine engineering, such a sthe drainage of extensive arms of the sea in Holland, the construction of the Suez Canal, and the deepening of the estuary of the Mississppi; and these not being enough, still more gigantic schemes have been projected. It has been proposed to admit the Mediterranean into two extensive tracts of the Sahara, which would give water communication to a large portion of Algeria, and make a seaport of Timbuctoo. Neither plan is likely to be put speedily into execution; but in the meantime, Mr. H. T. Spalding, of Blomfield, N. J., comes to the front with a proposal to turn the waters, of the Black Sea into the Caspian, thus enlarging the latter to its pristine size, and turning the barren and almost impassable deserts, left by the subsidence of its waters, into a highway of commerce for Central Asia. This ancient sea basin is considerably deressed below the general ocean level, and has been silted up in the course of ages by the Ural, Volga, and other lesser treams which flow into it. The consequence of this con raction and shallowing of the Caspian has been, not only hat the land left dry is incurably barren, but that the surrounding country has become unfruitful from want of rain, consequent on the diminished evaporation. Mr. Spalding proposes, as we have said, to restore to the Caspian its ancient body of waters, its ancient depth and area, which was nearly double its present extent, by connecting it with the Black Sea by a channel 150 miles in length, about 170 yards wide at its eastern extremity but two thirds narrower on the western half. The projector calculates that at the end of forty years from the beginning of the work, the level of the wo seas would be so nearly uniform that the navigation of he new channel could begin. Mr. Spalding further proposes to join the Don to the Volga, and thus lay the Sea of Azof also under contribution. The mere excavation of the proposed canal does not seem very difficult ; and as the Russian government appears to have directed its attention to the scheme, doubtless the opinion of competent scientific men as to its feasibility will be obtained. If it should prove successful it would be a magnificent work, and followed by political and economic results more than commensurate with the skill and outlay that would be required for its comple-tion.-Iron.

## New Discovery in Agriculture

The curious discovery is announced by Professor P. B. Wilson, of Washington University, Baltimore, that minutely pulverized silica is taken up in a free state by plants from the soil, and that such silica is assimilated without chemical or other change. The experiment, of which we give a more full account in our Supplement of this week, consisted in fertilizing a field of wheat with the infusorial earth found ear Richmond, Va. This earth, it is well known, consists of the shells of microscopic marine insects, known as diatoms, which under strong magnifying powers reveal many beautiful forms that have been resolved, classified, and named. After the wheat was grown Professor Wilson treated the straw with nitric acid, subjected the remains to microscopic test, and found therein the same kinds of shells or diatoms that are present in the Richmond earth, except that the larger sized shells were absent: showing that only silica particles below a certain degree of fineness can ascend the sap pores of the plant. This discovery opens up a new ine of research in agricultural investigation from which important results and much additional knowledge may accrue

The american Centennial Juries.-The list of jurors the Centennial was announced just as this issue was going to press, and the names will appear in our next.
Engineering projects ģie under advisement for che reguarization of the river Neva at St. Petersburgh, Russia.

## nITROGLYCERIN.

c ture delivered at the atevens ingtitute of technolog y, by g. m.

Thirty years ago the German chemist Schönbein discovered that iron behaved in a peculiar manner when immersed in a mixture of concentrated nitric and sulphuric acids. Instead of dissolving, it remained perfectly passive and unchanged. This led him to test his solution by putting some cotton in t. To his great surprise, the cotton did not dissolve either. He took it out again, squeezed it out, washed out all the acid, and put it in the drying apparatus in order to have it ready for analysis the next day. When he came back, his cotton was not there, and none of his students of whom he inquired had seen anything of it. He was convinced that somebody had been very careless, and repeated the experiment. This time, however, the Professor himself witnessed the disappearance of his cotton when the heat became sufficiently strong; and this showed him that a change had taken place in its structure. The new compound received the name of gun cotton, and the inventor took out a patent for it in 1846. Sir John Herschel spoke in the strongest terms of its great explosive power. At a meeting of the British Asmankind with the very wildest powers, by which they could tear up rocks, and almost call down lightning." Everybody began to make it, exhibit it at the dinner table, and discuss began to make it, exhibit it at the dinner table, and discuss
the question whether it was a true chemical compound or the question whether it was a true chemical compound or
only a mechanical mixture formed by the retention of some only a mechanical mixture formed by the retention of some
of the acid in the pores of the cotton. The dispute was setof the acid in the pores of the cotton. The dispute was set Ched by Sobrero, a pupil of Pélouze and now in the University of Turin. Walter Crum having shown that gun cotton, or pyroxylin, is a compound in which some of the hydrogen of the cotton is replaced by hyponitric acid, Sobrero made similar compounds with gum, sugar, dextrin, manna, and finally with glycerin, where it was evident that there could be no simple absorption. This was in 1848. Nothing further was heard of his invention of nitroglycerin until the Crimean war, when it was rumored thaAdmiral Napier was prevented from taking Cronstadt because he was afraid of torpedoes charged with the new terrible explosive by Professor Jacobs.
In 1864 the Swedish engineer Alfred Nobelobtained a patent for the application of nitroglycerin to blasting purposes. He found considerable difficulty in making it explode with certainty, and was obliged either to put gunpowder in the center of the nitroglycerin cartridge or nitroglycerin in the center of the gunpowder cartridge.
The lecturer next exhibited the properties of nitroglycerin. A slip of paper saturated with it was lighted, and burned with a light bluish flame; while another slip saturated with nitrobenzol, a similar compound, burned with a denser flame and gave off much dark smoke, showing the greater proportion of carbon in its composition. This nitrobenzol, from which artificial bitter almond flavoring is also made, is sometimes mixed with nitroglycerin in order to neutralize its explosive qualities and render it safe for transportation. It can then by supplying it withoxygen some pown fulminate or of potash.
A little nitroglycerin spread upon an anvil exploded with a loud report when struck with a hammer; nitroglycerin mixed with one third of nitrobenzol did not explode until chlorate of potash was added, and not then at the first trial.
The glycerin from which nitroglycerin made is so common
compound that it requires no description. It was first oba compound that it requires no description. It was first obplaster, obtained by boiling olive oil and litharge. It is perfectly soluble in water, and greedily absorbs moisture from the atmosphere; a tumbler nearly filled with glycerin will draw about $\frac{3}{8}$ of an inch of water from the air in a night. Nitroglycerin, on the contrary, is insoluble in water. When tasted or even touched with the hands, it produces a persistent throbbing headache; but the have any effect. Nitroglycerin is obtained by adding graduhave any effect. Nitroglycerin is obtained by adding gradu-
ally $\frac{1}{2} \mathrm{lb}$. of glycerin to a mixture of 1 lb . of nitric acid and ally $\frac{1}{2} \mathrm{lb}$. of glycerin to a mixture of 1 lb . of nitric acid and
2 lbs . of sulphuric acid. Various conditions enter into its lbs. of sulphuric acid. Various conditions enter into its manufacture, which cause the product to be more or less
easily exploded. The result is glycerin in which one, two, or three equivalents of hydrogen are replaced by hyponitric acid.
The attention of the lecturer was first attracted to nitroglycerin in 1865, by several terrible explosions which it had caused. One occurred in New York city in Greenwich street, opposite the Wyoming Hotel. One of the guests of the hotel, on polishing his boots, had noticed a reddish vapor
issuing from the box on which he rested his foot. The hotel clerk took the box outside and threw it into the gutter. An explosion instantly followed, by which every pane of were thrown a hundred yards was shattered, pedestrians out that the box contained nitroglycerin, left by a guest as ecurity for his board.
The next explosion was that of the steamer European, at Aspinwall, on the Isthmus of Panama. Forty-seven persons were killed, the vessel, the pier, and the warehouses near by were destroyed, and the damage was over a million dollars. Directly after this an explosion occurred in the express office of Wells, Fargo,\& Co., corner of California and Montgomery
streets, San Francisco. Eight persons lost their lives, and streets, San Francisco. Eight persons lost their lives, and property to the amount of a quarter of a million dollars was destroyed.
Now here was a substance manufactured at Hamburgh, Germany; carted to the wharf; loaded on board of the
part of it forwarded across the Isthmus by railway; thence $\mid$ parts of infusorial earth and $52 \frac{1}{2}$ parts of nitroglycerin can ightered to and loaded upon the steamer ; bearing a twelve not be coaxed to explode, and might be recommended as day's voyage to San Francisco, where it was taken to the ex- good filling for fireproof safes.
press office; handled with the usual recklessness of expressmen, and yet it did not explode. These considerations led the lecturer to investigate the subject,after having maturely reflected on the question whether a man " who had a home ought to embark in so dangerous an enterprise," and having at one time concluded "that he had better keep a peanut stand " than have anything to do with nit
The following July (1867) the
The following July (1867) the lecturer was sent for by the engineers of the Hoosac tunnel, who were desirous of finding some one who would take charge of the manufacture and use of nitroglycerin, and be responsible for it. He accepted the position on the condition of having absolute authority to plosive, and of managing the operation without interferenc from anybody.
A preliminary experiment with a charge of six ounces of nitroglycerin proved so powerful that those who heard the report thought his whole works had blown up. He then gave a very amusing account of his first entrance into the tunnel, carrying a pail filled with cartridges in one hand, his apparatus in the other, and the fuses on his person. All the miners were cleared out, and he proceeded to charge the holes, while the silence of the place was interrupted only by the plash of water trickling through the roof. When al nously hanging out of the holes, resembling an exaggeration nously hanging out of the holes, resembling an exaggeration of rats' tails, a sense of anxiety and discomfort was unavoida-
ble. Every thing, however, went off satisfactorily, and the spark from the electric machine exploded all the cartridges. Until the men were drilled sufficiently to be safely entrusted with this business, the lecturer had to go in the tunnel every 8 hours, and 3 of the intervening hours were used up in preparing the charges. Five tuns of nitroglycerin were thus used per month; and for the same amount of rock blasted out, only 1 life was lost through nitroglycerin, where 30 or 40 were lost through gunpowder. It is safe to say that the Hoosac tunnel would never have been completed without nitroglycerin.
The lecturer then exhibited the electrical machine, contained in a neat keg. To this he connected 15 fuses and exploded them before the audience. The machine is a fricploded them before the audience. The machine is a fric
tional one,its condenser having 450 inches of surface and the rubber being 6 by 8 inches. In practice,the fuses, instead of being close together as in the experiment, are attached to cartridges placed in holes from 6 to 12 feet apart, which they fill about two thirds or two fifths. As much as 6,000 cubic yards of solid rock have been blasted out at one discharge at Lake Champlain. The drill holes are made very deep, sometimes as deep as 50 feet. They are first gaged to make sure that they will receive the cartridges. Then the exploders are attached to the nitroglycerin car tridges, and these are immediately passed into the drill holes. The holes are next plugged with a bung, perforated to allow the delicate connecting wires to pass and to keep them away from the rock, by which the insulation would otherwise be destroyed. Finally, the wires are connected with the above mentioned electrical apparatus, which is kept in a warm, dry room, and the explosions take place the moment the ap paratus is charged

Owing to the many fatal accidents resulting from the handling of Nobel's impure, dark-colored nitroglycerin, the manufacturers were obliged to substitute a modification fo it, to which they gave the name of dynamite. This dy namite consists of a mixture of nitroglycerin and a kind of silicious or infusorial earth, "known under the various names of silicious marl, tripoli, rottenstone, etc." This earth absorbs the nitroglycerin without destroying it, and the result is a mixture which is no longer liquid and which can be transported with greater safety. Dynamite is only one of a large number of similar compositions of nitroglycerin. Mixed with sponge or other vegetable fiber, nitrogly cerin becomes porifera nitroleum; with plaster of Paris, selenitic powder; with red lead, metalline nitroleum ; with gunpowder in a fine state of division, lithofracteur or rend ock ; with sawdust, dualin Dynamite, adulterated with nitrates of soda or potash, is sold as giant powder. Thes additions are manifestly adulterations, because they are con verted into gases, so much more slowly than nitroglycerin that the power of the latter is considerably impaired. One might as well attempt to quicken the electric current by
coupling it to the velocity of a locomotive. Give four men coupling it to the velocity of a locomotive. Give four me them, the exertion of by any one, later than that of the others, wastes the force of all
Some of these compounds develop poisonous gases when they are exploded, and cannot therefore be used in tunnels without detriment to the workmen. In the Hoosac tunnel, when they were tried, the men would not pass through after the discharge until a train had re-established ventilation, but preferred to wait for several hours to go home.
Sometimes a diluted form of nitroglycerin is advantage ous, provided its price is proportionate to that of the pure article. Where the rock is hard and tough, it is easier to bore holes an inch and a half than only an inch in diameter,
because the drilling machine would soon batter up the thinner drill ; on the other hand, a charge of nitroglycerin, dilut ed so as to fill up two thirds of the depth, would be much more effective than if it were concentrated at the bottom. This, of course, does not prove that these diluted compounds ane stronger than pure nitroglycerin. At Hell Gate the trinitroglycerin was found to be six times as powerful as giant powder; and, as Professor Morton says, a mixture of $47 \frac{1}{2}$

