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

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NEW YORK, MAY 31, 1873.

## GRAIN BINDER ATTACHMENT TO HARVESTERS.

We present, in the accompanying illustrations, a new at tachment for binding grain on the harvester, immediately after it has been cut, which, it is claimed, operates without any more attention than is necessary to throw the twisting and binding mechanism into or out of gear. The sheaf is held in jaws until a band is twisted from a portion of its straw, then it is turned, rotated, and the tand wound around it, secured, and finally the finished bundle is released from the machine.
Fig. 1 is a perspective view, showing more particularly the devices for holding and manipulating the sheaf. Fig. 2 repre sents the band gatherer and twister, and Fig. 3 section of the bundle with the straw rope partially around it. The rake is ar ranged on the endles chain, A,operated by means of the gearing at H, Fig. 2 in the plarm of the har drawing wheols and ha suitable cutter and finger bars, with mechanism for operating and adjusting the same. The sickle is placed at B, Fig. 2.
In describing the essential portions of this invention, we shall first refer to the twister, depicted in our second figure. On the ends of the rake platform is supported a longitudinal, horizontal frame, $C$, for the purpose of holding and guiding a sliding car riage, $D$. A horizontal shaft, E , is hung length wise in this frame and con nected by the gearing, $F$, with the driving mechan ism. G is a bevel pinion which, while fitted upon the shaft, E , so as to slid
ine with the pivot, and which supports two horizontal bevel $\mid$ same into a band, as represented in Fig. 2. When the car wheels, as shown. The lower bevel wheel engages with a riage has traveled far enough to form a rope of requisite similar wheel which is on a horizontal shaft, $U$, which has length, the clutch, $M$, strikes a suitable atop, and is thrown its bearings in the plate, $Q$. The upper bevel wheel mesh a into another mounted on a horizontal shaft, V, Fig. 1 hanging in the frame of the harvester proper. By means of the clutch, at $W$, the wheel on the shaft, $U$, is thrown into or out of gear. $X$ is another shaft connected with the shaft, $U$ by the vertical gearing shown, which is in line with the cen ter of the ring, R, and holds a pair of jaws, $Y \mathbf{Y}$, which ex ength, the clutch, M, strikes a suitable stop, and is thrown dinal motion of the carriage. The wheels, $C^{\prime}$, are now thrown in ${ }^{\prime}$, ${ }^{\prime}$, as as io turn the turret and with the $Q$, , is C , as in Fig. 1. The pendent frame, I, is then, by suitable
mechanism, swung outward into position, and so supported, mechanism, swung outward into position, and so supported,
by a lever before mentioned, that the shaft, N , holding the band, is thereby thrown


## GRAINFBINDER ATTACHMENT FOR HARVESTERS.

 higher and in proper line with the middle of the sheaf. The clutch, W, is next moved to throw the shafts, $U$ and $X$, into gea and have them revolved Thereby the sheaf is rota ted in the direction of the arrow, Fig. 3, winding th band around it and pullin band around it and pulling at the same time the car riage, D, back. The end o the band is then tucked un der by the tucker, $D^{\prime}$, Fig 1 , which consists in a slot ted plate connected with lever and arranged in th position shown. When the lever is swung, the end of the tucker, forming a claw for embracing the bo.nd, is carried down and ahead and thus operated. The slide, $\mathrm{A}^{\prime}$, is next moved to open the jaws and discharg the sheaf the cradle the sheaf, crade is swung round into line with tre for C , to grain for another sheal and the lever holding th shaft, N, outwards, is tripped so as to allow the perdent frame, I, to com in line with the center of the cradle for forming an other band.Patented through the Scientific American Paten freely thereon, is connected so as to revolve with it by means |tend within the ring, holding curved clasps, Z, Fig. 3, within |Agency, May 30, 1871. For further particulars address the of a groove and feather. Between the pendent arms of the carriage, which are fitted over the shaft, E , there is arranged upon the latter, besides the pinion, $G$, above referred to, a frame, $I$, and between the parts of this frame another pinion, $J$, which, with regard to the shaft, $E$, is connected in the same manner as the first mentioned pinion. The pinion, $G$, meshes into the teeth of a bevel gear wheel, K, mounted upon a vertical shaft that hangs in the carriage. Loose upon this shaft is a pinion, $L$, which engages with the teeth of the horizontal rack shown, as constituting
C. Whenever, by means of the clutch, $M$, the pinion, $L$, is thrown into gear it will, by its connection with the shaft, E , be revolved and roll on the rack, imparting longitudi nal motion to the carriage. In place of this arrangement of rack and pinion, the inventor states that an endless chain may be substituted thus accomplishing the same ob ject with less working parts. The pinion, $J$, by the intermediate gear ing rapresented, actuates a horizon tal shaft, $N$, hung in the frame, I the rear end of which, $O$, carries a series pf hooks or other projections for twisting the straw. The frame, 1 , is either suspended directly from and hangs with the shaft, N , be neath the shaft, E, or it may be swung to one side by a suitably arranged lever fitting against a rail in the frame, C. By means of a clutch, at P, Fig. 1, which connects with the system of gearing, $F$, the above described apparatus may be readily thrown into or out of use.
To the rear end of the rear platform, Fig. 1, and about in line with the frame, $C$, is pivoied a horizontal plate, $Q$, which is the bed for the sheaf holder. This plate, for purposes to be described, can be swung in a longitudinal direction, as in Fig. 2, or laterally, as in Fig. 1. Above the pivot, and affixed to the plate, is a vertical ring, $R$, above which again is the turret, $S$, surrounding an upright shaft. T. Fig. 2, which is in


The above details being understood, the operation of the machine is readily followed. Grain enough for one sheaf is, by the rake on the chain, A, swept into the cradle while the same is in line with the frame, $C$, so that the straw will be held in the jawe, Fig. 2. Then the carriage, D, is thrown into action by the clutch, at $P$, so that it will move forward on the rack; but before so moving the pendent frame, $I$, hanging straight down, has the hooked end of its shaft, $N$, inserted in the butt end of the sheaf and revolved. As the carriage is moved ahead, the twisters continue to revolve and draw straw from the center of the sheaf, twisting the feated by its youthful rival.
inventor, Mr. Charles G. Dickinson, Poughkeepsie, N. Y. the same. On the shanks of these jaws is fitted a slide, $\mathrm{A}^{\prime}$, Fig. 2, by means of which they can be opened or closed at will On the uper part of the turret is shown a large bevel wheel, $B^{\prime}$, with which the whecls, $C^{\prime}$, on the shaft, $V$, engage whenever the turret, and with it the plate, $Q$, is to be turned. When the wheels, $C^{\prime}$, are not in gear, but the shaft, $V$, is ro tated by suitable connection with the main driving gear of

A new New Watering Cart.
A new watering cart, or van, has lately been put in operation in London. It consists of an iron tank, 7 feet 3 inches ong, 4 feet 6 inches wide, and 2 feet 6 inches deep, which olds 450 gallons of water. The tank is munnted on spring and carried on four wheels with light hinged shafts, and the whole of it is painted in bright colors. The distributor and branch pipe are on the improved principle, which admits of the outflow of water being regulated to meet the varying conditions of streets and weather. An interesting competi tive trial has taken place in Regen street between this machine and the old watering cart. The pair were filled and started from a stand post by Han over church, and the object whs to ascer tain the area of ground the water from each would cover. The two vehicle proceeded on their way towards the Re gent circus till they reached Newman' yard, where the cart, having made all the running it was capable of, "com pounded," while the van,"still going wel within itself," proceeded as far as the circus, and returned up Regent street to Air street, where it finally gave out The width of spread of the water from the van was twenty-three feet, that of the water from the cart being sisteen feet. By measuremen of the plans at the Vestry Hall after the trial, it was ascer tained that the van had traveled 2,640 feet, and had spread its water over an area of 60,720 square feet, while the cart had traveled only 1,440 feet, and had covered only 23,040 quare feet. The older machine has thus been signally de

According to Dr. Wallace, of Glasgow, the mortal used in the construction of the great pyramids of Egypt was com posed chiefly of plaster of Paris-hydrated sulphate of lime

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MUNN \& CO., Editors and Proprietors pUblished weekiy at
NO. 37 PARK ROW, NEW YORK
O. D. MUNN. A. E. BEACH.

vOL. XXVIIL., No. 22. [New Series.] Twenty eighth Year.
NEW YORK, SATURDAY, MAY 31, 1873.


## minING sCHOOLS AND COLLEGES.

In view of the vast and apparently inexhaustible minera weillt of the United States, and the necessity which mani festly exists for wider knowledge in the sciences pertaining
to its exploitation, the question has for some time past been to its exploitation, the question has for some time past been
under discussion whether the future development of our under discussion whether the future development of our
mines would be materially promoted and the great indusmines would be materially promoted and the great indus
tries which are based thereon furthered by the estallishmen of a national school, under government auspices, which should form a nucleus for all information relating to mining pursuits, and thus afford to the student an education which for practical value and extent, could not be gained in smaller and less favored institutions. The project is one which has met with much approval from a large class who, convinced that the inculcation of sound principles relating to the pro fession of the mining engineer could be best thus effected and that the present tendency toward wasteful and reckless systems of mining could be thus in a measure averted, have strenuously urged the matter upon the consideration of the general government
While admitting that such a scheme, based on so broad foundation, is by no means destitute of material advantages it nevertheless appears to us more probable that the benefit sought can be attained with greater surety through the estab lishment, in preference, of local schools of a similar nature It cannot be doubted that the proper situation of a nation al institution would form a matter of discussion, and perhap remain always a mooted point: one, indeed, which would inevitably give rise to sectional dissension between the advocates of the coal pits and the gold mines, the Atlantic and the Pacific slopes.
This, however, aside, it is questionable whether a single institution, necessarily widely separated from the majority of its points of advice, would be able to receive, ordinate and pply information gathered over so large and diverse an rea with that efficiency which could be secured in smalle colleges located directly upon the field. Clearly, we think, the latter would in this particular have as decided an advan-
tage as the present numerous local weather stations would tage as the present numerous local weather stations would $l$ ossess over a single central bureau for the study of meteorology. The nature and situation of our mines, their mode of exploitation, and the treatment of their several yields widely difer. In varying localities, even where ores are ex tracted for the same metal, it is more advantageous to study the work in the place where it is to be practised. The best method for obtaining silver from a Nevada ore is not always the mëst efficacious for one of Colorado; the graduate of one of our eastern mining schools, bristling with theories and crammed with book knowledge, too often finds that he has much to unlearn when he begins his actual experience in the West, and, to him at least, the fact is sufficiently eviden hat many hours of fruitless toil might have been saved had he acquired the theory of his profession while studying its practical workings. The Royal Schoois of Mines at Berlin, at Freiburg in Saxony, and at Clausthal in Prussia, certainly produce raen of high culture, but only the latter two graduate really practical miners, metallurgiets and engineers. Practice alone degenerates into empiricism, while theory, pure and simple, singly is helpless ; hence it is in the combi nation of the two that the most useful knowledge is to be gained. This learning, through territorial schools, maintained not by national but by state funds, should, we believe, be first acquired. Each institution could then pursue un trammeled that course of study best adapted to its geo graphical and geological position, transmitting the results o its observations to a central national bureau, for statistica eferenco and comparison with those of others; while th student desiring to follow any particular branch of mining
could select the seminary best situated for the imparting of could select the seminary
the instruction required.
by learning of the foundation of a school of mines at about a mile from Golden City, at the base of the Rocky Mruntain (latitude $39^{\circ} 40^{\prime}$ ), in Colorado Territory. Professor E. J Mallett, of this institution, whose experience we may her remark leads him to the adoption of views substantially the ame as those above advanced, informs us that its site pre sents every facility for the practical training of the mining engineer. The university, of which this school is an integra
portion, comprises three fine buildings; two of which are de portion, comprises three fine buildings; two of which are de
voted to theology and the classics and the third is exclusive voted to theology and the classics and the third is exclusive
Iy set apart as an academy of the physical sciences. Being ly set apart as an academy of the physical sciences. Being
less than a mile from the terminus of the high grade railway the principal mines and metallurgical works of the territory are within easy communication of the students, thas afford ing especial advantages for study in the field.
We trust that this institution will be the precursor of many others of its class in every mining district, as we believe that the establishment of such colleges cannot but tend, through the acquirement and dissemination of valuable knowledge largely
nation.