There are several methods of estimating the power of ex plosive substances. According to the experiments by Nobe and Abel, if the gases developed by the explosion of 2. lbs. of gunpowder are confined in the volume of 61 cubi inches, they will exert a pressure of 6,400 atmospheres, and the explosion will disengage 705 calories. The experiment of Messrs. Roux and Sarran, of Paris, with nitroglycerin and gun cotton, gave 1,784 calories for the former and 1,123 for the latter. Hence, if the explosive force of gunpowder is taken s unity, that of nitroglycerin will be 2.53 , and that of gun cotton 1.59
M. Berthelot computes this force in a different manner Taking 3,405 grains of nitroglycerin, he calculates that the elements composing it would produce an amount of heat equal to 430,500 calories, if they were transformed into water and carbonic acid: but the heat actually disengaged in making this quantity of nitroglycerin is 130,500 calories hence the difference between the two figures, 300,000 cal ories, represents the total amount of heat which the 3,405 grains of nitroglycerin are still capable of developing. This makes 1,320 calories for each 15 grains.
There is one element which seems to have been ignored in these calculations, namely, the time in which an explosiv is converted into gaseous matter. It takes a bullet one six tieth of a second to reach the muzzle of a gun. A charge of gun cotton, in blasting a mine or in a rifle, explodes after the manner of gun cotton; but if fired by means of a suitable charge of fulminate of mercury, it goes off with extreme violence. Nitroglycerin soaked into blotting paper burn rapidly with a voluminous flame when lighted by flame but detonates violently when spread on an anvil and struck with a hammer, or when fired by means of the initial ex plosion of a fulminate. Now, velocity of explosion is th very essence of disruptive force. This principle is lost sigh of also in Mr. Nobel's method of testing explosives, whic depends upon their projectile power. He puts them into a mortar and measures the distance to which they send a ball Taking the ballistic force of nitroglycerin as 100 , he finds for equal weights of other substances the following figures Compressed guncotton, 71 ; dynamite ( 75 per cent nitro glycerin), 72 ; gunpowder with 20 per cent nitroglycerin, 50 fulminate of mercury, 30 ; strongest rend-rock, 50.5 ; Cur tis and Harvey's powder (exploded with a fulminate), 28.
The mistake here is that substances like nitroglycerin which, by their velocity of explosion, produce the best ef fect in blasting, are ill adapted to the propulsion of projec fect in blasting, are ill adapted to the propulsion of projec-
tiles. They will burst the gun or expend part of their tiles. They will burst the gun or expend part of their
force in crushing the ball, and hence give indications much below their true strength. The real strength of nitroglycer in is probably 8 or 10 times that of gunpowder.
The explosion of nitroglycerin is so rapid and violent that the air above it has no time to move away, but acts like a
solid; hence it will act downwards when placed upon the solid; hence it will act downwards when placed upon the surface of a rock.
The lecturer, in the next place, put upon the table little heaps of dynamite, rend-rock, and mica powder, the latter being his own invention. He called attention to the fact that the mica powder burned with greater rapidity, and claimed that it was a more powerful explosive than the others. All the other compounds are made with a view to absorption of nitroglycerin by some inert substance; and when they are fired, there are two explosions, one of nitro lycerin on the outside of the particles of the infusorial arth, and another of that contained in the foraminiferou interstices. Hence there two weak blows instead of on trong one. In the mica powder, however, which consist of finely divided scales of mica, not more than $\frac{1}{40 \sigma \sigma}$ to $\frac{1}{10} 0_{0} 0$
of an inch thick, moistened with nitroglycerin, there is no absorption, and the whole mass is exploded at once.
Mr. Mowbray then protested against the popular assump tion that nitroglycerin cannot be prepared with sufficient purity to remain unchanged, to be safe to use, safe to trans port, and safe to store. He has sent $1,000,000 \mathrm{lbs}$. of his pure limpid trinitroglycerin all over the country in teams, which jolted over rough roads, rolled down bluffs, an broke down; in trains which were thrown off the track and in sloops which were storm-tossed.
He concluded by hoping that railroad and transportation companies would soon put an end to the clandestine trans portation of nitroglycerin under feigned names, by appoin ing certain days for receiving it.
C. F. K.

## Hydrocarbons in Dynamite.

A Rhenish manufacturer of dynamite mixes 2 or 3 per ent of some hydrocarbon, like naphthaline, with the nitro glycerin employed. Two different sorts of dynamite are made, in which the following proportions are employed

## Infusorial earth

Chalk
Solutio
Barytes of naphthaline in nitrogycerin

A NEW printing ink is prepared by first dissolving iron in sulphuric, hydrochloric, or acetic acid. Half the solution is oxidized by means of nitric acid, after which the two halves are mixed, and precipitation is produced by oxide of iron. The precipitate is filtered, washed, and mixed with equal parts of tannic and gallic acid, which produces a black bordering on blue. The black is washed and dried, then mixed with linseed oil; and the ink obtained is suitable for either leterpress printing or lithography

## IMPROVED MIDDLINGS SEPARATOR

We illustrate herewith a new and simple middlings sepa rator, in which descending streams of moldings are freed from impurities by the action of ascending air blasts.
In the upper part of a vertical draft box, A, are placed a number of inclined slats, B, which break and distribute th flow of middlings and the current of air. Said slats are lo cated at the entrance of a horizontal box, C, along which th particles carried over from the vertical box are transporte to the hopper, D , into which the final separation is made by a lighter current up the spout, E. The middlings are fed into box, A, from the hopper, shown above passing upon a vibratory shoe, $F$, and their supply being regulated by the slides, $G$. The bran is discharged through the fan, H .
Below the apparatus thus described is ar ranged a duplicate set of mechanism in which the middlings falling from hopper, D , are agai treated in the same manner by air currents se in motion by the fan, I.
The inventor informs us that he has practical ly tested the machine with excellent results. On has been in operation in the Oneonta Mills, On eonta, N. Y., since September last, and has been examined and improved by prominent millers of the vicinity.

Patented March 14, 1876, through the Scienti fic American Patent Agency. For further par ticulars address the inventor, Mr. Morris N. El well, Oneonta, Otsego county, N. Y.

## Artificial Grape Sugar.

The manufacture of glucose or artificial grape sugar from starch has become an importan branch of chemical industry abroad, although in this country it is little developed, perhaps because potatoes are not so productive a crop her as there; and our starch is mostly made from corn, and hence is too expensive for profitable conversion into sugar, since any excess of corn is easily convertible into whisky.
Fr. Anthon has analyzed three specimens of grape sugar sirup, made in Bohemia, France, and Germany, respectively, with the following results:

Bohemian. French. German.

| Dextrose or grape sugar | $48 \cdot 3$ | $30 \cdot 1$ | $50 \cdot 0$ |
| :--- | ---: | ---: | ---: |
| Levulose or fruit sugar | $6 \cdot 2$ | $5 \cdot 0$ | - |
| Dextrin $\ldots \ldots \ldots . .$. | $25 \cdot 5$ | $48 \cdot 0$ | - |

$\begin{array}{llrl}\text { Dextrin } \ldots \ldots \ldots \ldots . & 25 \cdot 5 & 48 \cdot 0 & - \\ \text { Water } \ldots \ldots \ldots \ldots \ldots & 20 \cdot 0 & 16 \cdot 9 & 20 \cdot 0\end{array}$
In the German sirup there was no dextrin, but 30 per cent of some substance soluble in alcohol, and not yet neare determined.

## IMPROVED STEAM RIVETER

The annexed engraving represents a new machine for riv eting together the angle bars, plates, and reverse bars that compose-the frames, crossfloors, and keelsons of an iron ship. The parts are first bolted together temporarily, precisely as prepared for hand riveting, and are carried prepared for hand re the are carried up to the machine by a large and suitably located crane. The rivets are heated in quantities, and are driven about as fast as
a boy can put them. in the holes prepared a boy can put them. in the holes prepared
for their reception. The driving is done for their reception. The driving is done
by direct steam pressure upon a large pisby direct steam pressure upon a large pis-
ton which moves vertically. Steam is ad mitted by the operator pressing the foot lever shown. When the pressure on the lever is removed, the weight on its end descends, and so causes the exhaust to open. The machine, besides being applicable to the purposes of iron shipbuilding, is especially well adapted for the riveting to gether of the parts of iron railway bridges or of any work made up of angle channel, or of any work made up of angle, channel, or Ibeams, or of flat plates associated with them. The capacity of the apparatus, we are informed, is equal to that of ten gangs of hand riveters, and it requires the attention of but one skilled workman, three laborers, and one boy. The riveting, when done, is better than handwork, for the reason that the heavy direct pressure applied forces the heated rivet into every part of the rivet hole, filling it solidly, and this without granulating the iron, as is often the case with hand-driven rivets.
For further information address the ma nufacturers, Messrs. Pusey, Jones \& Co., Wilmington, Del.

Peter Cooper and the Locomotive. Anything concerning the venerable Peter Cooper and the enterprises he has been engaged in is always interesting. The following account of the first locomotive and the reasons for building it, we find, says the Iron Age, in one of our exchanges:
Mr. Cooper had bought, as a speculation, the entire mag. nificent tract in Baltimore now owned by the Canton Company. Baltimore was then a city of 75,000 people, rich and prosperous, and had entered upon the railroad era. On July 4,1828 , the corner stone of the Baltimore and Ohio road was 1aid with imposing ceremonies by Charles Carroll, of Carroll-
ton. It was pushed energetically-a little too much so-fo when thirteen miles had been finished it was found that, in turning the rocks to save cutting, such short curves had been introduced that the then experts declared the line utterly useless. It could not be ased by steam. Five per cent had been paid in, and shares had been sold at 17 , such was the zeal and confidence of the people. But the chill was immense
and everything stopped. Mr. Cooper, then 38 years of age, saw new disasters to himself in the depreciation of his trac should the road fail. He proposed to the directors to construct an engine to be available on their line They wer

## sruct an engine to be available on their line They we

ELWELL'S MIDDLINGS SEPARATOR
willing, but incredulous. He brought down from his glue factory in New York an engine with a $3 \frac{1}{2}$ inch cylinder and 14 inch stroke, procured wheels and other appliances from the railroad company, and presently rolled out on the track the first American railway engine. The trial trip was to take place the next day. That night a thief stole all the cop fur
and brass from the infant machine, and this caused some fur


PUSEY \& CO.'S STEAM RIVETING MACHINE.
ing as engineer; and when the little baby locomotive threat ened to lose too much steam, he held down the safety valve with his own hands. The run was made with 30 passengers, little miles in 1 hour, and Baltimore was happy. Compare the to-day! and yet they follow on the pathway the little engine opened."


- A bellows just below the neck of the figure fur engthened pegs in the barrel, makes the different notes

Resin 1 part and beeswax 1 part, softened with tallow make a good grafting wax.

## MMPROVED SPOKE-SETTING MACHINE.

We illustrate herewith an improved apparatus for setting and driving spokes in a rapid and convenient manner, and in such a way that an exact inclination of all the spokes in a wheel is obtained.
$A$ is an adjustable frame which is supported on springs, as shown, so as to be moved vertically by the bolts and crank nuts, B. The hub is placed on a central bolt, and is rigidly secured by a crank nut, C. Above the main frame is the guide or set ring, $D$, on which the spokes are placed while being set and driven into the hub.
After the hub is fastened in place, the adjustable frame, B, is screwed down until the center line of the hub is on a level with the circle. The hub is then dotted above the leveling straight edge, and the bolts are screwed down until the desired dish or set of the spokes is obtained. This is necessary, as all hubs are made with straight front and sloping back mortises, throwing the outer ends of the spokes forward at the same inclination. It now only remains to rest the spokes upon the guide ring, and to drive them into the hub.
The inventor claims the apparatus to be a valuable aid to the wheelwright, inasmuch as it can fill four wheels while one is being filled in the usual manner. It can easily be constructed by any good workman, and needs no skill for its manipulation. It sets all the spokes at one setting; and in driving, each spoke is tapped in turn until all are driven, thus protecting the brace between all are drises. Being oljug ble bry leen the mortises. Being adjustable, any length of hub can be filled. Finally, the machine is well suited for refilling wheels, as the set is got by the
mortises and not by the end of the hub. mortises and not by the end of the hub.
Patented through the Scientific American Patent Agency, March 25, 1876. For further information relative to sale of rights or machines, address the inventor, Mr. Thomas S. Morgan, New Columbia, Massac county, IIl.

## IMPROVED ROWING GEAR.

There are two cardinal objections to the present mode of propelling boats by rowing. The first is that the oarsman is obliged to travel backward and to rely upon occasional glances over his shoulder to direct his course, and the second is that his power is applied to the oar at a very decided disadvantage. The second ob to the oar at a very decided disadvantage.
jection is perhaps the most serious one of the two, inasmuch a sit is well known that just a.t the most effective part of the stroke, the end, there is where the power is weakest and worst applied. A new device has re cently been patented (October 26, 1875) by Mr. William Lyman, of Middlefield, Conn., which gets rid of both of these objections in a very simple and practical manner, and, besides, secures some other advantages which will tend to commend it to oarsmen generally.
Mr. Lyman cuts his oar in two, and secures each part in a separate iron, as represented in Fig. 1. Each iron has a ball and socket joint which connects to a button, and each button slips into a slot made in the metal facing of the gunwale, and is there metal facing of the gunwale, and is there
secured by turning a pivoted catch. Lastly, secured by turning a pivoted catch. Lastly,
the two parts of the oar are connected by a the two parts of the oar are connected by a
rod hinged to each iron at 1 and 2 , Fig. 1. A moment's consideration will show that when the handle of the oar is pulled in one direction, the blade of the oar will travel, not in the opposite direction, as is usually the case, but in the same direction. Consequently, when the oarsman, seated as in Fig. 2, facing the bow, pulls in the usual way, he propels his boat bow foremost, instead of backing her, as he would do had he ordinary oars. Again, the arrangement of the lever is obviously such that the

Fig. 2.

strength of the rower is applied to excellent mechanica advantage, enabling him to pull a stronger stroke and to keep it up much longer than would otherwise be possible Steering is also rendered much easier, and the catching of rabs is avoided through the oarsman seeing his blade at
the beginning of the stroke. The parts of oars can easily be folded together for transportation, or may be closed up along the side of the boat, without detaching them from the gunwale, when not in use. A pair of the oars thus arranged weighs about five pounds more than ordinary oars, but this additional weight, it is claimed, has the advantage that, at the beginning and end of the stroke, it helps to lower and
raise the blade, owing to the peculiar position of the oar.


MORGAN'S SPOKE-SETTING MACHINE. 400 miles with this gear, spending his vacation in the Adi- bisulphide is shaken with fresh quantities of the salt as long rondacks and the Thousand Islands, and ending his cruise as it continues to blacken it; then it is decanted and dis-

## LYMAN'S ROWING GEAR.-Fig. 1.

by a row down the Connecticut river. The oars will be found on exhibition at the Centennial.
For further information, etc., address the inventor as above. The patents for foreign countries are for sale.

Underground Telegraphy in New York City. The Western Union Telegraph Company have begun the work of laying the telegraph wires in this city underground work of laying the telegraph wires in this city underground.
Experimental sections, made of iron pipes of a capacity of Experimental sections, made of iron pipes of a capacity of
125 wires each, are being placed in position, between the Cotton Exchange, the Telegraph Company's buildings, and other points. At the same time, pneumatic tubes for the transmission of written messages by the air blast are also being located on the line of the telegraph pipes. The pneumatic tubes are made of brass.
It is greatly to be hoped that this system of underground telegraphy may be extended throughout the whole city, to the exclusion of the present unsightly poles. That the plan is fully practicable has been amply demonstrated in London and other European cities.

The Discoverer of Bromine.
Science in general, and photography in particular, has just suffered a considerable loss in the death of M. Balard, who died recently in his 74th year. The illustrious chemist, to whom we owe the discovery of bromine, succeeded Baron Thénard in the professional chair in the Faculté de Sciences, in 1844, and Darcet as member of the Academy. He replaced Pélouse in the College de France, in 1851. M. Balard was President of the French Photographic Society, where his zeal for the new art, his great attainments, and his charming urbanity, won the respect and affection of all
miles with the lead, pulverized and mixed with a little metallic lead. The tilled. The affinity of lead for sulphuretted hydrogen and sulphur in general leads us to believe that Mr. Kern's method will prove a good one. Strips of bright metallic copper will also soon remove the color and much of the odor from bisulphide of carbon. Unfortunately exposure to light causes both odor and color to return.

## WHITE'S IMPROVED WASHTUB STAND.

Housekeepers will, we think, be pleased with the new invention herewith illustrated, which is intended as a useful convenience for the laundry. It combines a hollow stand in which clothes may be kept until the arrival of wash day, an arrangement for supporting washtubs, and an ironing board. The clothes are placed in the receptacle, $A$, and the inclined opposite ledges, B , serve to receive the tubs. C C are hinged sections which sustain the ironing board, D. The latter fits between two studs at one end, and has at the other two side pivots that enter into section bearings, one of which is open to permit the ready removal of the ironing
Spontaneous Combustion.
" Yesterday, about three o'clock, a disagreeable odor was observed in and about R. H. Delmage's carpenter shop ; a earch was immediately instituted, and smoke was discovered issuing through a small crack in the floor, but in such a thin vapory state that it was at first taken for dust ; a more careful examination revealed the fact that it was really smoke. There being no other means of access, the floor wes immediately torn up, when it was found that sawdust had accumulated to the depth of some five or six inches, and of course some saw filings and other débris had become mixed with the sawwith boiled linseed oil, which had leaked from a large can placed immediately above it ; from this mass the smoke was issuing, and further examination verified the startling conjecture that beneath the surface this composition was all on fire and was actually in a charred state. The surface was entrething as out, something as from a coal pit. There was no means of ingress to render it possible to have
been the work of an incendiary, and no possible been the work of an incendiary, and no possible means of the fire in any way having come from above. The only solution of the matter seems to be that it was a case of spontaneous combustion. Mr. R. H. Delmage, the owner of the shop, is a man whose veracity will not be questioned, and, besides, we have the same facts attested by severtelligent men in this community. Here, now, is a question for scientists. Will a combination such as the above generate fire? If so, the sooner that matter is settled the better. But for the timely discovery, great damage would certainly have been the result.-Afton (Iowa) Tribune, May 4. [We would inform our cotemporary that it is [We would inform our cotemporary that it is
very known that a combination of oil and combustible materials, such as that above described, will produce spontaneous combustion. Many such examples have been recorded in the pages of the Scientific American.-Eds.]

## Purification of Sulphide of Carbon.

Instead of the usual method of purification with board when not required for use. The hooks shown on the
ends of the stand also serve to hold the sections, $C$, in vertiends of the stand also serve to hold the sections, $C$, in verti-

al position. By closing the sections, C , and placing the ironing board on the stand, a very good bench is formed. The
apparatus can be cheaply made, and, the inventor states, can be sold at large profit
Patented through the Scientific American Patent Agency March 21, 1876. For further information relative to salo ef rights, etc., address the inventor, Mr. John J. White, 279 ('hurch street, Norfolk, Va

## DECISIONS OF THE COURTS.

## United States Circuit Court-Western District of

 Michigan.































## United States Circuit Court--District of Massachu-

 In equity.-Before Shepley, J.-Dectded. October term, 1875, to wit, April





## United States Circuit Court-mistrict of Massachu <br>  <br> [In equity.-Before Shepley, J. - Decided October term, 1875, to wit, April 4, 1876 .] SHprler, J.: Since the disclaimer, which was fled before the date of the bill in this case   

United States Circuit Court-DDistrict of Massachu setts.
 In equity.-Before Shepley, J.-Decided April 4, 1876.]

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| :---: |

## NEW BOOKS AND PUBLICATIONS.

architectural Iron Work, a Practical Book for Iron Workers, Architects, Engineers, etc. With Specifications for Iron
Work, Useful Tables, and Valuable Suggestions. By william Work, Useful Tables, and Valuable Suggestions. By William
J. Fryer, Jr. Illustrated. Price $\$ 3.50$. New York city : John J. Fryer, Jr. Illustrated. P
Wiley \& Sons, 15 Astor place.

This book is the best specimen which has reached us of a new trade litera-
ture which is now springing up to answer a demand created by the extenstye use of iron in architecture, not merely for tie rods and girders, but as a building material. The author is evidently thoroughly acquainted with his subject, and his book is an exhaustive treatise on the sclence and art of
building in iron. The specifications are admirably drawn, and the tables of proportions, weights, and loads for iron work of all kinds are full and comfor workmen and owners of bulldings as well as for the engineering profession. It is, moreover, free from those technical expressions which too often mpair the value of such works for practical workmen.
Vichas and Cortages, or Homes for All: Plans, Elevations, and Views of Twelve Villas and Ten Cottages, Suited to Various Wants and Locations. Designed by William L. Woollett, Fellow York city : A. J. Bicknell \& Co., 27 Warren street.
Judging from the number of books on villa architecture which reach us,
here must be a lively demand for rural and suburban residences jast now
and it is gratifying to observe the increasing neatness and propriety of detesque and clumsy attempts at ornamentation which disfigured the homes or the last generation. In internal convenience and sanitary arrangement, well executed plates, fully justify the above remarks, being marked by taste and ample provision for supply of light and fresh air. The brick bulldings illustrated in this book are especially commendable for the substantial
and effective use of this material, which is in most respects the best ever and effective use of this material, which
employed in building human habitations
Chemistry, Theoretical, Practical, and analytical, as ap plied to the Arts and Manufactures. By Writers of Eminence. To be completed in Forty Parts, price 50 cents each. Philadelphia, Pa. : Lippincott \& Co., 715 and 717 Market strect. For sale by James Sheehy, 33 Barclay street, New York city
This beridan Muspratt's "Chemitry and the the Dr and it is to that widely circulated work that the new pubication, an instal-
ment of which is now before us, owes its chief recommendarion. There is, however, some new matter in jt , and the modern notation is introduced. The work would be more readily adopted as an authority if the names of the

## o be published anonymously.

annual Report of the United States Geological and Geo Graphical SUrvey of the Territories for 1874. By F. V
Hayden, United States Geologist. Washington, D. C.: Govern ment Printing Office.
ying it out in a during 1874, he describes the topography and geology of Colorado and labors arts of the adjacent territories; and the botanical and palxontological fea being done by the expedition is an immense one; and a perusal of one of Professor Hayden's reports enables us to fully appreclate it. The book is
well and liberally illustrated, the photographers who travel with the expedion belng constantly at work as the party progresses.
Ladies' Fancy Work : Hints and Helps to Home Taste and Recre tions. By Mrs. C. S. Jones and Henry T. Wiliams.
This is the third of a sertes of useful volumes which the above named pub. isher is issuing, with the design of collecting, in permanent form, an im ense number of hints and sugkestions relative to tasteful household ornahille others have been known only to few individuals. The present book ells how to make fancy work of all kinds, includink paper and wax Howers, knell, leaf, and moss ornaments, bead and worsted work, and the thousare It is coplously illustrated, handsomely bound, and the descriptive matter is Eng and easily followed.
Engineer's and Mechanic's Pocket Book. By Charles H. Has-
well, Civil, Marine, and Mechanical Engineer, etc. New York city : Harper \& Brothers, Franklin Square.
Mr. Haswell's engineer's pocket book has been before the mechanical capitulating its contents. It is one of the best, if not the best, of hand books of reference extant; and it must be a matter of some difficulty to suk gest any useful practical facts or tables which are not to be found some where among its 700 pages. The present edition is the thirty-second, and is stry up to the times, through fresh and careful revision of the contents. e obtained postpaid, by malling $\$ 3.00$ to the author, at 6 Bowling Green, New York city
Catalogue of the Fishes of the bermudas. By G. Brown Goode. Washington, D. C.: Government Printing Office. This work is one of a series intended to illustrate the natural history col-
lections constituting the National Museum, which were en risted to the are of the Smithsonian Institution by Act of Congress in 184 .
Centennial Collection of national Songs. Price 40 cents New York city : C. H. Ditson \&Co., , Bradway
A collection of songs, more or less familiar, which will probably be wel