## experiments on the strength of materials

 Valuable results are anticipated from a series of experi ments undertaken by Professor Thurston, at the Steven Insticute of Technology, upon the strength of materials We recently gave a summary of the results of the experi nents upon woods, as reported in the Journal of the Frank lin Institute, for April.Work has now been commenced upon the metals, and the Professor desires to obtain samples of all well known brands the specimens to be 3 inches long, and of 1 inch round bar or 4 and $\frac{7}{8}$ equare bar, with, in each case, statements as concise as possible of the ores used and method of manufacture of the sample, with the understanding that the results may be published. The specimens may be sent to the Institute at any time. The work will le interrupted May 24th, and du ring the absence of Professor Thurston to attend to his duties as a member of the United States scientific commission to Vienna, but will be resumed on his return in Septem ber next.
We noticed a specimen of Ulster iron taken from open market, which had twisted to the limit of the machine, over $00^{\circ}$, without breaking off. The specimens are turned down in the middle, the neck being 1 inch long and $\frac{f}{8}$ nch diamter, by Whitworth gages.

## rights of purchasers of patented articles.

We published last week the decision lately rendered by Judge Sawyer, of California, in the case of McKay vs Wooster. Those who are in possession of an exclusive state county or other territorial right to make, sell and use a pat nted machine or patented article, of any description what oever, will be interested in learning that it is now settled by the decision of more than one United States circuit judge that the purchaser of such a machine or article within the
territory of one exclusive licensee may sell or use it within territory of one exclusive licensee may sell or use it within
the ter ritory of any other exclusive licensee without liability to an action for infringement. It amounts in a nutshell to this: The exclusive licensee for one county cannot lawfully sell or use in the county of another exclusive licensee, bu the purchaser without condition of the machine or article from such licensee can lawfully use or sell it in the territory of the other licensee.
With the present construction of the statute, exclusive licensees may take undue advantage of each other. It would be wise, therefore, in many cases to seek, ihrough the grant ors of territorial righte, the placing of restrictions on those working adjoining territory, so that neither licensee would ell to parties whose only intention at time of purchase wa to resell or use in the territory of the other.
The decisions so far made on the point proceed on the ground that, the machine or article having passed to the hands of the purchaser without condition, it is no longe within the limits of the monopoly, and hence such purchaser is not restricted in the use of the machine or article either as to duration of time or place. The Supreme Court of the United States has passed upon the lawfulness as to duration hines for any ming the thats origal the of patented but not as to place of use. No case has there been decided involving the question whether the purchaser witheut condition, from a licensee restricted as to place in making, using and selling, may lawfully use or sell the patented articles so purchased outside of such restricted territory. It is, how ever, foreshadowed, by those cases which involved the righ of purchasers to continue lawfully to use through any ex ended term of a patent, that the decision of the court of las resort would be in the affirmative on this question
the precise point to come before them for review.

## the new philadelphia steamships.

Under the heading of the "Loss of the Steamer Atlantic," we recently printed a resume of the views of several corr3s ondents regarding the construction of sea going vessels, eter," in reference to aileged serious faults in the building of he ships of the new American line lately established between Philadelphia and Liverpool. Since the date of the issue con taining the above, we have received a communication from Mr. B. H. Bartol, an officer of the company owning thes teamers, in which the strictures of our correspondent ar explicitly contradicted. We are informed that the vessel have been superistended from the keel upward by an expe-
rienced engineer from the Clyde, that $\$ 2,500,000$ is invested rienced engineer from the Clyde, that $\$ 2,500,000$ is invested
in the enterprise, and that the confidence of the proprietors in
the construction of their ships is such that the usual precau ion of insurance is deemed unnecessary.
We take pleasure in makiag this correction, as the state ments of our correspondent, doubiless honestly based on a misapprehension of facts, were such as to engender a feeling of public regret that so laudable an endeavor toward the re establishment of our commercial prosperity should have its nception under such unfavorable auspices. The pionee essel of the line, the Pennsylvania, we notice, has recent y accomplished quite an extended trial trip, satisfactorily proving her capability and efficiency for transatlantic rvice.

## THE VIENNA EXPOSITION-.-APPOINTMENT OF

 NEW COMMI8SIONERJackson S. Schultz, Esq., of New York, an energetic, tal ated and distinguished merchant, has been appointed United States Commissioner at Vienna, in place of Van Buren emoved. Commissioner Schultz is a gentleman of rea ability, and under his auspices the American departmen will doubtless assume as creditable an appearance as is posible under the circumstances. He is authorized to restor hose of the suspended commissioners who were not con nected with the disgraceful schemes of corruption
The New York Sun says that, if reports are to be credited the Vienna exhibition has not so far proved successful. The Viennese were in too much of a hurry to empty the pocket of strangers, and the report of their exorbitant charge pread far and wide. The bills of fare at the hotels have been increasing from day to day, a dollar and a half bein he latest charge for a tolerable breakfast, and twenty cent or getting boots blacked. Americans will be interested i the announcement that the proprietor of a hotel built ex pressly for transatlantic visitors openly avows his intention o get all his money back during the season of the exhibition. Extortion seems to be the order of the day in Vienna, and fter all it may not have been all native corruption that in fected our commissioners.

## THE NEW YORK POST OFFICE.

In the number of its substantial and costly bueiness struc tures, New York city has always been conspicuous, but the new post office and court house building, now being con structed in the southern portion of what has for years bee nown as the City Hall Park, promises to overshadow al buildings hitherto erected in New York, if not in the coun try, when considered with reference to its architectura beauty, its complete adaptability to the purposes for which it is designed, the excellent workmanship put on all its details, and the number of modern improvements which have been and are to be introduced. The Drexel building, at the orner of Wall and Broad streets, which has been just opened for business, is, for the purposes for which it was designed ne of the most beautiful structures in the country, but it could be placed in one corner of the new post office, and many of the arrangements for lighting, heating, ventilation tc., which would answer for a building of such size, woul be useless in one of the great extent of the larger building n the architectural work, also, the difficulties were much greater, owing to the irregular shape of the land on whic he building was to be placed, which is almost a triangle he frontage on Broadway being 340 feet, looking dow Broadway 130 feet, on Park Row 320 feet, and looking to ward the City Hall 200 feet. The entire area covered is bout one and one quarter acres, and this space, for the cel ar, basement, and entrance floors, is unbroken by any inte ior walls, the supports for the upper stories consisting of 22 cast iron pillars for pach (cellar, basement and entrance) loor. These pillars are 18 inches in diameter each, the iron eing 24 inches thick. There will be four stories from th ground up, beside the high Mansard roof ; the cornice will be 20 feet above the sidewalk at the lowest parts, and the ront elevations will be considerably higher, according to th elevations of the design on the corners and in the middle o each façade, beside the domes on the northern and souther fronts, which will tower high above the main building In every detail of the building, all the latest contrivance or making the work substantial and of the best quality have been studied. The roof will be of copper, with two corruga tions in each sheet to allow for expansion and contraction by heat and cold. Numerous substitutes, less expensive, have been urged upon the superintendent, but this was decided upon as most perfect and durable. Each window will have fireproof shutters made of a composition somewhat lighte han fire brick, and which has been tested up to a whit heat without showing any change. These shutters will be taken up by cast iron boxes, built in the wall, into which ney will be made to slide, and, considering that the rest of the building will be entirely of granite, iron, brick and glas it is tolerably safe to conclude that, isolated as it is from other structures and with granite walls of great thickness we shall have a building which would be practically freproof even in a conflagration similar to those which so recently de vastated Chicago and Boston.
In the thorough ventilation of so large a building, where so many are to be employed, and where a large proportion of the work is to be done by gas light, the difficultits presented are of no ordinary nature, and have never yet been entirely overcome in any of our large public edifices. It is believed however, that the plan for effecting this object in the new post office will be the most perfect of any that has yet been contrived. It is on the principle of that first applied on a arge scale in the north wing of the Treasury Department a Washington, under the direction of Supervising Architect A. B. Mullett, who is the architect of the new post office and general superintendent of all new public buildings. For
the three lower floors, in which a'l the post office business will be transacted, there are four ventilating shafts, with an inside area of fifty feet each on the bottom. These shafts run from the cellar to a little above the roof, and in the center of each will be a smoke pipe from the furnaces, thus heating the air so as to make a constant upward current. At the botiom, these shafts are conneited with what are called foul air chambers. into which run flues from all the rooms on the ground floor and below. These flues are made to run from openings at the bottom in the hollow cast iron pillars which support the whole interior of the luilding, so that, by the upward current which is created by the heat in the wentilating shaft, the foul air is drawn down from the bottom of each room to the foul air chambers and thence into the ventilating shafts. In addition to openings into the ventilating shafts. the rooms in the upper stories are provided with flues which terminate in ridge openings at the angle o the pitch of the Mansard roof and the center of the wate thed. These open:ngs have what are called pitch top covers to make a draft, no matter in which direction the wind may be.

In cold weather, the rooms are to be heated by steam coil :supplied from the exhaust steam furnished by the boiler which will supply power for the engines to run the elevators. Grave doubts are entertained whether sufficient preparation has thus far been made for properly heating the interior of this vast edifice, but this will be a want which can be easily supplied by additional boiler capacity in the cellar. The team coils will be placed opposite each window, under which, in the panels, are openings, so that the air will be drawn resh from the outside. The pipes, however, are protected by a kind of apron from the current of cold air, which is made to $p$

## reom

The floors, throughout the building, are all made with iron and brick arches. These arches have been built according to a method of Mr. W. G. Steinmetz, the superintending en gineer, by the use of center hangers, which has lately become quite popular with builders. It does away with the neces sity of building platforms, as formerly, is very simple, and the men can thus readily work on as many floors as desirable at, the same time. In many of the arches in the building where a flat ceiling is wanted, a large sized hollow brick is used, which is molded to make a perfect arch. on the top and be level on the bottom. The same end can be attained by filling out under the arches, in the old way, but the work i not so durable. The cost is about the same in one way as in the other, but the hollow brick are lighter, so that the weight the iron is not so great, and the ceiling is more certain to be dry.
There are to be four large elevators which will affor communication between the basement and top floors, and ten small elevators, of the telescopic style, worked by hydraulic pressure, from the basement to the entrance floor. The latter are to be simply platforms without carriages, for the convenience of the post office business, as the basement wil be used for sorting letters and making up mails, the entir north end being devoted to printed matter. On the firs loor will be the post office, receiving and money order depart ments, registering office, stamp and envelope bureaus, and the posimaster's, secretary's, cashier's and book-keepers' room The second, third and fourth floors will be devoted to United States court rooms, examination rooms, etc.
It is difficult, without a personal visit, to obtain an adequate idea of the great amount of work and material which this builaing, when completed, will represent. The additiona story which is now being added, before the Mansard roof is put on, involves no material change in the plan for the whole, although a portion of the cornice which had been placed will have to be taken down until the fourth story is completed. The granite used all comes from Maine, wher six hundred men have been employed for many months in cutting and dressing it, so that no work of this kind is don on the ground. There have, thus far, been used 300,000 cubic feet of granite, 10,000 yards of concrete, 27,000 barrel of cement, $9,000,000$ brick, and $5,500,000$ pounds of iron ; and the excavation previous to laying the foundation amounte to 100,000 cubic yards. It is impossible at present to sa when the work will be completed, but as Congress at its las session appropriated $\$ 2,500,000$ to carry on the building, it is now being energetically pushed forward, with a probabil ty that the roof will be on during the present year. New York has waited long for a post office suited to its needs; but with the completion of this building, it will have such an one as befits the importance of the leading city on the continent.