Inventions Patented in England by Aniericans
ICompiled from the Commissioners of Patents' Journal,
From March 28 to April 24, 1876, inclusive.
Air brake, etc.-Empire Vacuum Brake Company, New York elty.
Air Gon, etc.-A. A. Pope, Boston, Mass.
Air Gun, erc.-A. A. Pope, Boston, Mass.
Air Pistol.-A. C. Carey, Malden, Mass.
BAth Tub,-A. Seligsburg, New York city,
bending Tube Plates.-S. P. m. Tasker, Philadelphia, Pa
Bending Tubes, erc.-C. Scotiteld, Vineland, N. J.
Bend
Binonge Sheves.-S. Johnston, Brockport, N. Y.
Binding Sheavis.--S. Johnston, Brockport, n. Y.
Boot, etc.-R. S. Manning, Trenton, N. J.
Boot, erc.-R. S. Manning, Trenton, N. J.
Boot-LAsting MAchine.-F. S. Hunt, Lynn, Mass.
Boot-Lasting Maching.-F. S. Hunt, Lynn, Mass.
Boot-Sewing Machine.-c. Goodyear, Jr., New York city.
Bristre-Dresing Machine,-E. b. Whiting, st. Albans, Vt.
Cake Machinery.-G. W. Nelson, New York city
Cartridar anvil.-J. Saget, New Orleans, L
Chatr.- W. T. Doremus, New York city.
Dental Apparatus.-H. C. Howells, Flu
dental Apparatub.-H. C. Howells, Flushing, n. y.
Elastic Seam.-J. Bigelow, Boston, Mass.
Electric Engraving Machise.-J. C. Guerrant, Danvilic, Ill.
Engine Valve.-E. Purvis, New York city.
Fged Water Heatrr.-H. N. Waters et al., Wees Meriden, Conn
Gas Apparatus.-W. H. St. John, New York city.
GAs Meter.-J. Morgan, New Orieans, Ya.
GAs Stove, etc.-C. F. Brooker, Wolcotville, Conn
Grain Conveyer.-N. G. Simonds, Boston, Mass. Hoof Expandrr.-C. H. Shepard, Elizabeth, N. J.
Horseshoe Nail, Etc.-J. B. Wills, Keeseville, N. Injector. - J. Fergus, Philadelphia, Pa.
Machine Gun.-F. L. Balley, Indianapolis, Ind.
Magnetic Machine.-J. B. Fuller, New York city, Magnetic Machine.-J. b. Fuiler, New York city, et al.
Manging Apparatus.-W. G. Lewis, Framingham, Mass. Masiing Grain, etc.-R. d'Heureuse, New York eity. mining Machine.-F. M. Lechner et al., Columbus, Ohio. Observatory.-L. B. Sawyer, Boston, Mass.
Paper Boxes, etc.-S. Wheeler, Albany, N. Y. Paper boxes, etc.-S. Wheeler, Albany, N. Y.
Paper-Cutting Machine, etc.-W. Scott, Chicago, ill Papre-Cutting Machine, bTC.- W. Scott, Chicag,
Pipe NozzLe, brc.-M. Clemens, Worcester, Mass.
Playing Cards.-I. N. Richardson, Malden, Mass Priserving FAbrics, ETc.-W. Thilmany, Cleveland, Ohio
Pyrotrchic Sional.-E. F. Linton, East New York, N. Y. Prrotrchnic Signal.-E. F. Linton, Elast New York, N. Y
Rallway Whel.-A. Atwood, Brooklyn, New York, et al. Refrigrra'ror, pto.-J. H. Wickes, New York city. Sash Fastener.-N. Thompson (of Brooklyn, N. Y.), London, England Ship Alarm, etc.-F. X. Wagner et al., New York city. Smoring Pipe.-R. S. Manning, Trent.on, N. J.
Spari Arrester.-D. R. Proctor, Gloucester, Mass. SPARE AREETER.-D. R. Proctor, Glouces
Spindle CAP.-C. Weller, Philadelpha, Pa.
Spitr
textile Fabric.-S. Barlow, Lawrence, Mass
thermometer.-G. W. Schumacher, Portland, me
treating Ores, btc.-R. McC. Fryer, New York city
Treating Peat, btc.-J. N. Rowe
trbating peat, etc.-J. N. Rowe (of Rockland, Me.), Liverpool, Eng Triatine Wool, etc.-J. M. Dick, Buffalo, N. Y
Tube Cleaner.-C. b. Rogers, Saybrook, Conn
Umbrella, etc.-G. B. Kirkham, New York cty.
Veneer-Cuting Machine.-H. T. Bartlett et al., New York city

## 

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

improved die for making wasilers. IMPROVED DIE FOR MAKING WASIIERS.
Jacob Greenwold, Buffalo, N. Y., assignor to himself and William L. Wallace of same place.-This is a die for cutting washers and
imilar articles at one operation, being intended to be used with a common drop press or punch. The invention consists in making
the movable die in two sections that are screwed together, and attaching the central punch by shank and screw nut to the lower section.
mproved windlass water elevator.
Ezra M. Robords, Hutchinson, Kan.-This is an improved apparatus for raising water from wells by wind wheels or other power. It is so constructed that two buckets may be raised and lowered al-
ternately, while the power moves continuously in the same direction. MIPROVED RUBY PIN INSERTER FOR WATCh MAKERS.
Carl H. E. Bechert, Oroville, Cal.-This is a new form of spr nippers for inserting ruby pins in the rollers of lever watches. IMPROVED WINDMILL.
William Ford, Great Bend, Kan.-This is a novel contrivance of
the wind wheel, whereby the fans are self-adjusting to the wind, the wind wheel, whereby the fans are self-adjusting to the wind, sists of a contrivance of apparatus for automatically regulating the speed of the wheel.
mproved electromagnetic car brakes. Philip V. Conover, Keatchie, La.-This consists in the employthe ordinary car brake mechanism.
improved fireman's elevating laddek.
Berthold Huber, Brooklyn, E. D., N. Y.-This is an improved extensjon ladder, which may be raised vertically or inclined at any desired angle. It is constructed on the lazy tongs principle, the sides being brought together and the apparatus extended, by said sides being connected to two toothed sections which are turned by pulle
hand-crank gearing.
improved machine for making cores.
William J. Reagan, Pottstown, Pa.-This consists of a revolving hinged, the length of the cores being determined by adjustable pistons carrying the corc-supporting vent pins.
improved screw-cutting machine
Charles W. Roberts, Cohoes, N. Y., assignor to Norman W. Frost, of same place.-The object of this ithen of the machine known as the $\mathbf{C}$ W. Roberts pipe-cutting and threading machine and vise, so as to make it more convenient in use and more effective in operation. It embodies a number of useful and novel improvements, mainly in construction, which it
is hardly possible to describe without the aid of drawings. hardly pos
improved feed meciianism for thread winding. Ambrose Giraudat, Neuvy (Norwood P. O.), N. J.-This is an ingenious machine for winding threads for making stamens for arti-
flcial flowers, and for other uses. It winds the threads regularly and at equal distances apart, or at a greater or less distance as mary be desired.
mproved rail road rail chaik.
John. L. Rahmsteck and Charles W. Rahmsteck, Rahway, N. J.In this device a movable plate is made to fit between the rails and wedges, constructed and arranged to operate in connection with each other.
frictional, gearing
Moses Ray, Valley Grove, West Va.-This invention relates to the
transmission of power to machinery through smooth-faced friction wheels, and consists in arranging the shaft that drives the machinery in bearings that are held forward with greater or less pressure, according the character of the work, while it will yield to any ery.
mirooved metal-cutting machine
Jacob Schofield and Joseph Stevens, Newton, Ia.-This machine is for shearing off pieces of iron of different thickness, and com-
prehends two cutting jaws, of which the lower jaw is adjustable to different hights, while the upper jaw is brought down by suitable lever power.
improved maciine for making twist drills. Edward S. Taber, New Bedford, Mass.-This is a machine for making twist drills with increasing pitch or inclination of the grooves. It consists of a graduated cam combined with the mandrel which
advances the blank along and revolves it to the cutters, which advances the blank along and revolves it to the cutters, which
causes the advance of the mandrel to increase in speed as the work causes the advance of the mandrel to in
progresses, and thus increases the pitch.
improved middings separator
Joseph P. Keel and Andrew J. Seyler, Cedarville, III.-This inven-
tion comprises a reel in which the fine middlings tion comprises a reel in which the fine middlings are first separated
from the light coarse matters to be discharged, and air blast appa from the light coarse matters to be discharged, and air blast appa-
ratus and sieves for separating the remaining middlings from the residue passing out of the tail of the reel.
mproved hose coulinga.
George W. Price, San Francisco, Cal.-This invention consists of a tapered ring outside of the hose,said ring screwing into one of the as to bind the hose and thus attach it to the coupling. There is also a kind of detachable hinge joint at one side of the coupling, and sliding keys and hoods at the other side, for fastening the two parts
of the coupling.

MPROVED CUT-OFF FOR WATER CONDUCTORS. William P. Myer, Terre Haute, Ind.-This cut-off is adapted for
leaders of buildings. It is easily shifted to leaders of buildings. It is easily shifted to direct the water into one or the other of the discharge pipes, and will always indicate in
what position the shifting spout may be set. Improved feed water heater.
Samuel N. Hartwell, Wollaston Hights, Mass.-
Samuel N. Hartwell, Wollaston Hights, Mass.-This consists
mainly in the combination of a feed water heater with a grease mainly in the combination of a feed water heater with a grease condenser, through which the exhaust steam is passed, the steam
then being drawn to the heating chamber, to which the feed water is conducted in a spray through a coiled pipe with perforated end. The air which accumulates in the heating charnber is drawn off by an air pipe leading to a flue.
mproved car coupling.
Martin V. Remaly and Joseph F. Kinnard, Kittanning, Pa.-This car coupling couples readily without the stepping in of the attendant. It consists of a drawhead having a central bottom rib, with
side openings or recesses for the coupling link to swing therein. couples with a pivoted hook of the drawhead of the adjoining car.

IMPROVED TOOTH-PICK MACHINE
Leonard Anderson, Painesville, $O$.-This invention consists of a couple of veneer cutters, one on each of the two opposite sides of
the mandrel carrying the rotating block, and a splitting wheel for splitting the veneers into picks. The latter is geared with the mandrel which revolves the block in such a manner that the cutting and the splitting wheel move up to the block in the same meas
ure that it is reduced by the cutters, thus automatically cutting the blocks into picks, without further attention, after the block is put on the mandrel.

IMPROVED STOP WATCH.
Henri A. Lugrin, New York city.-This invention consists, first of a quarter second hand and its dial, located on the top of the watch movement instead of the face, whereby the hand can be geared with less complication of machinery than when located on of the movement and at one side of the center post, so as not to interfere with the quarter second, in combination with a short section of a dial to be used, if necessary, for counting minutes; third, of the adjusting lever, for shifting the quarter second back to the starting point, also arranged for shifting the minute hand bact
the same time.
improved machinery for dressing leather.
Harrison D. Chemberlin and Justus P. Luther, Berlin, Wis.-This is an improved machine for scouring leather when taken from the scouring by hand by means of a machine. It is a combination of the stones and brushes applied to pivoted arms of a revolving
shaft. Guide rings or weights hold the stones and brushes to their shaft.
work.
improved hair-heading machine.
Ella J. Crosby, Sabula, Iowa.-This is a rubber-covered base
piece, in connection with an adjustable assorting piece, that swings above the base piece and heads the hair by friction therewith.