## MODERN PRINTING MACHINERY AND APPLIANCES.

 HOW A DAILY NEWSPAPER IS MADE.The use of types and the introduction of the power print ng press marked the commencement of a series of improve ments in the printing business, no one of which have, sub sequently, created a distir ctive era in the trade, but the com bined results, as seen in the offices of one of our "great
dailies," afford one of the most interesting, though not dailies," afford one of the most interesting, though not the least complicated, subjects for careful examination. The ype founder, and to make, by the old hand process, the grea amount of type now used, would require almost as many hands in a type foundery as it takes to run a cotton mill; but as in the case of the sewing machine, the demand seems to have been thus enlarged only with the increased facilities of production. Of bype-setting machines, there have been a great many brought before the public, one or two of which
hare certainly possessed great merit, but, from one cause or
nother, they have not been generally adnpted, and are not used at all in daily newspaper work. For some tinds of and there is fair reason to suppose that a successful type and there is fair reason to suppose that a successful type
setting machine, which will accomplish all the labor of the compositor, may, at no distant day, be perfected. It is a compositor, may, at no distant day, be perfected. It is a
field which has long taxed the ingenuity of some of our most field which has long taxed the ingenuity of some of our most
skillful artisans, and is one in which success will be sure to skillful artisans, and is one in which success will be sure to
bring a rich reward, as by far thegreater part of the expense bring a rich reward, as by far thegreater part of the expense
in the mechanical part of the dnily newspaper, as in fact of early every printed book and paper, is in the type-setting. The press room, however, is by far the most attractive part of a modern newspaper, and here the improvement, made have been constantly in the direction of more rapid, oconomical, and perfect printing. The Hoe ten cylinder rotary press, which has been and still is used in most of the large newspaper offices, was long thought to be the most perfect machine possible for doing a large amount of work, and doing it well. It is capable of printing twenty thousand im ressions per hour, but to do this work, ten feeders are re quired, beside a pressman, and two or three assistants to take away the printed sheets, and only one side of the zaper an be printed at a time. To make a press which will sav he work of this number of men, which will print both sides or a perfected sheet, at the same time, and which will also do the work as rapidly, has long been a problem which in entors have endeavored to solve, and both here and in Eng land have their efforts been crowned with success.

## the walter, bullock and hoe presses.

The Walter press, so named from its inventor, the proprietor of the London Times, and the Bullock press which has been used here for the past four or five years, ar each self feeding, and deliver a perfect printed sheet, or on printed on both sides. There are some points of similarity n their construction, both feeding from endless rolls of of paper, with a knife to cut off the sheets at the proper tim efore they are passed to the " fly" where they are delivered The Waiter press is considerably smaller and more compact han the Hoe ten cylinder press, but the Bullock press is stil maller, occupying a space only ten by six feet and six feet high. The Walter press, it is claimed, w'll print eleven housand perfected sheets per hour, which is somewhat fast er than the Hoe ten cylinder, when it is remembered that th maximum work of the latter is only twenty thousand copie of one side, or half printed papers, per hour, while the aver ge work of the Hoe press will only equal about fiftee thousand impressions per hour. The Bullock press print ten thousand copies per hour, both sides.
In all of these fast presses, the more rapidly the work is done, the less perfectly are the sheets printed, but the Wal er press is especially designed to do better work than any other fast press, and with this idea, the proprietors of the New York Times, who ase this year expending one hundred thousand dollars in refitting and adding to the facilities of heir already admirably arranged office, are about putting up ne of the Walter machines in their press room. The pres will cost, as put up and ready for work, about $\$ 45,000$, o about the same as a Hoe ten cylinder press. The papor is taken from a reel and passed throus'l rollers, one of which revolves in a trough, where it is partially immersed in water
thus wetting or damping the sheets, which adds much to the facility of obtaining a clear impression of the types. In he B.llock press the paper is dampened by a separate ma chine, the rolls of paper being already wet when placed in the press. From the rolls which dampen it, the paper i passed on between cylinders, on one of which are the stereo yped forms, and the other constitutes the impression cylin der, tholatter revoicing against covered rollers to remov ny ink which may have been taken from the printed sheet o do this perfectly, constant attention is required, and the covers, when soiled, have to be changed. The inking appa ratus is quite similar to the fountains used in the Ho presses, and there is nothing essentially different in the prin ciple of the fly for delivering the sheets. Two men, how ever, are required at the box where the sheets are delivered to keep them straight, which, with the pressman and one assistant, make at least four men required to attend one of these machines. The Bullock press does not require more do much better work than the Bullock.

## NEWSPAPER BTEREOTYPING

Perhaps the greatest improvement for facilitating the rapid production of newspapers, since the introduction of the power press, is that oy which newspaper forms are quickly and cheaply stereotyp! d. In fact, it would hardly be poss ble to use either the Bullock or the Walter press to prin from type, as the cylinder which the stereotype form is made to fit is so small that the type could not well be held in place. Even with the Hoe presses, however, if it were not for the process of stereotyping, great difficulty would be experienced, and was felt in former years, in printing an edition of anyhing more than twenty or thirty thousand copies with suf ficient rapidity to meet the demands of a daily newspaper To obtain and make ready all the news, and have the types set up and put in the form, requires the full force of editors eporters and compositors up to 2 and $30^{\prime}$ clock in the morn ing. Then stereotype plates are made of each page, for a many presses as desired, according to the number of copie to be printed. If three of the ten cylinder presses are to be cod, by making three sets of plates, fifty or sixty thousand copies can be printed per hour instead of only twenty thou ion of sterentyping was the maximum before theintroduc New sterentyping
ten years ago. It must not be supposed that this was the printing haful stereotyping for any kind of printing, a have been used; but by the prdinary method of making ster eotype plares from plaster of Paris molds, the time consumed was so great as to render this method totally unavailable for spaper work. After many experiments. however, what is called the

## PAPER PROCESS

making the stereotype mold was successfully introduced. This consists in beating into the face of the type, with a eavy brush, a prepared sheet, with a kody almost like paper pulp, and somewhat thicker than heavy railroad card. The type form, with this wet blanket kind of mold beaten into it, is then placed on a steam bed to drive ut the moisture and harden the mold, which, in a few minutes, can be taken off almost as hard as a sheet of card board, but holding a perfect impression of the type. To make and trim a plate, with type metal, is now very simple and the same mold can be used for as many plates as desired The shortest time occupied in getting a plate ready, from the time in which the form is ready for the stereotypers, is abou wenty minutes, the greater portion of this being taken up in drying and baking the mold, and the difficulty in doing it ore rapidly lies in the fact that the type form, when read or the stereotypers, is very wet, and all must, of course b made perfectly dry. These stereotype plates are made of type metal, which consists of lead, zinc and antimony, and they may be used to print any number of copies required The cost of making the plates cannot be said to add anything to the expenses of a large newspaper, as enough is saved in he wear of type to cover the expense of making the plates. The mechanical work of a daily morning newspaper is near y all done at night, as the copy of the paper which the city abscriber reads at his breakfast table represents the wor f printers and editors up to 3 o'clock in the morning, and he pressmen thereafter.

## EdITING A DAILY NEWSPAPER

All through the twenty-fourhours, however, the reporters correspondents and agents of a daily newspaper are busily en gaged in collecting, writing and telegraphing information on very possible subject for its columns. In Washington and San Francisco, in London and Vienna, in China and Japan and in almost every known quarter of the globe, the agents of the press may be found, whether they act as the direc employees of some particular paper, or send accounts of mat ters supposed to be interesting, to be paid for only when used. Some idea of the number and activity of these agents may be formed from the fact that, notwithstanding the grea mount of matter which a daily newspaper contains, it ofte ccurs that two or three times as much is prepared and aid for as is printed in the paper. This matter is constant y coming in from the telegraph office. from the mails, and rom reporters, and the editor and his assistants receive and prepare it for the printer, or consign it to the waste pape asket, writing their comments thereon, witty or wise o ommonplace as they may be; but in all cases the news and ditorials are intended to represent a day's picture of the world's life, with the reflections which we all, according to our light, gather from reading aud past experience, fo future guidance.

## setting UP THE TYPE.

The compositors commence type setting at 6 or 7 o'clock, al etters, editorials, articles of any kind, or advertisements, going to a common desk, where the fifty or morecompositors, in regular order, are handed their "takes," or pieces of copy which are longer or shorter according to the work, and when one " take" is finished another is ready, so that a composito may first set up thirty lines of one of Tyndall's lectures, then theater advertisement or a notice of an auction, then a por ion of a letter from Vienna, or perhaps an account of a rio in New Orleans; but the work is all so arranged that the labor of these fifty or more compositors represents the stead nd orderly preparation of all the articles and ad vertisement which appear in the paper. The foreman and his assistant eceive the editorials, the telegraph, and all the reading mat ter, from the editor and his assistants, and the advertise ments from the counting room, and the work is so divided up as to keep all hands at work until it is time to go to press, or until all the copy is set up. There is a limit to the time, however. The paper must go to press in time for the mails, and so that copies can be sent out by the morning trains. This makes it necessary to have all the type set up and ready for stereotyping by half past 2 or 3 o'clock, and here not a min te is lost. In case, however, of important news coming in fter this hour the men are kept at work and a later edition printed for the city and near-by circulation
In the publication of newspapers, as in all other branches of business, there is, of course, an active competition; every reader has his preferences, and each paper has particular qualities or advantages which commend it to its patrons, but all are anxious to get the first and fullest details of all mat-
ters of public interest which transpire in any part of the world.

The Stilwell \& Bierce Manufacturing Company, of Dayton, Ohio, add the following postscript to a business letter eceived from them on May 12: "It may be of interest to you to know that we have received inquiries about the Eclipse water wheel from New Zealand, and about Stilwell's heater and lime extractor from Belgium, as well as a great many bout each from nearly all the States in the Union, each, of the parties writing, starting by saying: 'I saw your adver tisement in the Screntific American.'
$\underset{\text { Mr. Chan Lai Sun, Chinese Im- }}{\text { abot }}$ perial Commissioner of Education, recently delivered a lecture in Springfield, Mass., on the subject of tea and its culture. He began by stating that tea grows in every province in China except three or four upon the northernmost Siberian border, but the quality and quantity depends largely upon the locality. The leaves resemble those of the willow, and aregathered duringthe spring and early summer. They are first exposed in a cool dry place for a day or two, then rolled into a ball on a table of bamboo slats, and dried in the sun. The rolling is to extract a portion of the juice of the leaves. After they have been dried in egg-shaped iron pan over a charcoal fire, and incessantly stirred until a certain point of dryness until a certain point of dryness
is reached. The operator stirs
 Fig. 1.-bridge at albany: with his hands, thrusting them in all portions of the pan, of preparing it. The Chinese tea connoisseur purchases an and practice enables him to dry the leaves almost exactly
alike. The raiser superintends this process, and then brings his tea in bamboo baskets to the tea merchant, who adjudges its quality, and buys it at prices ranging from $\$ 15$ to $\$ 20$ per picul, equal to 133 t pounds. The merchant mixes his purchases together in a large reservoir, and at his convenience weighs out a number of pounds of tea leaver, and women and children spread them upon a large stage, and separate the leaves into grades accordingto quality. The tea stalks are the lowest grade, and the sorters are paid by the number of ounces of stalks they bring in. Children earn from 4 to 5 cents a day; the very best workers rarely earn as much as 10 cents rarely earn as much as 10 cents $\quad$ Fia. 2.-bridge at augubta, maine,


Fig. 2.-BRIDGE at aUGUBTA, MAINE,
hours after the tea has evapo rated. The more common way of tea drinking is to have a teapot six feet high and three feet in diameter, kept warm ready for any one to drink who chooses.
The speaker considered that as long as the tea is of good quality, it matters little how it quality, it matters little how it is prepared. The best way is to warm the pot with boiling
water, then put in the tea and water, then put in the tea and
pour the water upon it. It pour the water upon
should never be boiled.
should never be boiled.
The seeds of the plant are about the size of a small cher ry; and from those not wanted for planting, oil is expressed used for cooking purposes. The tea in this country is generally much injured by long convey ance by sea, and has a moldy taste to one who has drunk it tasts freshness. The individuel in its freshnes. The individual consumption of tea is muc greater in China than here.
live upon such wages, and until other nations can raise tea
for 12 cents a pound they cannot compete with China in its production.
After the sorting each grade is packed by itself in chests or bamboo baskets, the first for exportation and the latter for home con sumption. It is ordered by importers abroad through a tea taster, who receives a salary of some $\$ 3,000$ a year and operates as follows: He has a long, narrow table, on which 60 or 70 cups are set; a boy weighs exactly one ounce from a small box into one of these cups, and if he has samples enough, all the cups are used. Hot water is then poured into each cup, and after five minutes the boy calls the master, who sips from every cup, holds the liquid in his mouth a moment, then ejects it and notes in his book the quality of the tea. The purchaser orders upon his taster's estimate, and when his packages arrive at the ware house, about one in twenty is opened for comparison with the sample. If it proves of inferior grade, a material reduction is a once made in the price, so that without con nivance with the teataster the adulteration
 of tea is next to impossible in China. $\qquad$
Fig. 3.-La salle bridgif:
The tea is always examined to determine its age, as it is is put in, about twenty drops of hot water turned on, and $^{\text {dit }}$ choicer when young. It is a vexed question whether black it is ready to sip. It would be very intoxicating to drink and green tea belong to the same species; it is probable, however, that they are branches of the same variety, and the color depends upon the locality. If a seed of black tea be planted in the green tea region, a few generations will make them, a few generations will make them high, oreen can readily beturned high, green can readily be turned into black, but black cannot be made to appear green. The latter obtains its bluish color artificially, Prussian blue being used in the coloring, butin such small quantities as to be harmless. The annual averageyield of a tea plant is abouttwenty ounces, and too much rain affects the quality as well as the amount. The plants live from 20 to 30 years, and, when old, are frequently cut down, and a young shrub grafted into the old stock. Quicker returns are thus obtained, but the turns are thus obtained, bu
plant does not last so long.
Tea is drank pure in China, but there are very different ways
traced the manufaccure of iron bridges from the state of crude ore to the finished fabric, ready for shipment to the locality where it is permanently to re main. We will now give our readers views and particular of some of the most important bridges erected by Clarke Reeves, \& Co. The view of the Albany bridge (Fig. 1) will show the style which is technically called a through bridge, cally called a through bridge, having the track at the level of
the lower chords. This view of the lower chords. This view of
the bridge is taken from the west side of the Hudson, nea the Delavan House, in Albany. The curved portion crosses the basin or outlet of the Erie canal, and consists of seven spans of mountains, and of which only ten or fifteen piculs are of seventy-three feet each, one of sixty-three, and one of one produced in the kingdam, he has a baby teapot, an inch and hundred and ten. That part of the bridge which crosses the a half high, and about an inch in diameter. A pinch of tea river consists of four spans of one hundred and eighty-five feet each, and a draw two hundred and seventy-four feet wide. The iron work in this bridge cost about $\$ 320,000$.
The bridge over the Kennebec river (Fig. 2), on the line of the Maine Central (Fig. 2), on the line of the Maine Central
Railroad, at Augusta, Maine, is another instance of a through bridge. It cost $\$ 75,000$, has five spans of one hundred and eighty-five feet each, and was built to replace a wooden deck bridge which was carried away by a freshet.
The bridge over the Illinois river, at La Salle, on the Illinois Central Railroad, shows the style of bridge technically called a deck bridge, in which the train is on the top. This bridge consists of eighteen spans of one hundred and sixty feet each, and cost $\$ 180,000$.
The bridge on the Portland and Og . densburgh Railroad, which crosses the Saco river, is a very general type of a through railway bridge. It consists of two spans of one hundred and eights five feet each, and cost $\$ 20,000$.

dred feet long.
The New River bridge, in West Virginia (Fig, 6), consists of two spans of two hundred and fifty feet each, and two oth ers of seventy-five feet each. Its cost was about $\$ 75,000$.
Before the erection can be be gun, however, a staging or scaffolding of wood, strong enough to support the iron structure until it is finished, has to be raised on the spot. When the bridge is a large one, this staging is of necessity an important and costly piece of work. In Fig. 6 is shown the staging erected for the support of the above mentioned New river bridge, which is on the line of the Chesapeake and Ohio Railway, near n. romantic spot known as Hawksnest. About two hundred yards be low this briage is a waterfall, and while the staging was still in use for its construction, the
river, which is very treacherous, suddenly rose about twenty feet in a few hours, and became a oaring torrent.
The method of making all the parts of a bridge to fit exactly, and securing the ties by pins, is peculiarly American. The plan still followed in Europe is tha of using rivets, which makes the erection of a bridge take much more time, and costs, consequent ly, much more A riveted lat tice bridge, one hundred and six ty feet in span, would requir ty feet in span, would require n thil of tion, while one of the Phœnix ville bridges of this size has bee Thected in eightand a half hours.
These specimens will show the general character of the iron bridges erected in this country. When iron was first used in constructions of this kind, cast iron was employed, but its brittleness and unreliability have led to its rejection for the main portions of bridges. Experience has also led the best iron bridge builders of America to quite generally of America to quite generally
employ girders with parallel top employ girders with parallel top and bottom members, vertical posts (except at the ends, where they are made inclined toward the center of the span), and tie rods inclined at nearly forty-five degrees. This form takes the least material for the required strength.
The safety of a bridge depends quite as much upon the design and proportions of its details and connections as upon its general shape. The strain which will compress or extend the ties, chords, and other parts can be calculated with mathematical exactness. But the strains coming upon the connections are very often indeterminate, and no mathematical formula has yet been found for them has yet een found or whe the wheels, axles, and uoving he wheels, axles, and moving parts of carriages, cars, and machinery. Yet experience and judgment have led the best builders to a singular uniformity in the treatment of these parts. Each bridge has been an experiment, the lessons of which have been studied and turned to the best effect.
There is no doubt that iron bridges can be madeperfectly safe. Their margin is greater than that of the boiler, the axles, or the rail. To make them safe, European governments depend upon pigid rules, and careful inspection igid res, they are carried out o see that they are carried out. n this country government inspection is not relied on with such certainty, and the spirit of our institutions leads us to depend more upon the action of self-interest and the inherent trustworthiness of mankind when indulged with freedom of action. And so we find that the best security for the safety of iron bridges is to be found in the self-interest of the railway corporations and others, who certainly do not desire to waste their money or to render themselves liable to damages from the breaking of their bridges, and who consequently will employ for such constructions those whose reputation has been fairly earned, and whose character is such that reliance can be placed in the honesty of their work.
The fall of the Dixon bridge, with its three score of victims and similar disasters which have, from time to time, shocked the community, go far toward proving the truth of this proposition. Experience, we trust, has fully demonstra ted the futility of intrusting the construction of fabrics, to which the lives of hundreds may be confided, to parties whose sole claim to consideration is a plausible-appearing invention on paper or in the model, but whose ideas have never withstood any prolonged or severe ordeal of practical


We close our description in presenting a general view of the Phœnix Works (Fig. 7). From this a good idea of the large extent of the establishment may be gained.
The extent of this impor tant center of industry fully justifies us in giving the pub


Fig. 6.-NEW RIVER BRIDGE ON ITS STAGING.
position for five minutes. Twe ty-one men then jumped on board, and the boat being trimmed level, the freebosird was found to be 2 feet 18 inch es, or only 6 y inches deeper in the water than when empty The boat was then tested as to her carrying power. She was filled with as many men as she could conveniently hold, and her ample accommodation for passengers, in proportion to her width and length, and her re markable air buoyancy, were shown by the fact that, with forty-seven men on board, the boat preserved a freeboard of nineteen inches. With this nineteen inches. With this number of men on board the

boat was rocked heavily from gunwale to gunwale, but shipped no water. The men were then ordered out, and told to jump into her hurriedly, in order to realize the behavior of a life boat under circumstances of confusion or emergency arising from fire, collision, etc. The teadiness and buoyancy of the boat enabled her to stand this lic this ample and detailed description of one of the most in- | test also satisfactorily. The boat was then filled to the out eresting of American manufactures. For the engravings side level with water, and with twenty-one men on board we are indebted to the publishers of Lippincott's Magazine. side level with water, and with twenty one men on board rocked heavily, when it was seen that the water acted as ballast and promoted steadiness, the motion of the water be| Experiments recently made at Liverpool with an iron life | ing checked and confined to the center of the boat (in con- |
| :---: | :---: |
| foat, constructed from the designs of Mr. Hamilton, of the | formity with the requirements of the Ships' Life Boats Com- | tee) by the perpendicular shape of the inner sides of the side and end cases or compartments. As another test of buoyancy, the boat was filled to the outside level with water, but with no one on board, when the freeboard showed $20 t$ inches. The boat was then filled with waier to the thwarts in or der to show her manageability in the event of being filled by a heavy sea. Two plugg in the bottom of the boat were then drawn, and the boat gradually relieved herself of the water until it had subsided to the level of the water in which she floated. The last test of buoyancy was to fill the boat with water to the outside level, and then to direct twelve men to stand on the gunwale. The water of the dock thereupon just touched the edge of the gunwale, showing that the water ballast gave her really greater buoyancy and stability. Lastly, to test the enormous strength of iron boats constructed on this principle, a dingy of a size uitable for coasting vessels-12 feet long by 5 feet beam, and 2 feet 4 inches in depth inside-was dropped from the crane bodily into Windsor Iron Works, have given some very satisfactory re- |the dock-a hight of upwards of 21 feet. It fell perfectly sults as far as its strength and stability are concerned. The flat, with a tremendous force of impact and a noise as of boat is 25 feet long, with 7 feet beam, and 3 feet 3 inches in- thunder. On examination it was found that the bottom of side depth. She is double bowed, with side and end air the dingy on the starboard side, was slightly flattened, but chambers. The boat, when empty, had 2 feet 8 inches free that not a single joint or rivet had been started, and that the board amidships. Eleven men were made to stand upon the buoyancy of the boat had in no wise been affected. edge of the gunwale until the water just touched the edge of the gunwale on the loaded side. The boat was kept in this



Fig. 7.-THE PHENIX WORKS

The London Times says that the impression made by these crucial trials was that Messrs. Hamilton \& Co made by these patent life boat, in the words of patent life boat, in the words of Bopta to the Nopet Institution, provided a " bond fide life boat for passenger ships and merchant vessels, and that if the Northfleet and Atlantic had been supplied with these boats and a proper boat lowering apparatus, hundreds of lives might have been saved." The extra buoyancy of these boats, which secures their manageability af ter being filled by a heavy sea, isobtained by means of inclosed air. The lateral stability and steadiness in a heavy sea are secured by distributing this air buoyancy along the sides of the boat, while an ample amount of end buoyancy gives longitudinal stability and prevents the water being shipped in a heavy sea from rushing to either end of the boat. This side and end buoyancy is obtained by means of a series of portable watertight cases or boxes, conforming
to the boat's sides, and fitt.ng close to them. When in harbor, and the boat is required to carry cargo, these water tight portable cases can be removed, and easily and quickly replaced on a vessel going to sea.

## THE WONDERS OF THE EGG.--IV [Lecturi by profrbbor agabsiz]

We continue the publication of Professor Agassiz' inter esting lectures on embryology, for the reports of which we are indebted to the New York Tribune:
You may open dozens of eggs brought for sale from the country, and find that not one is in a perfectly natural con dition, because the careless transportation has changed the elation of parts. I have told you, on a former occasion, that the white speck marking the spot where the germ be gins its development (what naturaliots call the blastoderm) would always be found floating on the top of the yolk, bein kept in that position by the strings of albumen by which th olk is suspended, as it were, in the egg. I opened a num ber this morning without finding what I wished to show you all the eggs I had for examination having been jerked in arket carts and exhibiting torn chalazes (the strings of a bumen by which the yolk is held in position), and I only suc ceeded by borrowing eggs from a neighbor who keeps hens now pass you one in which you see the little speck floating on the surface of the yolk, the beginning of the germ. Here is another egg prepared in the same way and showing th sume thing, though in this specimen one of the strings is rroken. It is not so easy to prepare an egg for investiga tion as you may suppose. [Here Professor Agassiz showed how to open an egg from the side so as to cut the shell long tudinally. Various specimens of open eggs were passed round.] In one of these two eggs, you can see the mem brane which lines the shell and covers the white; in the other the membrane is removed, together with part of th white, in order that you may see how the white is deposited in layers. Here are two hard boiled eggs cut longitudinally, 0 as to show the position of the yolk; exactly in the cente of one, while in the other it is on one side. The first has elt no influence from the hen; in the second the yolk ha been drawn on one side by the warmth of the hen as she brooded upou it. You also see in these eggs the air cham ber at the blunt end of the egg, and you will observe that hese air chambers are lined by two membranes which are seen to be distinct at that end of the egg, but which unite to urround the white.
In order that you may have some idea of the rowth of an egg before i eaches the stage in which we usually see it I hav rought the ovarie of on, taken tho ens, thin from the an mals this moming, and he oviducts that is, the passage or chan int which the eggs are drop ped from the ovaries afte bey have reached a certain phase of development. In the oviduct the egg re eives its final envelopes, and in that organ is se reted whatever is needed o form the shell and the white. I was fortunate in my selection this morning or the two ovaries showg uccessive phases showed n great pharfection grat perfection. In he large hardy the largest hardy the size a pea, others that of in head, others hardly isible to the naked eye. oviduct is empty and collapsed; its share in the work is not yet begun. In the other we have eggs o all dimensions, up to the full sized mature egg of the fowl : a yolk just read to be dropped into the viduct whiched into the

arly stage of ovarian eg of hen (natural size.) eive it, and at the lower of oviduct; c. Empty eggs; b. end of the oviduct a perfectly formed egg with a perfect shell, just about to be laid.
In this second ovary, then, you have all the successive phases-eggs so small as to be hardly perceptible with the nalied eye; others as large as a pin's head; others the size of a pea; others about the dimensions of a hazel nut; other as large as a walnut, and finally one complete, mature egg. The first of these hens had not yet begun laying, while the second was already sitting upon eggs. My finding of these ovaries in the right condition was a mere chance; and, indeed, when you consider how many fortunate circumstance are essential to a successful investigation in embryology, the wonder is that we know so much rather than that we know so little. Indeed, nothing better rectifies a tendency to over hasty conclusions tban an attempt to observe.
Let us now return to the subject where we left it in the last lecture, and consider especially the process of reproduc ion in vertebrates. I choose that type because vertebrates have no other mode of multiplying than by eggs, and I wish now especially to dwell upon the history of the egg, and its importance as such in the problem of reproduction. I told
you that all eggs were alike up to a certain point in their de velopment. By this I mean thai the essential characteris ics of all eggs in their incipient condition are the same But the yolks of different eggs produced by different animals may differ in color and size. The yolk may be light, almost white in some; dark yellow, orange or reddish, greenish or