IMPROVED WINDMILL REGULATOR.
Solomon Vermilya, Plain View, Minn.-This is an improved regulator for windmills, and consists of a friction pulley operated by a fulcrumed and weighted lever in connection with a governor, the
pulley operating a windlass that throws the wheel in and out of the wind.
improved lifting Jack. woves the construction of the lifting jack, for whi . Y.-This im were granted to same inventors, July 13, 1875, so as to give it a able tube standard has been adjusted at the proper hight, it is locked in place by turning an eccentric. This construction enables the jack to be accurately adjusted to any desired hight.
IMPROVED EARTH AUGER.

Oscar Rust, Macon, Mo.-This improvement relates, first, to the
form of cross section of the body of the auger, whereby the draf or force required to operate it is reduced; and, secondly, to the
censtruction of the head of the auger, and parts connect censtruction of the head of the auger, and parts connected therewith, whereby it is adapted to slide up and down on the boring
shaft, so that it may be removed from the well or hole without shaft, so that it may be removed from the well or hole withou
raising the shaft, and whereby also certain other advantages are attained in practical operation of the auger. It is an improvemen on letters patent granted on August 3, 1875, to the same inventor

## NEW TEXTILE MACHINERY.

IMPROVED FULLING MILL
Joel M. Baldwin, Evans' Mills, N.Y.-This improvement in fulling
mills consists, essentially, of a shaft running through a middle mills consists, essentially, of a shaft running through a middle opening in the hammer heads, and working them by an eccentric
in said opening. By this, space is economized, the mill can run in said opening. By this, space is economized, the mill can run
faster, and the contrivance can be located above the floor. The faster, and the contrivance can be located above the fioor. The in part of metal, making a more permanent mill.
improve warp tension regulator.
Alexander M. Fyfe, Cornwall, Canada.-This is an improvement the warp passes from the warp beam, is arranged to be shiftedin position, corresponding to the beat of the lathe, by means of levers connected with the latter. By the arrangement the roll will move toward the harness when the lathe swings back after beating up, and at the same time the shed opens; and when the shed closes the
roll will move back again as the beat-up takes place, thus relieving the warp of undue strain by the shed, and at the same time making uniform tension.

## NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

TMPROVED BARBED FENCE WIRE AND baIR FORMER. William H. Jayne and James H. Hill, Boone, Iowa.-Thefirst is a improved foul-pointed fence barb, composed of two pieces of wire bent into the form of a $U$, from opposite sides of the fence wire, in such a way that the bend of each piece may be between the arm fence wire, leaving the four points projecting in opposite direc tions. The same inventors have also devised and improved a fence barb former, which is an improvement on a similar devicc for which letters patent were granted to them January 18, 1876. The
invention consists in an improved barb, four slotted disks, and the three handles, connected togetherand operating so as suitably bend the wire.
mproved wire fence tightener.
William F. Daniels, Lime Spring, Iowa.- In using the device a bar
is hooked upon the wire, and a cylinder is put in in such a way that is hooked upon the wire, and a cylinder is put in in such a way that
the wire to be tightened may pass into its slot between the arms of the bar. The cylinder is then turned, winding the wire around it, until the said wire has been drawn to the desired tension, where is held by a pawl and ratchet wheel.
improved toy box.
Joseph Kayser, New York city.-This is a box for candies, col-
lars, and other purposes, which produces, by the opening and closing of the drawer, a change of pictures on the top part of the box
improved glazed plaid paper.
John F. Marsh, Springfield, Mass, assignor to Springfield Glazed Paper Company, of same place.-This is a new method of manufac
turing glazed plaid paper, consisting of the following steps consecutively performed, namely, coating the paper with an ordinary
glazing preparation, ruling the glazed surfaces in suitable color and designs, and finishing or glazing the coated and ruled surface by polishingor pressing the same
improved coffee sheller.
José A. Mosquera, Caracas, Venezuela.-This is a machine for
shelling coffee in a rapid manner, so that the be shelling coffee in a rapid manner, so that the beans are freed from the shells or pods without being crushed or broken. It consists of
a grooved and notched revolving cylinder that breaks the shells in a grooved and notched revolving cylinder that breaks the shells in
conneetion with suitable knives. The lower separating knife is placed nearer to the cylinder than the upper breaking knife.

IMPROVED BAYONET
Samuel W. Hill, Pittsburgh, Pa.-This is a ramrod and bayonet combined in one device, and so constructed that it serves for both for their respectlve purposes. ordinary ramrod and bayonet do
IMPROVED mirrok.
Henry Goldberg, Herkimer, N. Y.-This is a reflecting mirror, of the frame, passing over pulleys on the ceiling and attached to a single adjusting strap. It can be conveniently manipulated by a
person standing between the ordinary mirror and the suspended person standing
reflecting mirror.
mproved revolving scraper.
urved upward extensions formis invention consists in inwardly of the scraper, and in an apron attached to the cross bar of the handles to overlap the back. The extensions rest upon the carth
when the scraper is tipped over, to prevent the earth from being scraped up by the back. The apron prevents the earth from slipping over said back.

James Collins Cempro
James Collins, Central City, Col. Ter.-This consists of a cutter with a central sliding and spring-acting part for forming and cut-
ing, simultaneously with the outer part, the article to be produced.

## NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

Edward C. Ibbotson, Chelsea, Mass.-Diaphragms of wire are placed beneath the portion of the roof which extends over the platorm. Above the diaphragms are chambers which communicate with the interior of the car, and also with cows on the ros. The ir enters under the diaphrag
mproved gate.
Emerson Lyon, Stoughton, Mass.-This gate is suspended on roliers, attached to hangers from an upper cross bar. For the passage
of wide or high loads the gate is pushed back, so that it and the bar are balanced upon a post, and the gate and bar are then swung around upon the pivot of the post into a position parallel with the roadway.

## NEW HOUSEHOLD ARTICLES.

## mproved dish cleaner.

Robert W. Chappell and Isaac Mayfield, Spencer, Ind.-This inention consists in connecting a chamber for holding the dishes or other articles with the upper part of a pump cylinder by a pipe, and with the water tank by a spout; also, in using a gate and rack in
improved steam cooking apparatus.
Stillman Wilkins and James D. Murphy, Abingdon, IIl.-This consists of a series of traps, through which pass concentric tubes.
When the cooking is to be wet the bottom of the section is made Hat, and the part of the tube above said bottom is close, or made without perforations. When the cooking is to be dry, the bottom of the section is concaved, and the part of the tube above said bottom is perforated, so that the water of condensation may flow down through the said tube. Any desired number of sections or trays may be used, and the upper section or tray is provided with a coni-
cal cover, which brings the steam to the center.

$$
\begin{aligned}
& \text { IMPROVED STOVE PIPE THiMBLEE. } \\
& \text { ard. Riceville. Iowa.-This is animprot }
\end{aligned}
$$

Charles Inward, Riceville, Iowa.-This is an improved thimble for connecting a stove pipe with a chimney, or with a wall or ceiling
through which it passes. It is formed. of an inner part, provided through which it passes. It is formed of an inner part, provided
with the collars, and an outer part, made in halves. One half is made in one piece with the inner part, and the other part is hinged at one edge to the edge of the first half, and secured atits other edge by a hand screw and lugs.

> IMPROVED CLOTHES WRINGER.

Samuel F. Leach, Chelsea, Mass.-This is an improvement in the clothes wringers formed of two elastic rolls arranged to work
in frictional contact and rotate in opposite directions. The object in frictional contact and rotate in opposite directions. The object
is to reduce the friction incident to the use of such wringers in consequence of the pressure of the springs. To this end a pair of spiral springs is applied at each end of the rolls, and they are conrolls, which are mounted in a small frame and bear on the journal of the upper roll. The journals of the lower roll are supported on similar friction rolls.

## IMPROVED STEP LADDER

John Calvin Blauvelt, Blauveltville, N. Y.-This mainly relates to an improved construction, whereby a stepladder may be readily adjusted for use as a ladder, without it being necessary to turn it

IMPROVED METHOD OF MAKING TEA AND COFFEE. Jonathan Miller, Himrod's, N. Y.-This invention relates to a new method of preparing decoctions or infusions of tea, coffee, etc., and it consists in the method of filing a tight and unyielding chamthrough the same, whereby the expansion of the grains consequent upon the absorption of the water produces a considcrable pressure, which, in the unyielding chamber, fills up the little interstices or
channels between the grains, thereby preventing the fine dust or channels between the grains, thereby preventing the fine dust or
pulverized portions of the coffec from being washed through and pulverized portions of the coffec from being washed through and compelling the water to permeate the pores of the coffee grains in
its passage through : the said expansion in the filled chamber acting in the nature of a press, so that the bulk of the coffee is held as ing in the nature of a press, so that the bulk of the coffee is held as

## NEW AGRICULTURAL INVENTIONS.

imploved fruit pickers' basket.
Orville W. Odell, Woodhull, N. Y.-This is a bucket so construcing down from the tree and without injuring the fruit. The comfeatures consist in arrangements for allowing the bottom to open and the fruit to escape.
improved cultivator.
Casper Oehrlein, St. Paul, Minn.-This invention may be adapted as a furrow opener, to make furrows for the reception of the seed, and rakes may be attached to it for cultivating potatoes, by loosening the soil and tearing up weeds.

## mproved check row planter.

Joseph Rothehild, Shelbyville, Ky.-In this machine are embodled new and ingenious devices for dropping the seed at a greateror less distance apart, the adjustments of which are effected by a
improved whiffletree attachment for plows. Thomas B. Baldwin, Troy, Pa.-This consists of the roller commonly connected to the plow beam, for gaging the depth of the vents the horses from stepping out of the traces traces, and pre

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petroleum in boilers on p. 164, vol. 30 . As to zinc in boilers, see p. 315, vol. 34 . Engineers of pleasure steamobats must be duly licensed. See p. 228 , vol. 32.-C. H. B. will find a table of the values of metals. on p. 169, vol. 32. We publish an index in each
volume.-C. S. R. will find directions for galvaniz-
ing cast iron on p. 346, vol. 31.-W. H. D. will find directions for making friction matches on p. 75,
vol. 29.-D. J. will find a recipe for paint for outdoor work on p . 409, vol. 31. Celluloid is described on p . 23 , vol. 33 . -J. McG. will tind a recipe for waterproof glue on p. 42, vol. $32 .-$ H. D. E. . will find 1al, vol. 23 . -J. I. Weparating is informed that we cannot re
and what impurities the water contains. - M. M. H. is normed that his query as to the wagon ween a physician.-W. J. will find an answer to his query as to pitches of gas pipe threads on p. 378, vol. 32 . p. 203 , vol. 30 . -W. M. will find a treatise on taxi dermy on p. 159, vol. 32.-A.B.R. will find a descrip tion of the process of refining petroleum on $p$,
340 , vol. 26.-J. J. R. will find directions for bronz ing castings, on pp. 11, 85, vol. 33.-J. B. K. will find directions for annealing gold on $p$. 299, vol. 28 .
D. $\mathbf{c}$. $\mathbf{w}$. can cementrubber to cloth with the compound described on p. 203, vol. $30 .-\mathrm{J}$. J. H. should address a manufacturer of air compressors.- L.M.
will find directions for straightening wire on p. 299, vol. 34.-G. W. E. will find directions for ma find directions for making marine glue on $p$. 42 nol. 32 . - A. L. L. Will find directions for making
rubber stamps on p. 156 , vol. 31 . $F$. $B$. should address the manufacturers of the rifle in question E. T. C. will find directions for fireproofing W. P. M., B. O., and others who ask us to recom-
mend books on industrial and scientific subjects, mend books on industrial and scientiffc subjects,
should address the booksellers who advertise in our columns, all of whom are trustworthy firms or catalogues.
(1) J. S. B. s
(1) J. S. B. says: I have a room divided by a partition wall, over which is a space of 2 feet;
and I wish to know how mirrors may be placed so that a person in one room can see a particular point in the other? A. Place a mirror over the partition in such a position that it will reflect the
light coming from the desired point in one room o the observer in the other
(2) A. McC. says: 1. There is an engine in his vicinity $18 \times 24$ inches; it runs at 90 revolutions a minute with 60 lbs . steam, and cuts off at $9 / 8$
stroke. It is estimated to supply about 50 horse power. It takes steam from two boilers, each 4 56 three inch tubes. The grates are $41 / x^{x} 81 / 6$ feet and are set 22 inches from boilers. The bridge wall is 6 inches from boilers, and there is a good draft. This engine requires on an average 11/2
tuns of Illinois coal per day of 10 hours. The tuns of Illinois coal per day of 10 hours. The
company are greatly dissatisfled at the amount of coal burnt, and wish to find some way to reduce it
Is the amount unreasonable? A. Under the con ditions stated, the engine is not working as economically as could be desired. 2. Can you sugges any improvement in the setting of boilers? A.
Before making any change it would be best to find out the cause of the excessive consumption whether it is due to defects of the engine or ine
ficiency of the boiler, and this could only be de termined by experiment.
(3) W. J. McG. asks: 1. When was the in perihelion in January, 1883. 2. Were Mars and Jupiter in aphelion during October, 1874? A. Yes,
Jupiter on the 24th, Mars on the 25th. 3. What Jupiter on the 24th, Mars on the 25th. 3. What middle of the next Platonic year? A. A Platonic year is a period of time determined by the revo is calculated by the precession of the equinoxes is accomplished in about 25,000 of our years. Assuming that the Mosaic record of creation is correct, this world is now near the end of the first quarter of the first Platonic year, and astronomy has not informed us exactly in what position the
earth will be in 30,000 years hence; but from the earth will be in 30,000 years hence; but from two and three degrees less than at the present time.
(4) H. B. asks: How can I calculate at of the present value of 120 monthly payments of mo each, first payment due at the end of one
month? A. We believe it would be necessary to solve this by interpolation, calculating present
values for different rates of interest. Some of our readers may be interested in making the solu(5) J. D. R. says: A brother and myself regard to the king a small steamboat, but differ in regard to the kind of engia inches in diameter, to drive a main shaft at 20 to 25 revolutions per minute. My brother contends that $10 \times 12$ engines, geared so as to make 4 revolutions to one of the shatt, would be best, while I contend that 2 engines $10 \times 48$ inches, atliable to break and use no moresteam. Which iable to break and use no more steam. Which
would you recommend? A. We think your plan is preferable.
(6) M. C., Jr. says: I am using 2 engines on the same shaft, working at right angles to each other) $81 / 4$ inches in diameter and 30 inches
stroke, making 30 revolutions per minute, with an indicated boiler pressure of 85 lbs . to the square inch. How many feet of 2 inch gas pipe (entirely
surrounded by cold water) will it take to condense the exhaust steam from those engines, and leave the water so condensed at a temperature of $170^{\circ}$
Fah.? Can I attach the end of the 2 inch pipe to my feed pump directly, in place of the air pump, and so force the water back into the boiler as fast as it is condensed? A. We do not think you can
make this arrangement work very satisfactorily. (7) S. F. H. asks : 1. What would be proper dimensions for a steam yacht about 20 feet in length? A. Make it of 5 feet beam and 2 feet
draft. 2. What would be the proportions of an engine, boiler, and serew, and the pitch of screw
necessary to drive the boat at a speed of 5 to 10 miles an hour? A. Use a propeller 2 feet in diam es. Boiler should be 28 inches in diameter, 31 feet high.
(8) Y. E. says: 1 . We have twin tubular
boilers, the tubes of which have been in about 4 years, and are now giving out. We have had 3 new ones put in since last summer, all in the lowe ow. They all crack where they are expanded just behind the front boiler head. As I think 40 ou can assign any cause for their falure W use tannate of soda, and the tubes are not badly scaled. We use common tallow in cylinder, and
heat the feed water with exhaust steam. A. It is ot uncommon for tubes to give out in this time ven with careful management ; and as in othe ases they last much longer, the result is common attributed to defective material. 2 . When w once or wide, there is a heavy jarring in the boilers he check valve rattles, etc. I think this is cause by the connecting pipes between boilers and mu rum being too small. Can said jarring injure th
tubes? A. The jarring you speak of certainly no good, and we think it would be wórth your while to have it stopped. 3. How was Mr. L Cooper's boiler of 1 inch gas pipe (described in
No. 13 of your current volume) built? A. Mr cooper will perhaps oblige this and several othe correspondents by replying. . Are self-packing
or steam-packed rings in cylinders generally conidered better than common cast iron rings tight ned with springs? A. There is considerable dif water gage, placed about 6 feet from boiler and connected thereto by half inch pipe with two el-
bows, show the hight of water correctly, or should bows, show the hight of water correctly, or should
the pipes be larger, or the gages be nearer the
(9) W. E. D. says: 1. I have a second hand upright iron boiler, 12 inches in diameter and 4 fee Would it be safe to put in 12 one inch gas lues, and use it for running an engine? A. We think it would answer with a single flue through
the center. 2 . Which way would be the best to set it, upright or horizontal? A. Set it upright. (10) E. A. McC says.
(10) E. A. McC. says: 1. I have for several years used large quantities of peaty muck for manure and the cases from manure while fer menting. The bedding and green muck form consider very valug hirds of my compost, which weeks and turning once or twice. I have now with of peat muck which was put in wet last fall with two wheelbarrow loads of green horse man
ure at the bottom to start the heating. A few days since with thermometer at $40^{\circ}$ outside, pile showed, at 18 inches below the surface, a tem perature of $126^{\circ}$. Professor Kedzie, of the Michigan Agricultural College, says that this brown peat muck, so abundant in our Michigan swamps, is worthless. Is this a fact? A. Professor Ked zie's opinion is very probably correct.
heating benefit or injure it? A. It is to some exent beneficial. 3. Can sulphuric acid be used, on (11) L. H. E. asks: Having the area of a must assume one.
(12) C. D. P. F. says: In a country place we use water from the river, and it is not clear. $w$ pump by steam through some 1,000 feet of pipe to the peculiar formation of the river bank, we had to place the steam pump some 20 feet above the iver, and the question is what kind of filter we a small box filled with sand placed in the cistern and the pipe leading to the house, but it was so small it would not answer. In addition, the iron pipe stains the water; and having been affected by water taken through a galvanized pipe from the well, we are prejuciced against can we clean the iron pipe to water, see p. 267 , vol. 34 . We presume the iron rust shows itself in the water only when the pump is first started, and the water afterwards runs clear. If this is so, you should arrange your pipe with faucets to admit of discharging this discolored
water outside of your cistern, and also to exhaust yourpipe when
then stand in it.
(13) J. O. asks: 1. What is the best mate to use in the division wall of a double house I have tried a brick one, but one can easily hear in
the next house. A. Where you have tried brick your wall was probably only 8 inches thick, and the fioor joints meeting at the center of the wall, If you make the wall 12 inches thick, and place 4 joists, your wall will be tight enough.
(14) J. B. T. says: We have been heating nace in the basement, placed in the center, about 20 feet from the front, with one large register in middle aisle, directly over furnace. The church is only one story high, and the excavation in the cellar, where the furnace is placed, runs across the whole width of church and extends back to the feet square inside walls of cellar, about 4 fet from front. One of these has a trough about $1 \times 2$ feet, running in horizontally, about 12 feet paralle with front wall, for cold air. There is no ventilation in ceiling. Our trouble is that in very cold weather we cannot get the thermometer (placed yet with this abount of heat ban or 00 Fah., yet with this amount of heat below, the air in the
gallery that runs across front of church, about
feet high, is so hot as to be almost unendurable can you tell me what will remedy this? A. Try nicating indirectly with the exterior air; this will enable the heated air in the upper part of the church'to expand, and drive out the cold vitiated air at the bottom.
(15) O. O. J. asks: 1 . Cn the stroke of a by the eccentric? A. Yes, by employing an eccentric having more throw. 2. Which is the most an inch lead, cutting off at one half a quarter one sixteenth lead, cutting off at three fourths stroke, engine running at 80 revolutions a minute? A. Cutting off at the half stroke would be the most economical. Your condition of lead should be just reversed, however, since, the longer the 3. Is common black ofl good to put in a boiler to keep it from scaling? A. Some people recommend it, but the value of an anti-incrustator depends on the quality of the water used.
(16) A. B. C. asks: Will I lose power by belting a saw and grist mill so that the belt wiL
run from bottom of driver toward driven pulley run from bottom of driver toward driven pulley,
and returning on top? A. It is better to run the and returning on top? A. It is better to run the
belt the other way; but the difference, if the belt belt the other way; but the difference, if the belt
is given ample width for its duty, will not be practically appreciated unless the belt is very long, or of very common leather.
(17) J. J. asks: 1. Is it possible to caseharden cast iron? A. Yes. 2. Could car axle journals while in med by the application of any substance tion? A. Not more than they would be by the casehardening which ordinarily takes place on a chilled cast iron or casehardened iron the hardest? A. There is a very little difference in favor of chilled cast iron.
(18) O. D. asks: Why are rubber gaskets injurious to boiler plate? I have several manhole corrode away quite rapidly. What action, if any, does the rubber have on iron? A. Possibly the (10) J. D. J. ase 1. Can (19) J. D. J. asks : 1 . Can the lap on a slide
valve be increased or dimished valve be increased or diminished so as to make it-
cut-off at any point desired, by setting the eccentric so as
No. 2. $\mathbf{Y}$ stationary or portable engine in New York city must furnish a certificate of competency to run an engine. Where can he get the certificate
Inquire at the police station of the district.

## (20) G. S. N. says: My engine is $2 \times 6$ inches

 minute. I wish to drive $a$ lathe whose changes of speed on cone pulley are $6,5 \%, 41 / 4$, and $33 / 4$ inches. What sized pulley must I have on drive shaft to inches in diameter(21) P. F. says: If the packing rings in a cylinder were subjected in their travel at one point to a steam pressure of 275 lbs. to the square nch, and at anothex point in their travel to 75 lbs ., what would be the result in one year's use on a
locomotive running 100 miles a day? A. The packing used u
the most.
(22) G. B. asks: Will glycerin have any meat, fish, etc.? A. No. Glycerin is not injuri-
(23) E. W. asks: 1. In what part of the earth's revolution around the sun is our planet at tronomers? A. The distance stated by the books is a mean between the shortest and longest dis-
tance. 2. How much does the orbit vary in distances from the
$3,000,000$ miles.
(24) Sprague \& Co., Glenwood, Lowa, no your issue of April 15, you tell R. S. Jr. that his engine, of $23 / 4$ inches bore and $51 /$ inches stroke, is
rather too small to drive the engine lathe of 16 nch swing. We have an engine (our own make), of 234 inches bore and 4 inches stroke,that drives a 20 inch swing engine lathe, 6 foot iron planer, drill
press, shop grindstone, and milling barrel for foundery, and about 40 feet of main line shaft all at once, with 80 lbs. steam in boiler. It makes 2200 revoke.
stroke
(25)
(25) H. P. B. says: 1. We have two boilers, one upstairs and one down. Can they be con-
nected so that we can draw from the lower when there is not enough hot water in the upper, for a bath room? A. Yes.