VARYANDOVIDUCT FROMA LAYING HEN. (答 NATURAL SIZE a. Immature ovarian eggs. b. Matare ovarian eggs. c. Opening of
oviditwhich recelive ithe egg when it drops from the ovary. d . Egg
ofth hell in lower part of oviduct. brown in others. It may have the size of a hen's yolk jus ready to drop into the oviduct, such as you have seen in th specimen just passing, or it may be so small as to escape th unaided vision; but the elements composing the yolk and the membrane surrounding it are the same in all-at least no power of the microscope has ever yet revealed any differ ence in these jarts. Yet no naturalist would confound the egg of a mammal with that of any other vertebrate. The vitelline membrane of the mammalian egg seems thicker in proportion to the size of the egg than the membrane sur rounding the hen's yolk. In examination it is found to be a very complex apparatus. The mammalian egg has, indeed a a kind of momliranous shell, called by naturalists the chorio or zona pellucida. It is made of special cells, and might a first be taken for a part of the yolk neembrane, and thus lead to the impression that the vitelline membrane of mam malia is much thicker than that of birds. There is also great difference in the tenacity- or elasticity of the yolk. The yolk of a hen's egg is so plastic that I can press it with my inger and yet not break the membrane; others are hard to the touch, and others so soft they can barely bo handled Eggs differ greatly in transparency at different periods o their development. A hen's egg is at first so transparent that the whole interior may be seen under the microscope; later when mature, the whole yolk is, as you all know, yellow and opaque. The different parts of an egg may differ with eference to one another. The germinative vesicle may be for instance, nearer the center or nearer the side. It may ven be drawn so near the vitelline membrane as to touch it. This is especially the case among turtles' eggs. Let it be understood, then, that when I speak of the identity of eg structure I allude to the correspondence of essential parts verlooking those differences whirh are indeed of secondary mportance and of no value with reference to the part played by the egg in the economy of reproduction.

THE FECUNDATION OF THE EGG
In what now does fecundation consist, and what is the ubstance whose conlact with the egg contributes to the formation of the new being? When entering upon this sub ject, let us not forget that some eggs undergo all the neces sary phases of growth without any such influence from the male organism, and that this occurs even among animal whose structure is highly complicated, as with the bees among whom unfecundated eggs produce males or drones while fecundated eggs produce females or working bees Among vertebrates no egg has ever with certainty been nnown to produce a new being without fecundation; but in lead to the formation of the new being, as, for instance, seg mentation, previous to fecundation. The spermaries ar
organs of exactly the same structure as the ovaries. In the spermary, cells are formed which may be compared to those peculiar cells of the ovary which we have called eggs. These sperm cells do not produce yolk, but gave rise within them. selves to peculiarly constructed particles usually called spermatic particles. Previous to the formation of these particles a kind of segmentation of the substance filling the cell takes place, which may be compared to the segmentation of the yolk in an ovarian egg. This kneading process ends in forming bundles of little bodies (the so-called sperm ary particles) which, on closer examination, resembles tad poles, and have indeed been compared to them, not inaptly They are long in comparison to their width, almost thread lik 3 , and have a blunt end with a tail-like appendage. When highly magnified, the edge of this tail-like appendage seems very thin and resembles a fin. When the cell breaks, which eccurs under somewhat different circumstances in different animals, these particles move with astounding ra pidity, producing a commotion in the liquid in which they re held, and having every appearance of animated beings Indeed, when these phenomena were first observed by mi roscopists of the 17th century, the spermatic particles wer supposed to be little animals. What they are, and the par they play in the process of fecundation, has been learne nly within a few years, if indeed we know even now what their function truly is. That they exist throughout the ani mal kingdom is an ascertained fact, and they can be observed under the microscope without a very high power. A mag niter of a few hundred diameters will bring most of them, though not all, into view, and will show their rapid motion. These motions cannot be better compared than with tho: of the tadpole, the chief movement being a wriggling, rapid vibration of the tail-like portion. A great many theories have at different times been current respecting these parti cles, but it is useless to recall them, since they have bee found to be wholly incorrect. At one time physiologists did not doubt that these particles were actually the beginning of he new germ; they went so far as to assume that they con tituted the portion of the body known as the axis, the back bone or nervous center. We are sure now that all these theorics were unsound. But it cannot be doubted that these particles play an important part in the econory of reproduction, since, under investigation of the most minute and dimcult character, they have been seen to reach the egg and penetrate into its interior. This is an accepted fact, though not all embryologists who admit it as such have had the good fortune to see it themselves.

## Controlling Sex in Butterfiles

A suggestive article as to the possibility of controlling exes in buttertlies has been communicated to The Amesican Naturalist by Mrs. Mary Treat, and from the results of numerous experiments she finds occasion to believe that the larva to which the freshest and most tempting food was supplied in unlimited quantity nearly always developed nto female butterflies while those for which the supply of ord was limited almost as uniformly proved to be males Dr Pact i how inclined to thint thrt the his inat is whe the his init, ermined at or about the time of conception, or at least, early in the embryonic condition. In the honey bee, especially, it has been proved that the sex is decided at the time the
egg leaves the oviduct. The sex in man, according to Koeliker, becomes fixed toward the end of the second month of œtal life.

## The Hartford Steam Boller Inspection and

 Insuranee Company.The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of March, 1873
During the month, 1,056 visits of inspection were made, nd 2,254 boilers examined, of which 720 were examined internally, and 214 were tested by hydraulic pressure. Defects in all discovered, 1,207 , of which 314 were of a dan gerous character. These defects were mainly as follows Furnaces out of shape, from overheating and other care ess management, 86-16 dangerous; fractures of plates, 106-52 dangerous. (These fractures, in many cases, come rom carelessness in blowing out boilers when hot and immediately filling them again with cold water. It is safe to say hat one half the boilers with fractured plates have become of from this practice. It will be readily seen that boilers aet n brick mut cotain hat for in brick duction of cold water before the boiler is cool is very hazard ous. The strength of the iron is not only impaired, but serious fractures and bad strains are the results.) Burned plates, 89-47 very bad; blistered plates, 162-34 of which were reduced to a dangerous thinness. The outer leaves were burned and contained no strength, and the inner one was of insuffient thickness to sustain safely the pressure carried. Deposit of sediment, 176-20 very bad, with great danger of burning the fire sheets so that they would become contorted and dangerously fractured. Incrustation and scale, 232-24 dangerous; external corrosion, 72-12 dangerous. This trouble usually comes from defective boiler fitting Internal corrosion, 33-7 dangerous; internal grooving, 125 dangerous; water gages defective, 42-4 dangerous; blowout defective, 31-9 dangerous; safety valves overloaded and out of order, 23-3 dangerous; pressure gages incorrect and defective, 106-of which 19 were so unreliable as to be very dangerous indicators; boilers without gages, $103-1$ was running at very high pressure and was regarded as in dan gerous condition; cases of deficiency of water, $15-10$ dan gerous; braces and stays broken and loose, 47-24 dange ous; boilers condemned as unsafe to use, 16.

A Gigantic Newspaper Establishment.
The proprietors of the New York Tribune are about to erect a new building for the better accommodation of the editor says:
The Tribune has outgrown its cradle, and requires a home more in harmony with its wider plans and greater influence. The building from which Horace Greeley for a quarter of a century led the free thought of the country will be long remembered. The room in which he labored has been kept sacred since his death. No lesser presence has ever broken the spell his memory left there. And now that we are about to erect on the old site the largest and most imposing newspaper office in the world, the controlling thought of the proprietors of the Tribune is that here is his true monument. The great journal which he founded, animated by his spirit and faithful to his teachings, will, we trust, keep his memory green in every region upon earth, and the mas sive pile, reared upon the scene of his labors and his glory, will speak continually of him and his work to the millions of citizens and strangers who shall traverse for centuries to come the broad avenues of Manhattan Island, and the noble rivers that wash it on either hand. The space we have formerly occupied being much too narrow for our uses, we have acquired property on every side of us, until our front axtends upon Printing House Square over 60 feet, upon Spruce street 100 feet, thence north to Frankfort street 165 eet, with a frontage upon that street of nearly 29 feet This liberal ! pace is to be covered with a building nine stories high, surmounted by a lofty tower, which in beauty and elegance as well as in bulk will be the most considera ble business edifice in the southern part of the island. Some of the most eminent architects of the day have com peted in furnishing designs for the building, and the result is one upon which all who take pride in the architectura adornment of the great metropolis may justly congratulate themselves. - It will be not only a superb and artistic monu ment; it will also be as perfect a business house as the skil and experience of the most competent builders can devise t will be absolutely fireproof in every part, and built last for ever.

## The New water runnel at Chicago

Our readers will remember that the city of Chicago is sup plied with fresh water by means of a tunnel, built under the bottom of Lake Michigan and extending out under the lake wo miles from the shore to a crib where the water is let in and flows to the shore, being then pumped and distributed through the city. Its capacity is only $54,000.000$ gallons a day, a quantity insufficient for the rapidly growing demands of Chicago. Contracts for onother tunnel have been accord ngly made, and this new work is now in process of construc ion. The new tunnel will be seven feet in diameter an ix miles long, of which two miles will be under the lake and four miles under the city. A correspondent of the New York Times says that "the laborers on the shore end have progressed some 2,000 feet out under the lake, while from the crib end another body of men are working steadily for ward to meet them. The limited diameter of the bore ren ders it impossible for many to work at once, but they are at t night and day, averaging at each end a progress of perhaps twelve feet in twenty-four hours. The masous keep as close ehind the diggers as possible. The soil penetrated is hard blue clay, and such a thing as a caving in has not hap pened so far. A tin tube, eight inches in diameter, is con tantly advanced with the workmen, thus furnishing a cir culation which prevents the accumulation of foul air. It is hung in the top of the tunnel, and, when necessary, is worked with a fan at the outer end. This new tunnel runs parallel with the old one, distant from it about fifty feet. It enters the same crib, and strikes the shore at the same water works, but will deliver its supply at the new works, at the corner Ashland and Blue Island svenues, three and five-sixths mile from the old ones; and to reach it the new tunnel is to be extended under the city, river, large business housesand all $t$ is estimated that the cost will be somewhere in the neigh orhood of $\$ 1,000,000$.
From the tunnel there are to be nine or more shafts reach ng to the surface of the ground for fire purposes. The water, of course, will rise in them to the level of the lake and, should the pumping works give out, will be easily ac cessible to the engines. This land tunnel, as well as its lake connection, is to have a vertical diameter in the cloar of seven feet and two inches, and a horizontal diameter of seven feet. Its capacity will be over $100,000,000$ gallons per day. It will be lined with heavy masonry, a foot thick, and of the best materials. January 1, 1875, is specified as the date of its completion.

## New Electrical Instrument.

Among the recent patents granted here is one to F. H. Varley, of London, England, for a novel portable electrica machine. It consists of a glass or rubber rod, having upon it an exciting band or girdle of suitable cloth. A smal Leyden jar is attached to the girdle. The rod is held in one hand and the girdle moved with the other. The friction of the girdle upon the rod excites electricity which passes to the jar, and thus a considerable quantity of electricity may be collected. It is a simple ard apparently an effectiv instrument.