1. Of what are eggshells composed? A. Mostly A. They are used in medicine.
(26) H. A. J. says: We mine clay by sinking large pits, 50 feet in diameter at the surface,
hoisting the clay out by means of a derrick and hoisting engine. These pits are often sunk to a depth of 50 or 60 feet, and our trouble lies in get-
ting out the water. We are now hoisting it out ting out the water. We are now hoisting it out
with a large hogshead, having seen nothing that with a large hogshead, having seen nothing that
we thought was more easily worked. It is impossible to let a steam pump down, as the sides are tell me of any, if broken, woid by hand or steam power, that would overcome the difficulty? $A$. From your description we think you could put in whatis known as a submerged pump,to be worked blevers wherever desired, or a steam siphon or vacuum pump
(27) W. W. S. asks $: 1$. How is carbon, such
as forms in gas retorts, worked into regular shape? s forms in gas retorts, worked into regular shape? A. By sawing. 2. Which is the most powerful el-
ectric battery? A. Grove's battery is one of the ectric battery? A. Grove's battery is one of the
most powerful. The negative element consists of a thin strip of platinum placed in a porous cell
containing nitric acid. An amalgamated zinc cast-
ing, contained in an outer cell nearly flled with water, serves as the positive element. The water is acidulated with from 10 to 12 parts by weight of sulphuric acid.
(28) S. H. K. asks: Can the Gramme mag-neto-electric machine be constructed of hand power capacity, and its light practically adapted to
magic lantern illumination? A. We think not, unless it might be in conjunction with one of Gasonic acid vacuum tubes.
(29) G.H.E.says: $1 . I$ have made a telegraph instrument. I put on the magnet 1,050 feet of No I am sure the wire is on right. I intend it for a re lay, but when attached to a battery it does not
show the least attraction. How many feet and what size of wire should I use for many feet and o be worked with a hundred miles of wire? A.
You need three or four times as much wire to get ood results.
(30) M. A. W. says: I have made a battery with inc zand carbon plates. I ground coke and bon, and used old scrap zinc amalgamated for the other plates. Each is fastened to a strip of pinewood, screw cups rising above for connection.
Both are suspended in a porcelain cup, containing Both are suspended in a porcelain cup, containing
a solution of bichromate of potash, sulphuric a solution of bichromate of potash, sulphuric acid, and water. The zinc is acted upon very per-
ceptibly; but on bringing the wires together,there is no current, nor the leastsign of a spark. Ihave the trouble that was a powerful one. What is the trouble
with mine? A. A battery of that descriptiongives ittle or no spark. If the connections are properly

(31) F. H. M. says: 1. I have a wooden
(3use standing about 600 feet from the sea. In rear of the house, about 15 feet away, is a large rock, and another stands about 10 feet in front. Do you advise me to put a lightning rod on my
house? A. A good rod, properly attached and having a good earth connection, will certainly offer great security to the house. 2. Is any danger from lightning incurred by using the wires of a
district telegraph company A. Theoretically, from this cause.
(32) B. D. asks: Is it necessary, in order to secure the safety of a building against lightning, to have two ground connections? A. If it were
possible to have one ground connection with no appreciable resistance, that would be sufficient. It is better, however, not to depend upon one ground unless you are sure that it is a good one.
Earth connections, as generally made by lightning rod men, are, 9 times in 10, worse than useless.
(33) J. M. says. 1. Please inform me if, in making an induction coil, the primary and secondary coils are connected in any way,or only wound
upon each other, with insulator between? A. They are not; keep them well insulated from each other. 2. Is the battery connected with the two ends of the primary, and the shock received from the two
ends of the secondary? A. Yes. 3. What size of iron wire shall I use for the bunch in the core? A. No. 18 or 20. 4. Will 6 (No. 1) cells of Leclanché's battery be enough? A. Yes, but the circuitshould only be closed for a few moments at a time if the Leclanché battery is used.
(34) F. E. says: 1. I am making an induc-
tion coil and battery. The coil is 8 inches tion coil and battery. The coil is 8 inches long and
intended to be about 6 inches thick. Primary wire is $11 / 2$ inches in diameter, and secondary $\frac{1}{80}$ inch, the sizes you gave in answer to a former quesary 1,200 feet. Primary is covered with cotton secondary with silk. Both are covered with thin narrow strips of cotton and silk respectively, lap-
ping about $1 / 8$ to $1 / 4$ inch, kept tight with a little gallon one cell Grove, Are these proportions right and is the machine strong enough to give good shocks? The coil is $5 / 8$ inch in diameter, and is composed of 80 iron wires. A. You will not get
much spark without greatly increasing the length of the secondary, but such a coil will give severe breaker? A. A spur wheel with spring contact is one of the simplest. One side of the circuit is connected to the wheel, the other to the spring. By turning the wheel, the current is interrupted as the spring falls from one tooth to another. 3 Will a 1 inch wide piece of thin platinum foil be
the correct size for the above battery? A. Yes. 4. Can I make the porous cup of plaster of Paris, very thin, so as to be quite as good as earthen
ware? A. Plaster cups do not answer. Use clay am
(35) A. S. says: Please inform me if a way
has been invented to telegraph a person's own handwriting. A. Yes, teveral. Caselli's pantele graph has been used for commercial business in France. By this syste
can be transmitted.
(36) E. M. R. asks: 1. How can I strength passing each half several times in the same direc tion over the opposite poles of a strongly charged
electromagnet. 2. Why will not a register work electromagnet. 2. Why will not a register work on a long circuit? A. Because the current is to
much weakened by the resistance of the line Register magnets are ordinarily wound for circuits
of low resistance. By rewinding with small wire of low resistance. By rewinding with small wire
and greatly increasing the number of convolutions, they can be made to work very well on long circuits.
(37) C. H. F. s8ys: I have a new constant ment that will give an interrupted current fo medical use? A. A small magnet placed in cir cuit, and connections so made that the latter is
broken every time the magnet attracts its arma broken every time th
ture, might answer.
(38) M. L. L. says: I have observed some lay of forty ohms on a line four miles long, having ve other relays of the same resistance in circuit which seem very peculiar; and I shall be glad if prepared a dark box, as used by Edison in experinenting with the "etheric" force, but instead of
the common pencils I used two lumbermen's pen cils, with points cut square across, which were $1 /$ inch wide and $\frac{1}{1}$ thick. I connected a wire from one of the pencils to one of the main line connectcil to the armature; and upon opening the key noticed through a $8 / 4$ inch hole in the box, a
white spot of light (not a spark) the size of a silver opening circuit; , which was only three times thespot would disappear entirely, and it would require fine adjustment of the pencil points to get the light again. I again tried the experi-
ment with another pencil, the points of which ment with another pencil, the points of which
were $1 / 2$ inch square, and $I$ only got the center were $1 / 2$ inch square, and I only got the center
part or strip of the spot, about $1 / 4$ inch wide. I can get stimilar results by connecting the wire to A. Unless of the relay instead of the line post current, as it most likely was, you have been de ceived jby reflection or irradiation. Further ex Int will make this evident
(39) G. D. P. asks: What chemicals are for receiving dispatches? A. The best solution for this purpose is the following: Water 100 parts, nitrate of am
potassium 5 .
(40) C. A. says: 1. Please give a descrip
tion of the Siemens and Halske galvanic cell. A Siemens and Halske's battery is a modification the sulphate of copper cell. It consists of a glass jar in which a copper disk is placed. Over this is a bell-shaped tube of unglazed porcelain through which vitriol is dropped as required. The jar is
about half flled with paper pulp, and on this is about half filled with paper pulp, and on this cloth. The zinc rests on the paper in a solution of zinc sulphate. 2. What are its internal resistance
and electromotive force? A. The electromotive and electromotive force? A. The electromotive
force is the same as the Daniell's cell, but the re force is the same as the Daniell's cell, but the re-
sistance is considerably higher, though not so high as to prevent the use of the element for local.
(41) A. F. B. says: What is the best form and size to make an electromagnet, not over 3 nches long, to develope the greatest attractive or purpose? With what size of insulated wire should the cores be wound, and about how much should be put in a coil? A. Make a soft iron horseshoe
Use No. 14 copper wire, 160 feet in magn
coil.
(42) A. B. says: 1. I wish to make a magWhat should be the diameter of the core? $A$. This depends upon the battery used. 2. What size of cotton-covered copper wire should a use A.
Use 240 feet of No. 16 copper wire, and two or
three cells of Daniell battery will be found effective.
(43) B. L. asks: 1. In working a foot lathe, spring able to use a lighter fly wheel by flxing Shall I lose any power by applying said spring? A. Yes, a little.
(44) W. L. asks: Can you give me a recipe for a soldering liquid that will mix with oil?
We do not know of any such preparation.
(45) H . and H . ask: Can you give us a re-
cipe for bleaching chair cane? A. Have you tried cipe for bleaching chair cane? A. Have you tried
sulphurous acid or chlorinated lime? If the cane sulphurous acid or chlorinated lime? If the cane
be freed from grease by a little solution of carbo be freed from grease by a little solution o
nate of soda, there should be no difficulty
(46) A. W. asks: Is there any way of taking the stain out of red or stained cotton with-
out injury to the staple? A. Send us a piece of out injury to the staple? A. Send us a piece of
the goods in question, plainly marked with your the goods in questio
(47) J. H. H. asks: Is there a liquid, soluto tin and insoluble in linseed oil? gether in an iron pot equal parts of pitch and gutta percha. Use while hot.
(48) J. C. R. asks: How can kerosene
stains be removed from marble? A. Cover the stain with hot pipe clay and allow to cool gradual1. Kepeat the operation if necessary
(49) A. S. asks: How can I keep oil paint, used on flags, soft, so that the paint will not break
when perfectly dry? A. Try the following: Diswhen perfectly dry? A. Try the following: Dis-
solve $2 / 2 \mathrm{lbs}$ good yellow soap in $11 / \mathrm{g}$ gallons boilsolve $21 / 2$ lbs. good yellow soap in $11 / 2$ gallons boil-
ing water, and grind the solution while hot with ing water, and grind
$11 / 4$ cwt. good oil paint.
(50) W. R. H. asks: 1 . What is there in tubing? A. Kerosene oil partially dissolves rub-
ber. 2. Can any substance be added to the oil to counteract the effect? A. There is nothing that
can be added to the oil that will prevent this action.
(51) M. F. G. asks: Please give me a recipe for making black ink, with a rich gloss. A. A
fine gloss may be given to any good black ink by ine gloss may be given to any good black ink by
the addition of a suitable quantity of sugar. Fo the preparation of inks, see numerous recipes in back numbers.
(52) E. H. asks: What is the proportion of the compound salts used for the bichromate bat
teries? A. In 1 gallon of water dissolve 10 ozs. bichromate of potassa; to this add 1 pint of strong
(53) R. M. A. asks: Can you give mea simple and effectual solvent for paint? A. Rub quickly over the surface a strong solution of po-
tassa in alcohol, and rinse immediately in water to tassa in alcohol, and rinse
remove traces of alkali.
(54) W. H. A. asks: What can you recomare now using in three rotary ovens,which require light inside? A. In a somewhat similar case, we
have known a good variety of coal oil to give sat-
(55) N. A. W. says: I have been trying to hermetically seal tin cans containing cold fruit, after exhausting the air with an air pump; but the
air rushes back into the can. How can I successfully and perfectly perform the operation? A. Solder a tube made of some easily fusible alloy fill the vessel with the fruit, and seal canery othe opening except the tube; place the open end of the tube in connection with the vacuum cham ber of the air pump, remove as much as possible
of the air, and, by the application of a hot flame
or iron, close the tube close to its junction with the can.
What is caustic ammonia? A. Spirits of ammonia (spiritus ammonice causticce) is prepared by cohol) which absorbs it. Caustic ammonia, liquor of ammonia, or aqua
(56) J. D. McC. asks: Is there any chemitaken from coal oil without destroying the virtue of the oil? A. Agitate for some time with strong
oil of vitriol, wash with clean water, and finally gitate with lime water, and allow to settle.
(57) J. E. P. says: One of your correspon-
dents was good enough to advise me to use gum dents was good enough to advise me to use gum
tragacanth with white pigments, and to spray with tragacanth with white pigments, and to spray with
caoutchouc dissolved in naphtha. I find the latter makes a dirty solution, and I have no guide as to
proportions. How is this solution prepared? A. In order to facilitate the solution of the caoutAllow solution to go on for about 12 hours; strain through a linen cloth, dilute largely with fresh naphtha, and filter through clean filter paper. If
the solution is too dilute, allow it to evaporate untall of the required strength, which experiment will best teach you. We do not think this preparHow a commercial article.
How are the figures of ferns and other flowers
produced on fine muslin? I have heard that the spray or atomizer is used for this purpose. Can you give me the process? A. Use an atomizer
(58) C. H. K. asks: I send you some samcovering furniture, but are not waterproof enough for outdoor work. I use glycerin in the cles it draws the glycerin out, and, when dry again, the surface cracks. Can you tell me any way of avoiding this? A. Try dipping for a mo-
ment in a clear but weak solution of caoutment in a clear but weak solution of caout-
chouc, and allow the solvent to evaporate in the air. By this means a delicate transparent film of the cloth.
(59) A. G. N. asks: 1. Would galvanized iron rope be suitable for a lightning conductor?
A. Yes. One about half an inch in diameter is A. Yes. One about half an inch in diameter is
preferable to smaller sizes. 2. How should the preferable to smaller sizes. 2. How should the point be joined to the wire, and of what material
should the point be composed? A. Points can be made of any metal; galvanized iron points answer very well, and may be fastened by soldering.
(60) W. B. C. says: My cistern water has suddenly become very hard. How can I soften it? A. Try the addition of a little lime water.
This will decompose the bicarbonate of lime held This will decompose the bicarbonate of lime held in solution, and fall with it to the bottom as an in-
soluble powder. Allow to settle for a short time soluble powder. Allow to settle for a short time
before using it. Experience will teach you the
(61) J. F. asks: What is resorcin, and how it made? A. Resorcin $\left(\mathrm{C}_{6} \mathrm{H}_{6} \mathrm{O}_{2}\right)$ is a compound and homologous with orcin. It is obtained by the action of melting potassa upon galbanum, a gum
resin imported from Africa. To prepare it, the resin, freed by alcohol from its gummy constituents, is fused with $21 / 2$ to 3 parts hydrate of potas
sium till the mass becomes homogeneous. Water is then added, the liquid acidulated with sulphuric acid, and flltered when cold; the flltrate shaken two or three times with ether; the ethereal solution distilled, and the residue, after being evapor-
ated to a certain extent over the water bath, is iuated to a certain extent over the water bath, is in-
troduced into a retort and distilled over an open troduced into a retort and distilled over an open
fire. The frrst portion of the distillate is watery liquid passes volatile acids; but aftedias in radiating crystals. The product may be freed from adhering volatile acids by dissolving it in a small
quantity of warm water, supersaturating with baquantity of warm water, supersaturating with baryta water, and again agitating with ether. On
removing the ether by distillation,there remains a removing the ether by distilation, there remains
sirupy liquid which soon crystallizes, and may be further purifled by redistillation. Resorcin is very sulphide of carbon and in chloroform. It crystal lizes only from very concentrated solutions,in tab-
ular crystals or short thick prisms. When first prepared it is quite colorless, but acquires a fain
(62) P. R. asks: What will cure cancer in a child's mouth? A. We believe your trouble is cancrum oris. It occurs in children of debilitated
habits, between the ages of two years and five. "The symptoms are generally these: The child is out of health and evidently weak, and on one the cavity of the mouth, a whitish or ash-colored eschar is seen in the center of the cheek, which gradually increases until the slough has spread over the whole of the interior of the cheek, lips,
and gums. The saliva is copious, and horribly fe and gums. The saliva is copious, and horribly fe-
tid. There is great constitutional disturbance; pulmonary complications are very apt to arise
and the disease frequently ends fatally. The
treatment consists in the application of the nitrate
of silver to the slough, in frequently syringing the of silver to the slough, in frequently syringing the
mouth with solutions of chloride of zinc or chlor inated soda, and in the free administration of
strong beef tea, wine, or brandy, and chlorate of potassa in decoction of bark."-Tanner.
(63) H. L. S. asks: How can I find the most
favorable spot for an artesian well? A. The only way in which a question of this kind can be settled any reliable work that teaches how this practical method can be avoided.
(64) A. E. P. asks: Is the pressure on a dam increased by the amount of flow back from the dam, or is it increased only by the perpendicu-
lar hight of the water? I claim that it makes no difference as to the amount of flow or water stored, but a friend thinks it does. A
right, as we understand your question.
(65) F. M. J. asks: 1. If a flue in an up right tubular boiler springs a leak under water,
and we plug both ends with the flue in the boiler, is there any danger of the plugs boiling out? A. Yes, unless they are secured by a bolt passing
through the tube. 2. Is the pressure in the flue greater than that in the boiler? A. No.
(66) G. C. says: We have an engine $8 \times 16$
inches, carrying 60 lbs. pressure. How fast should we run it for economy? A. At from 140 to 150 revolutions per minute.
(67) E. L asks
(67) E. L. asks. 1. How can I draw a normal to an ellipse, from a point located outside of
the ellipse? A. Draw straight lines from the the ellipse? A. Draw straight lines from the
point to the foci of the ellipse. The line bisecting the angle, so formed at the given point, will be the explained in any rood treatise on conic sections. (68) G. W. M. says: 1 . I have a boat, 18 eet long and of 6 feet beam, with a propeller of 14 inches diameter. Can I run the boat with an engine $3 \times 31 /$ inches, and a boiler 30 inches long
and 24 wide? A. The propeller is rather too small. 2. What size of steam pipe should $I$ have? A. Steam pipe $3 / 4$ to 1 inch in diameter. 3. How fast
can I expect to run her? A. You may realize a can I expect to run her?
(69) J. T. asks: 1. What is the difference between a high and a low pressure engine? A. One has a condenser, and the other exhausts into
the air. 2. Why will a low pressure boiler, carrying 40 lbs . steam, run a boat as well as a high
pressure one carrying 130 lbs . steam? A. You must be mistaken in your statement. Can you verify it?
(70) $W$.
(70) W. H. says : I wish to construct a water engine to run a screw-cutting lathe of 9 inches swing and 4 feet bed. Our hydrant water has a force of 64 lbs . per square inch. I have been insteam engine, but with enlarged ports. Is this so? A. A wheel would make a more efficient engine. There are numerous forms of water engines in the
market, and it would be well for you to address market, and it would be well for you to address
(71) J. H. K. says: I have been runring an
engine and boiler for 7 years; the boiler is tubuengine and boiler for 7 years; the boiler is tubu-
lar, and I find that, where the steam goes direct lar, and I find that, where the steam goes direct
from the steam chest into the heater, there is an ncrustation on the lower part of the boiler The boiler becam 189 to 2 inc The boiler became cracked in two places, and
commenced leaking. I then took out the boiler,
examined it closely, and found that the flues of examined it closely, and found that the flues of the boiler were entirely surrounded or covered
with a lime sediment. Can you recommend any with a lime sediment. Can you recommend any
thing to put into the water to prevent the accuthing to put into the water to prevent the accuand to take off the present sediment from the flues? A. We would recommend you to blow off some of the water, at least once a day, and about
once a month clean the boiler, letting the water once a month clean the boiler, letting the water
run out, twelve or twenty-four hours after the fire is hauled.
J. R. says: I have an ordinaly furnace in the basement of a 3-story house. The fur nace has a sheet iron cover, which becomes hot
and radiates in the cellar. Could I check the radiation by blanketing the cover with asbestos or (78) A . A . Yed
(73) J. A. says: Three plain cylinder boil-
ers, side by side, were 30 inches in diameter ers, side by side, were 30 inches in diameter and
40 feet long, with a 3 inch water connection at the bottom, and a steam drum on top, 8 feet long and 20 inches in diameter, w safety valve in centith drum, 8 inches above the top of the drum. They
were flled up to the safety valve, and then the pressure was put on up to 85 lbs. on the inch. One joint leaked so that we had to make it afresh; it was under the safety valve casting; after tak-
ing off the weight, the engineer said that two or ing off the weight, the engineer said that two or
three barrels of water ran out of the valve, and the valve was the highest point of the boilers. 1 verifled this myself. Can you explain this? A. From your description it seems probable that,
while the boilers were being tested, they were while the boilers were being tested, they were
stretched or distorted considerably, so as to have stretched or distorted considerably, so as to have
greater volume, and that, when the pressure was greater volume, and that, when the pressure was
relieved by raising the safety valve, the boilers est pacted and the water poured out at the highest point. We have frequently called attention to and always recommend that the boiler be filled with water and gradually heated.
(74) R. E. H. says: If a lever be placed
ith one end on a solid block, the other on scales and a weight be a soid block, the other on scales, and a weight be suspended from center of lever if $I$ move it nearer to them, and less if I move it the other way? A. Yes.
(75) J. W. O. asks: Several of my friends say that the closer a horse (or any other animal) I cannot see why the draft increases with the dis tance, except by the adaitional weight of chain or rope, and friction on the ground, if it
ground. A. You have the right idea.
(76) F. E. K. says: We have two new boilare: Length, 22 feet, daumeter 44 inches, thicknues of shell $3 / 3$, of heads $1 / 4$ inch, with two 16 inch flues.
The heads are stayed with 5 stay rods and 20 sta The heads are stayed with 5 stay rods and 20 sta olts. They are built of C. H. No. 1 iron. Ther What is the greatest presure at which it would be safc to run them: A. From 50 to 60 lbs .
(77) H. K. says, in reply to I. F. F., who lieve the well at the St. Louis county insane asylum is, being 3,337 feet deep. At the depth of 3,545 feet he thermome
(78) J. R. F. says, in rep y to J. J., who plowing a circular field, beginning at the center Let $l=d i s t a n c e$ between horses, $r=$ radius of ircle plowed by inside horse, and $n=$ number of horse is plowing around a circle with a radius, $r$ the outside horse is plowing round a circle with adius $r+d$, and the distances traveled by each re pectively are $12 \tau$ and $(r+(1), 2 r$, and the difference $d 2 \pi$. The total diff erence, for $n$ times around, is ravels in the track of the outside hore the firs time, and so on for each succeeding time until the last time around, when the outside horse makes a track of the radus $r+n d$, which the inside horse does not travel; nether does the outside hors travel in the track of the radius $r$, made by the in-
side horse in the first time around. Hence the diference in the distance traveled is $(r+n d) 2 \pi-r=2$ $=n d 2 \pi$, the same as above. This, it will be ob served, is simply the difference between the dis tance which the inside horse travels the first time around and that which the outside horse travel