All new subscriptions fo the Scientific American wil be commenced with the number issued in the week the names are received at this office, unless back numbers ar and subscriptions entered from thanaif ditird

## Cூartespandeuce.

## Deep Sea Sounding. Scientifc American: <br> To the Editor of the Scientific American

Allow me to suggest a further improvement in the deep ea sounding apparatus suggested by Dr. George Robinson, and commented upon by Mr. C. F. Lewis, on page 277 of your current volume.
The gage suggested by Mr. Lewis may have a weight at tached to its lower part by a pair or more of clutches, re verse of those used in pile drivers, to release the hammer at the requisite height, and an air chamber, or, still better cork float, at the upper part. The weight must be sufl ciently heavy to rapidly sink the whole apparatus, while th cork float or air chamber must have sufficient buoyancy to ustain the care on the surface of the water when the weigh is detached; thus, instead of letting down and hauling up he gage with a rope (an operation always troublesome in eep waters and difficult in any but calm weather), it could imply be thrown overboard ; the weight (a stone or a couple f bricks would answer just as well) would carry it to the bottom, upon contact with which the hooks would let go the hold on the weight, and the gage, thus released, would speed o the surface, carried by its float and bearing on its regist he pressure of the water on the very bottom of the sea Mr. Lewis is certainly correct in saying that, should the age be carried a certain distance away from the vertica ine'of its descent or ascent, it would not materially alte he pressure on the same; but my opinion is that, for grea depths, a correction for the compressibility of the wate however small, would have to be made. An objection seem o suggest itself. A gage, as described, would sometimes b carried, by the under currents of the sea, out of sight and hus be lost. This could probably be remedied in the folowing manner: Let the weight be considerably large rela tively to the surface which the body of the gage presents to the current, and let its shape be that of two cones joined by heir bases, or of pyramids, or of some similar form. Thus by facilitating the descent of the gage by augmenting its velc city, the deviation from a vertical line will partly be remedied. Besides, to the upper part of the gage a small flag can be attached, or still better, a phosphide of calcium tube uch as was described several weeks ago in the Scientific AMERICAN. Such tube, bursting into flame upon contac with air when the gage has returned to the surface, would, at night, show its whereabouts at a considerable distance; or the phosphide of calcium tube may be so constructed as to mit a thick black smoke easily perceptible at a distance in day time, while its flame would be visible at night.
New Orleans, La.
To the Editor of the Scientific American
The object of an article by Dr. Robinson on "Deep Sea Soundings without a Rope," on page 244 of your current vol ume, seems to me to be to invite discussion rather than to suggest a means of accomplishing the object. In the first place, it would be impossible to time it, on account of cur ents and counter currents. Secondly, no vessel could b made strong enough to withstand the pressure of water at 2,000 fathoms; and should the gases condense, a vacuum would consequently be produced within the vessel; and if he vessel were made strong enough, it would be too heavy or rise. The powder and fulminate would be liable to ignition rom the immense pressure before reaching the bottom. It ould be liable to stick in a soft bottom, and, if charged to heavily, it would produce rupture, or too lightly, it would orce out the piston.
The great and insurmountable obstacle, in my opinion, is he low $t$ mperature of the sea at great depths, which ha been found, by actual tests, to be as low as $34^{\circ}$; consequent y the gases must condense, if not liquefy, under the press re; and either a collapse of the instrument, or loss by dis placement, would prevent its rising. All the other obstacles can be overcome. If any way could be devised to kee up the temperature of the gases and consequently the expansion, so as to balance the pressure of the weter, it woul e feasible. The suggestion of a pressure gage by Charles $H$ ewis, of Albion, N. Y., is perfectly $p$
Grand Rapids, Mich. Hawley N. Cargill.
Remarkable Astronomical Phenomenon

## To the Editor of the Scientific American:

On May 6, at 8 P. M., the 1st and 2d satellites of Jupite were observed so close together (having only about the dis tance of the radius of the planet between them) that, if the direction of their motion was favorable, contact seemed like . Upon further observation, both were found to be reced ing from the planet, but the one near to it, being the 1st ad the more rapid motion, and at 9.30 had approached so ear to the other that they seemed to be separated only by he space of a satellite's diamete
At 9.45, the contact was almost neariy perfect. At no tim did they present the appearance of a single spherical body but that of an elongated disk, with a faint shadow where on atellite overlapped the other, appearing to cover one hal its surface. The instrument used was a Dollond glass of our inches aperture.
An instance of two satellites having come in contact, so that one completely covered the other, is recorded in the memoirs of the Royal Astronomical Society, but is of rare ccurrence. The observation was made by the Rev. R. Main that the 1st and 2 d satellites were approaching each other, and it appeared to me that they would pass very nearly, if
ot exactly, over each other. I therefore continued to watch them until conjunction took place, and was not disappointed, as they came in actual contact and covered each other so completely that only one single body, with perfect sphericity, as visible."
Vassar College.
JUnior.

## The Million Dollar Telescope

To the Editor of the Scientific American:
Before we make the telescope, let us have some ideas of what may be expected to be discovered by its use. Judging from the remarks of some of your correspondents, they probably calculate to see, on the distant planets, mountains and valleys, rivers and lakes, cities and towns, and even the sort of inhabitants who occupy them. Now if we admit that all these things are there, and that we have a telescope powerful enough to see objects at that distance which are no larger than a man, is there not still a difficnlty to be over come, which has escaped attention? This difficulty is readily understood when we consider the immense velocity of the earth in its daily revolution, and also that of the planet under view. It is easy enough to see the planet whirling in space, but we may probably require something more than the powers of an instantaneous photographic machine to form any proper idea of the particular objects on its surface; though with our moon, which mostly has but one side towards us, it may be somewhat easier. If any one doubts, let him place himself on the periphery of a wheel which is turning round at the rate of five thousand revolutions per second, and then try to discover the beauties of a flea which is revolving on another wheel at the rate of ten thousand revolutions in a second, in a contra'y direction. After this xperiment, let us hear what he has to say on the subject. New York city.

## A Voice from the South

Messrs. Munn \& Co.:-Gentlemen :-
Please accept my thanks for the prompt attention which ou have paid to my application for a patent, and the persevering energy which secured it.
I think that the Scientific American is the great patron of inventors, and is vorthy of its name and reputation. I will endeavor to obtain subscriber.
Rosedale, La.
Chas. H. Dickinson.
Manufacture of Whiting and Paris White.
At the Plymouth works of Raynolds \& Co., Bergen, N. J., four huge grinding mills are constantly running, breaking up the chalk and mixing it with water, which is constantly flowing in as the chalk mixture flows on. On ieaving the mills, the mixture passes along a series of wooden troughs, where the sand, which has a greater specific gravity than the chalk, is deposited, the chalk passing on into the settling pits, of which there are twenty four. On being taken from the pits, the whiing is partially dried on a flooring, under which hot flues run. It is then cut up into large rough lumps and placed in racks on cars which run round on tramways into an immense oven. The heat from the flues in this oven is greatly increased by an airblast, which also carries off the moist exhalations from the drying whiting. Twelve hours on the heated floor, and $t$ :elve hours in the oven, thoroughly dries the whiting, and it is ready for packing or the putty factory. The old process of drying, first for twenty.four hours on chalk stones, and then for thirty-six hours on open racks, was not only more tedious, but, from the variations of the temperature, was bad for the whiting for some purposes. These Plymouth works turn out about twelve tuns f whiting a day-between 3,000 and 4,000 tuns a year. Paris white, of a fine quality, is used for finishing paror walls, adulterating paints, making paper heavier and whiter, etc. For this purpose, what is called cliff stone, a better and harder quality of chalk, is used. Paris white is made much on the same principle as whiting, only being more carefully washed and more slowly dried. Many thousands of tuns of cliff stone and chalk, imported from En gland, are worked up every year.

## Patent Medicines.

Dr. Pierce, proprietor of Dr. Sage's "Catarrh Remedy" and Dr. Pierce's "Golden Medical Discovery," takes exception to our publication of the analyses of his medicines, as translated from the Berlin Industrie Blätter in this journal of April 26. He admits that the description of the ingredients of the "Catarrh Remedy" is correct as far as it goes, but states that some of the most important are omitted, and that the proportions are not correctly stated. In respect to his " Golden Medical Discovery," he asserts that it " contains not one single drug, medicinal agent, nor poisonous ingredient mentioned in the said analyses."

The contract for the supply of the letter carriers' summer niforms, for the New York post office, has been awarded to Messrs. Freeman \& Burr, of Fulton street, New York city The dress is a gray flannel blouse braided with black, with vest and pants of the same material. The contractors' system of making clothes to order by mail is described on our advertising pages.
S. A. T. says: "I am an amateur mechanic. chemist, and little of everything, or what is termed a 'jack of all trades' and I must say that I owe the Scientific American for nearly all my knowledge. I would not be without it, as I constantly receive from its columns ideas and information whic

## SIMPLE HAND STAMP.

Our illustration represents a new hand printing stamp which seems excellently adapted for use in printing cards, envelope advertisements, ticket marks, and similar purposes. It consists of a stand, one end of which is made circular and is filled with ordinary printer's roller composition, the other contains a pliable material upon which to place the paper to be imprinted. At the middle of the stand are upright projections, to which is pivoted the inner end of the stamp lever. To the outer extremity of the latter is pivoted the stamp holder, which thus, when held by the wooden handle shown, always retains its horizontal position. On the lower end of this appliance is detachably secured a small electrotype or other reproduction of the desired inscription. Directly under the lever are springs which serve to raise it a little after the end is brought down, and also a receptacle for holding the small roller shown in the foreground. Orainary printing ink is used, a small quantity of which is supplied in the circular box repre sented, which is furnished with the apparatus.
To operate the device a portion of the ink is distributed over the bed of roller composition by means of the small roller. A metal cap, in which is made an opening of suitable size, is then placed over the inked surface, as represented in the engraving. The end of the lever is next turned in the direction indicated by the doted lines, and the stamp pressed down upon the ink, when the lever is then carried over, ready to make an impression. As this motion takes place by means of the rod, A, connected with the end of the lever and actuating suita ble mechanism, the ink slab is rotated so as to present a fresh surface of ink for the next impression.
Any colored ink may be employed, and the pad and type easily cleaned by a little oil of turpentine. The inking sur face, it is stated, will last for years, and may be renewed for a few cents. The device is of convenient size and strongly constructed, and will doubtless form a convenient article for employment in counting houses, ticket officer, and similar localities. Patented March 4, 1873. For further particulars address the inventor, Mr. Geo. H. Rountree, Milwaukee, Wis.

## rag Cotting Evaine

The invention herewith illustrated is an apparatus for holding the bed cutters of a rag.cutting engine, and adjust ing them up to the cylinder. It is claimed to obviate the use of wedges, and to admit of applying a set of cutters and removing them in the most ready manner, thus forming an important improvementover the rude devices in common use
Fig. 1 is a perspective view of the invention, and Figs. 2,3, and 4, sectional, plan, and detail drawings. A is a metal box fitted in the bed frame of the machine immediately under the cylinder, indicated by the dotted line, B, Fig. 2. This box serves to hold the case, C , in which the cutters, D , are confined. Its sides are made slightly wider apart at one end and bottom than at the other end and top, so that the case, C, which is correspondly fitted, will wedge in tight when shoved therein. The cutters, D, are fitted to bars or
saddles, E, Figs. 2 and 3, placed in the botsaddles, E, Figs. 2 and 3, placed in the bot-
tom of case, C, transversely. The bars have tom of case, C , transversely. The bars have
temper screws, F , passing down through temper screws, $F$, passing down through
them to the bottom of the case, by means of which they may be raised or lowered. In Fig. 2 a transverse view, and in Fig. 3 an end view, of one of the saddles and its screws is clearly represented.
The cutters are also secured between the crossbars, $G$, Figs. 1 and 4, which hold them to the work while being ad

justed up and down. Two or more cases, $C$, with sets of knives, may be employed, so that when one gets dull it may, through the above arrangement, be readily removed and another substituted. If the case, $C$, be difficult to start when wedged in, a bar, H, Figs. 1 and 4, and screw, I, may be employed for the purpose ,the screw passing through said bar,
which is placed against the end of box, $A$, and screwing into the case, C .
For the convenience of parties preferring to grind their cutters, the bars or saddles are inserted with a dovetail, so that the knives may be easily removed for that purpose and again adjusted. The bedplate is firm and does not vibrate. It is further claimed for the invention that all steel knives may be used up much closer than by the old process, thereby effecting a saving in both time and matorial. It is stated that actual experience has shown that the blades, through
blade of thin plate steel, having a shank which is fixed in an ordinary wooden handle. The edge is made sufficiently sharp to scrape and loosen the dirt from griddles or bake pans, and the corners may be poked into angles and used to dig out the deposit. It was patented Feb. 11, 1873, and further information regarding it may be obtained by addressing the patentees, Messrs. V. N. Davis \& Son, Stoneham, Mass.

## THE BIGL MITRAILLEUBE

A new mitrailleuse, invented by M. Sigl, of Vienna, has recently been experimented upon at the camp of San Maurizio, Italy. The weapon, we learn, has already been adopted by Austria and that government has ordered 140 to be constructed for its use.
The Revista. Marituma says that the barrels are 37 in number, of a caliber similar to that of the new Wernelli breech-loading musket used in the Austrian army, that is 432 inch, with six grooves of rifling. The weight of the charge is $61 \cdot 7$ grains, and of the ball $312 \cdot 1$ grains. The essential portion of the device lies in the firing mechanism. A lever, placed in line with the axes of the barrels, serves to draw to the rear the breech arrangement containing needles, spiadles and thei springs. This portion moves upon two slides applied laterally to the posterior edge of the bundle of barrels. By placing the lever straight, the device is drawn away from th rear face; by pushing the lever down, th movable part is carried in close contact with that surface. While the parts are separated

## ROUNTREES HAND STAMP.

this mode of adjustment, will last at least twice as long, and that the device has been tested by three years' use in binders' and trunk board making, working up tarred rope and performing other heavy work.

Patented through the Scientific American Patent Agency by Edward Wilkinson, Sept. 5, 1871. For further particu lars address W. O. Davey \& Sons, 117 Wall streat, New Yor city, or Cyrus Currier, 290 Market street, Newark, N. J.

## SCRAPER FOR HOUSEHOLD USES.

We presume that-every housekeeper, of however short ex perience, has at some period discovered that dirt has an un explainable and withal a marvelous affnity for naccessibl angles of staircases, and mop boards, and doors, and corners of cooking utensils after grease has been in them, and cakes


WILKINSON'S RAG CUTTING RNGINE.
itself there, and declines to come out under the persuasion of the sharp end of the dust pan, or the point of a spoon, or frantic slashes with a broom : and it wears a woman's soul out, and then she gives it up, and her husband comes home and

immediately perceives it, and says she isn't half as neat as his mother was, and makes other and similar brutal remarks. Well, the object of the instrument represented in our engraving is to obviate all these difficulties. It is simply a
charged chamber is dropped in two vertical grooves in the frame. The lever is then brought down, the mechanism is pushed forward, the cartridges enter the bores, while the movable breech, fitting firmly against the rear of the barrels, closes that portion and prevents ail escape of gas.
The firing apparatus is contained in the fixed or rather sliding portion, between which and the barrels the magazine of cartridges is placed. First, and nearest the cartridge chamber, is a disk containing movable needles; next in rea is a simple plate, which may be freely moved in a vertical direction. This plate lies bet ween the needles and the spring spindles, when the machine is being charged and before iring (Fig.1). After the breech is loaded and closed,by press ing firmly on a charging lever, a cylinder of bronze, in which are 37 cavities is pushed forward. In each cavity is a spin dle with its spring. The plateinterposed between the needle and spindles hinder the latter from moving, and consequently, the containing cylinder be ing pushed ahead by the lever, the spindle are forced back in the sockets, at the same time pulling upon and extending thei springg.
To fire the piece, an articulated lever, placed in the direction of its axis, is lifted, the inter posing plate is drawn down as shown in dotted lines, Fig. 2, when the spindles, set at li berty, are thrown forcibly, by their springs, against the needles. These carry on the motion to and explode the cartridges in the chamber. Afterthe spindles are drawn back after the round has been fired, the simple weight of its lever causes the interposing plate to return to its former position. The cartridges are arranged with central priming and the areedle has sufficient play to be disenger neede has sumicient play to be disengaged from the cylinder and thrown back by the ac tion of the gases. Dispersion of the balls
is effected by giving the bundle of barels both a lateral and a vertical movement on a suitable pivot. The firing lever is connected with graduated mechan ism, by means of which motion may be imparted to the ma chine coincident with the discharge, so as to scatter the balls according to the distance they have to traverse. The weight of the whole machine, with appendages, is 3,275 lbs.


In the absence of special information, we presume the artridges are forced back into the chamber by the explosion, and removed with it. A very slight recoil was noted The most effective firing and dispersion of balls took place at 3,608 feet distance. The average rapidity of fire was 500 shots, or 15 filled chambers, per minute.

## NEW STEAM ROLLER.

We illustrate a new steam roller, constructed by Messrs. Aveling and Porter, of Rochester, Eng., which has, for some weeks past, in company with another roller by the same makers, been doing excellent work at Vienna, rolling the roads in the Prater, and preparing the approaches to the Exhibition. The steering wheels are at the back of the fire box, and carry that end of the boiler without the intervention of any framing. The machine is, in fact, as nearly as possible a traction engine possible a traction engine
with very broad wheels, with very broad wheels,
those at the leading end being placed ciose together, so ing placed ciose together, so
that they roll the space that they roll the space
which would otherwise be which would otherwise be
left between the tracks of left between the
The leading wheels are, as will be noticed, made somewhat conical, and they are mounted on a dead axle of which the ends are deflected downwards, so that the downwards, so that the wheels are brought together at their lower edges and spread at their uppar ones. This arrangement enables a strong center pin, bolted to the leading axle, to be carried up between the wheels as shown, this center pin passing through brackets projecting from the smoke box. A collar on the pin takes a bearing against the lower bracket, and the holes in the latter are formed so that the center pin can not only rotate freely, but can rock to a limited extent, so as to allow the leading wheels to adjust themselves to the curve of thes road surface. The outer ends of the leading axle are connected by a bow or frame, as shown, which servos to receive the steering chains, the engine being steered by the driver from the foot plate.
At the trailing end the arrangement of the machine is similar to that of the agricultural locomotives of the same firm, the crank shaft, etc., being supported by wrought iron brackets formed by extending upwards the side plates of the fire box casing This mode of carrying the crank shaft bearings saves much dead weight, and substitutes simple riveted work for brackets bolted to the boiler.
This roller weighs $7 \frac{1}{4}$ tuns; but machines of the same type, of much larger sizes, are made by the same manufacturers. We are indebted to Engineering for our illustration.

## BTEVENS INSTITUTE LECTURES...-FLUGRESCENCE.

 by pregident henby mortor. The spring course of lectures at the Stevens Institute oTechnology, which we have reported in full, closed with a Technology, which we have
brilliant lecture on "Fluorbrilliant lecture on "Fluorry Morton.
Like a traveler on the surface of the earth, so the pilgrim of science will pass through regions wherehe is familiar with every insh of ground, catching now and then a glimpse of ingccessible hights, which he can approach, by a steep ascent, profficetly aer to abtain a basis for near to obtain a their nature, but which he their nature, but which he cannot reach with the means at present at his command. After having frequently acted as a guide to his audiences through well known regions, the lectur. $r$ requested his hearers this time to set out with him on a journey to one of those inaccessible uplands of science. Before entering upon the study of fluorescence, we must



Fig. 2. those coming through 0 are composed of many colors or waves of many different sizes; they are separated and ap pear so on the screen at S Y. Such a band of colors is calle a spectrum. When a beam of pure white light is passed through a prism or is analyzed, as we call it, we get the well known series of colors: red, orange, yellow, green, blue, indigo, violet. Beyond the violet, however, there are invisible rays for a distance more than five times as great as the length of the visible spectrum. They are called actinic rays, and produce photographic and chemical effects. The lec turer exhibited a drawing of the invisible spectrum by cast ing on a screen the greatly magnified image of Fig. 2.
Although the difference between the colors seems but slight: only a difference in the length of the wave; yet each element of the most composite beam of light is so unalterable that the least change of tint never takes place. Red light through it were passed through a hundred lenses or prisms, cannot become one atom more or less red, and atill less can cannot become one atom more
it be changed to another color.

## flashed out in large luminous green letters.

What then is the carse of color in Nature? Is not white light changed to green when it falls upon a leaf, or to red when it strikes a brick wall? No; white light contains all colors; when it falls on a leaf, all rays of light except those producing green are absorbed by the leaf or converted into other forms of force, while only the green are reflected. On the other hand, red objectsabsorb all but the red rays. To prove this, a cluster of banners of various bright colors was illuminated succesively by light of different tints. The banner having the same color as the light remained bright, while all the others appeared black. If colored objects changed the color of the light, a red banner, for example, would have remained red even in a green light.
Do not colored glasses and solutions modify the lengths of the waves or the colors of the rays which they transmit? No; they check the passage of some rays, while they permit others to pass through them. To demonstrate this, the lecturer produced a splendid spectrum on the screen by means of the electric light. On interposing a plate of red glass, the red of the spectrum was not made brighter, but all the other colors were extinguished. A green solution interposed extinguished all the colors of the spectrum but the green, and a blue solution all but the blue A solution made by extract ing boiled tea leaves with alcohol, absorbed with the violet and also certain shades of and green. The con, orange, passed thren. The colors which passed through formed a combination of olive green. A solution of permanganate of potash produced five dark bands in the green of the spectrum, nearly obliterated that color, and consequently the light it allowed to pass through was reddir purple.
Such being the universal laws of color, it must have been a matter of no little surprise to the first ol. servers when they discovered substances which, on being illuminated with one kind of light or color, exhibited another. To illustrate this phenomenon, the lecturer exhibited two pictures of a flower with leaves and buds. The colors of one appeared brilliant by ordinary light, while the other was of a yellowish hue, so pale as almost to escape notice. On illuminating both with a bright yellow light, the highly colored one faded and became as dull as its companion; but in substituting violet light, a remarkable change took place. The colored picture remained dull, but the pale one seemed to glow with splendid red, blue, and green hues. Here, then, substances receive violet light; they neither absorb nor reflect it, but change it to red, blue, and green. What does this mean?
The lecturer then inter. rogated a large screen, which seemed perfectly white when illuminated by the electrical light, as to what property it possessed in reference to light. With green light and red light,

## the screen gave no answer; but with blue light, the wor

In the experiment just performed, it was only violet light or a mixture of blue and violet that produced the effect. Thousands of experiments go to show that violet light alone developes Huorescence in all bodies capable of exhibiting this phenomenon, but any color may cause some body to fluoresce. In the picture of the flower, the blue color is only excited, so to speak, by violet light, the green by blue rays, and the center, which was red, was excited by the vijlet and also by the red rays, but not by the intermediate ones. From hundreds of such observations, Professor Stokes deduced the law that the exciting light is always of a less wave length than the fluorescent light which it developes. To show that the invisible or actinic rays of the spectrum also excited fluorescence, the professor projected a spectrum from the electric light on a screen coated with some fluores cent substance, in such a way as to cause the extreme violet
and ultra violet rays to strike it. Far beyond the visible vi- bottom, and only the rod, with the soil within it, is recovered and ultra violet rays to strike it. Far beyond the visible vi- $\begin{aligned} & \text { bottom, and only the rod, with the soil within it, is recovered } \\ & \text { let rays, the substance fluoresced with green light. Here, }\end{aligned}$ then, we have a method of rendering that region of actinic rays visible and amenable to experiment.
In spectrum analysis, t'ie metals are recognized by bright lines in different localities of the spectrum. Silver, for ex ample, gives two bright lines in the green. Stokes discov ored that it as well as other metals gave lines in the activic spectrum also. The lecturer exhibited these lines on the creen by burning bits of different metals in the electric arch, when they came out beautifully in the fluorescent spectrum of the invisible rays. It seems to us that, by means of this extension of the spectrum, the utility of that wonderful instrument, the spectroscope, has been extraordinari ly increased.
It follows from these ex periments that light rich in short waves, such as that produced by the electric discharge in rarefied nitrogen, is the most effective for showing the beau ties of fluorescent substances. The lecturer had according y arranged a number of Geissle: tubes, containing pure ni trogen highly rarefied, through which he passed the electric discharge of the enormous Rulhmkorff coil, represented in he Scientific American of December 28, 1872.
Sulphate of quinine solution, illuminated by these tubes, glowed with a milky blue light, although it is perfectly

平sculin, a substance contained in the decoction of horse hestnut bark, produces the same effect. By means of thi property, the one twenty-millionth part of æsculin can be detected in water.
An extract of the seeds of stramonium glows with green light.
Morin, a substance extracted from Brazil wood, lights up with a brilliant green.