解 examined, with the results stated:
H. A. W.-We do not think that yon would sue ceed in the artificial production of the mineral, ven if you had the exact composition. Send $u$ J.-Send us a sample of the tin powder used in ectrotypy,-W. C. s.-They are scales of used in posed mica with oxide of iron.-Rev. J. McC.-The bolt does not appear to be well made, nor of superior iron.-L. L.-It is black oxide of manganese, containing copper.-J. M. G.-It contains sicarbonate of lime, and carbonate of magnesia, V. M. T.-It is sulphide of iron.-E. P. C.-It is ron pyrites.-W. W. J.-It is difficult to say, with ut making a lengthy chemical analysis, why you iron pyrites.-F. W. B.- It is a coating of oxide of zinc. It does not injure the zinc, but rather tend you can coat the interior of the refrigerator with paraffin.-W. B.-They are well crystallized sulphate of lime or gypsum. They are sometime found 10 times as large as those sent, and as limpid as pure watcr. Have you found any such?-R. D.
B.-We are unable to account for the scaling. The metal appears tough, close grained, and bright a red oxide of been rolled cold.--J. w. . -No. 1 is is silex with black oxide of iron.-W. T. C.-No. is the sulphate of baryta. No. $2:$ The powdered mineral contains the carbonates of lime, magnesia, and iron, with some silicates of alumina and silex.-J. E. L.-We did not detect arsenic.-T. S L. G.- We child in specimen sen It was mostly iron pyrites.
J. B. F. asks: corn burr and sheller? ? $\mathbf{w}$. E. T. asks: How can bear grass be prepared for mar ket?-E. P. W. asks: What is a cheap material for small balloons, from 1 foot to 10 feet in diameter Could tissue paper be made to answer by covering
it with balloon varnish or some other preparation

## COMMUNICATIONS RECEIVED.

 The Editor of the Scientific American acoriginal papers and contributions upon the follow ing subjectsOn a Remarkable Cloud. By J. P. N.
On Sunday at the Centennial. By J. E. F. On sunday at the Centennial. By J.
On the Imponderables. By W. T. Q. On Sugar. By
Also inquiries and answers from the following:


## B. H. P. - F. - B. H. C.-S. N. M.-U. V. W.

espondents whose inquiries fail to appea Could repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.
Enquiries relating to patents, or to the patenta bility of inventions, assignnents, etc., will not be
published here. All such questions, when initials only are given, are thrown into the waste basket as it would fill half of our paper to print them all but we generally take pleasure in answering briefly by mail, if the writer's address is given.
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the column of "Business and Personal," which is the column of "Business and Personal," which is
specially set apart for that purpose, subject to the specially set apart for that purpose, subject to the
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Bale ties, G. S. France Bale ties, G. S. France................................6: Basin or sink plug, wash, F.............. Belt tightener, F. D. Green. Binder, temporary, T. J. Crichton Binder, temporary, W. B. Re
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|  | Gas generator, carbonic acld, J. Graber Gas, making, W. H. Tupper. |
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|  | Gas stove, . . J. Caldwell (r). |
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