Canary" glass, which contains uranium, fluoresces with a splendid green color.
Many other sübstances were exhibited with beautiful ef fect by Professor Morton ; the most remarkable, however were two recently discovered by bimself, and which he named thallene and petrollucene. To these was due the stri king beauty of the flower exhibited in the early part of the lecture. Messrs. Hawkins and Wale, instrument makers in the Stevens Institute building, have made a very neat portable arrangement for showing these substances. A smal folding pocket of blue glass contains a design painted with fluorescing substances. This can be earried in one's pocket and exhibited ly daylight.

In order to study the properties of fluorescent bodies. the lecturer had examined by means of a spectroscope the light emitted by a great number of fluorescent substances, which were illuminated by a beam of sunlight deprived of all but the blue and violet light by passing through a solution of ammonio-sulphate of copper. He found that æsculin, quinine, morin, and many other bodies gave continuous spec:ra while those of the salts of uranium, thallene, petrollucene, etc., were characterized by bands of great regularity bu differing with different substances and resembling their absorption spectra. Curious connections have been found between the latter and the luminous bands, of fluorescence in certain cases, as, for instance, with thallene and petrollucene, as had indeed been already observed in other substances by Stokes and Hagenbach ?

What, then. is fluorescence?
In answer to this question, the lecturer projected on a so as just to touch a tuning fork. Then taking another similar tuning fork, he went off to some distance and sounded ii. The vibrations from this fork traveled through the air, set the other one in motion, and this motion was communi cated, though whe fro vas plainly visible to the audience whose swinging to and fro vas plainly visible to the audience.
In a similar manner the vibrations of light might be conveyed by the luminiferous ether to a fluorescent body, whose particles would set in motion, though with diminished velocity, the ether filling up the interstices between them, thus giving rise to a color of lower order

## Railroads and Bridges

During a recent lecture at Cooper Union, in this city, by Professor Plimpton, of the Stevens Institute, he described the wonderful influence railroad power had upon commerce and all descriptions of industry in this country, and stated that the United States had more miles of railroad than Great Britain, France, Spain, Italy, Switzerland, United Germany, Austria, Turkey, and Russia enmbined. The London Engineer recently asserted that in the world there were 130,000 miles of railroad, and America had 60,000 , but the fact was that this country had no less than 68,000 miles, and this year would have 76,000 miles of railroad. The lecturer described the formation and materials composing the four great descriptions of bridges-the arch, truss, suspension and tubular, their relations to each other, the amount of pressure they could bear, and what strain they should be expected to resist, by com
be required to perform.

## The Hydra.

This is an instrument for obtaining samples of the ocean bottom, the invention of a blacksmith on board of the British ship Hydra. The Challenger, the English exploring ship now on a voyage of discovery round the world, is supplied with quite a number of these instrumeats. The machine consists of a hollow metal rod, fitted with valves, and in
which are rove cast iron weights of 100 pounds each, one for which are rove cast iron weights of 100 pounds each, one for
every 1,000 fathoms of estimated depth. The whole is so adjusted that the weights detach themselves on striking the

When the Challengrer started on her voyage three month have to be replenished before she has completed her work. have to be replenished berf. $A$ much by Sidney $F$ and . of the late Professor S. F. B. Morse, patented here in 1866 This machine consists of a rod containing a series of hollow glass balls, by means whereof, the number of balls being in reased or diminished, any desired degree of buoyancy may be imported to the instrument. Bags of sand or stones are attached by which the rod is carried down and the lower end made to scoop up a portion of the ocean bottom. The sand bags become detachtd when the rod strikes bottom, and the rod then rises with amazing velocity to the surface, shooting up into the air as if discharged from a gun. This instrument is also provided with glass pressure chambers, and mercury, so rranged that the pressure of the water will drive the mercury from one chamber to the other. The depth of the cean bottom will be indicat:d by the quantity of mercury oo exchanged. The ragister of depth is very exact. Thi sounding instrument requires no line, and is, we believe, the first of the kind ever invented

DECISIONR OF THE COURTS.
United States Circuit Court.---Nineteenth District California.


Inventions Patented in England by Americans. [Compiled from the Commissioners of Patents' Journal.]

Mand
CAR Coupling--E. H. Janney, Alexandria. Va.
CLIEANING WABTE.-S. S. Lewis et al. (of New $\mathbf{Y}$
rik city), London, England. Dyzing Indigo.-J. Marble, Worcester, Mass. Economising Furi, ETC.- E. F. Grifln, Chicago, Im
FRUIT CAN, ETC.-W. H. I. Howe, New York ctty (as Purifirr.-E. Duffee, Haverhll, Mass Mafing Metal Tubirg.-S. R. Wilmot, Bridgeport, Conn. Ordnance, etc.-J. P. Taslor, Elizabethton, Tenn. Plled Fabric.-A. Warth, Stapleton, N. Y. Railway Carriage.-W. b. Rogerson, Paterson,
Red Organ.-G. Woods, Cabridgeport, Masb. Sidi OranN.-G. Woods, Cambridgeport, Mass. Trlegraph.-T. A. Edison, Newark, N. J.
Trimgraph.-W. F. Coffln, New York city

## Zecent Smerican and forciqu Eqatants.

Improved Heating Stove.
William R. Akers and James E. Johnson, Malcolm, Iowa.-This invention consists in the arrangement of an air chamber at the Dase of an air heating
stove, to recetve the foul air from the room and discharge it into the amoke chamber to be carried off with the smoke, so as to malntaln a purer atmos phere in the room aud regulate the draft, the construction of the whole be-
ing simple and cheap, and calculated to be very efflctent and serviceable. Improved Cradle.
 me strong which suspended by surtable means the bottom frame, with ing or supporting frame, and may be adjusted on it to any desired hight. By olded up to be carried about or stored, without taking up unnecessary

Ed Improved Grain Dryer
Edwin S. Forgy, Da yton, Ohio.-This invention is an apparatus for drying
rain and other similar substances which can be moved from place to place and which will fully utilize the heat generated. A stove is arranged in the base of a casing of sheet metal with which is connected a plpe which passes
through the casing and extends upward on the outalde to moke and gaseous products of combustion. A zigzag, which consists of a frame in which is fastened a series of inclined plates, is so arrunged that grain placed upon the upper plate will, when the zigzag is ribrated, descend rom one plate to another, or from the top to the bottom of the zigzag, and be discharged near the bottom of the casing. The zigzag has room to play
laterally within the casc, and is vibrated by means of an eccentric rod Wich is supported on eccentric Journals in boxes on the sides of the case, a rotating motion being given the eccentric rod by means of a crank, so that hand or other motive power may be applied. By this arrangement the grain
subjected to a gradually increasing temperature as it descends. The is subjected to a gradually increasing temperature as it descends. The
vibrations of the zigzag will evenly spread the grain over the plates and set vibrations of
in motion.

Improved Cloth Measuring Register.
Samuel Crocker, Port Allen, Iowa.- This invention has for its object to hall be so conatructed as to count and register the number of yards mea ared, thus rendering a second and third measurement of the goods unnece ary. In using the machine, a bar is adjusted to the division marks of the cale of a plate that indicates the number of yards to be measured off, where is held by a spriag cacch. The end of the edge of the cloth to be measure end of a stop. The left hand is then sllpped along the edge of the cloth to the last fret of the scale. The stop is then pressed downward by the thumb of the right hand, and a spring revolves a wheel hair a tooth. As the pre ure upon the stop is removed, the sald stop is forced upward by another he division ma $k$ marked 1 on the scale of the plate, the division ma $k$ marked 1 on the scale of the plate, and so on, the
pointer always registering the number of yards measured off. As the ointer in its movement reaches the ba. first mentioned, the further opera tion of the machine is stopped, and the operator knows that he has mear sured off the required quantity.
Improved Boiler Tube Scraper.
John B. Christoffel, Williamsburgh, N. Y.-This invention has for its ob Ject to improve the construction of the biller tube scraper for which letters
patent No. 62,816 were granted to the same inven patent No. 62,816 were granted to the same inventor on March 12, 1867 radial plas as there are destgned to de blades in the scraper. The blan are made of light spring steel, are arranged spirally, and have holes in the ands to receive the pins of the collars. To the rod at the innersides of the collars are secured stops, to prevent sald collars from moving tuward each ther whlle allowing them to move outward freely. Upon the rod at the ends of the springs which are colled arourd sald rod. This constructio nables the scraper to adjust itself to the size of the tube co be operatio upon, and adapts it to be used elther end forward, as may be desired.
Oscar G. Cosby, Richmond, Va.-This invention con
Canvas above the mattress on rollersextending from head to a oot on wit each side,arranged as to stretch the canvas tight anil hold the patient on It While the mattress and its frame, which are suitably arranged and provided with devices for lowering it, are lowered to allow a vessel to be presented
under the mattress. The rollers are fointed near the head, and provided with devices for raising and lowering that portion to support the patient tid a sitting or reclining position. Gears and cranks are emplosed to raise and lower the mattress and its frame, also the head portion of the canvas an he rollers on wich it is strecthed, and ratchets and holding pawls are use hold them in position.

Improved Trimmings.
Wellwood Murray, New York city.-The abovelnventor has patented two Inventions. The first consists of a blas box plaited trimming of plain lace
alone, or the same with the edges trimmed with figured lace, or figured lace or other goods trimmed with figured lace or other suitable trimming on the edges, folded longitudinally a little one side of the middle, so that one edge trimming comes a little higher than the other, showing two rows of edging or trimming. The blas box plaits of one part cross those of the other dia gonally. Ths lades' neck wear, also cuffs and other light articles, and also triminggs for
various purposes. The second invention, called collarette trimming, is composed of a comblnation of plaited ruching of net, with narrow platte and pointed musiln, the net being placed on one side only, or on the front
and back of the muslin, and sewed along the middle of the front plece and and back of the musinn, and sewed along the midale of the front plece and upper edge of the back plece when a back plece is ased, to the plain edgeo
the muslin. There may be one or two strips of the latter, one placed above the other when two are used, and made narrower than the bottom plece so that the points of the latter will not be covered. The back plece of net will be wider than the willest strip of musilin so as to project below the polats, thus making the sald trimming of one or two rows of
without a margin of net projecting below the points.

Improved Carving Machine.
Henry Grabenbecher, New Fork city.-The Invention consists in the im provement of carving machines. The supporting table furnishes bearing for the spindie of the cutting tool and for the gage pin, and also a suppor for the siding carriage, to which the jointed block and pattern holdin
frame are attached. The spindle is revolved with a suitable driving shaf The tool can be applied to and removed from the spindle, so that it may be replaced when desired. The gage pin is fastened in the support, which is laterally adjustable on the table and can be set at any suitable distance from the tool, according to the dimensions of the articles to be cut. It can als
be longltudinally adjuated in the support, so that fts polnt can be set an hold exactly in line with the point of the tool. The silde can move an and forth, hut not sidewise, or up and down. To its front end is secured a cross arm. The block to be carved, and the pattern to be imitated, are fastened to the face of a plate which has cars at its ends, which are pivoted to the ends of a bar. The plate can be swang to hold the block and pattern
at any sultable angle to the tool and gage pin, and can be locked at any at any sultable angle to the tool and gage pin, and can be locked at any
desired angle to the bar. The whole frame can moreover be vibrated so that the block and pattern can be swung on two different curves. A spring connects with the sllde and tends to draw it back, away from the tool and pin. Another spring serres to balance the frame and to hold it nearly
horizontal. The operator, after the olock and pattern have been properly horizontal. The operator, after the block and pattern have been properly
secured to the plate,and the tooland pin belng adjusted, has only to vibrate secured to the plate,and the tooland pin being adjusted, has only to vibrate
the plate up and down, and draw it back and forth, and swing it sidewise so as to bring every part of the pattern in contact with the pin, which will cause the tool to reach corresponding depthsand parts of the block, and to reproduce the pattern. When work 18 to be cut on more than one side namely, when it becomes necessary to turn the pattern, In order to bring
all parts of its surface in contact with the pin, a holder is used in which all parts of its surface in contact with the pin, a holder is used in which
laterally adjustable brackets are fastened to the face of the plate. The block to be cut is centered between the brackets, and the pattern between the brackets. When the pattern is turned, the block will also he turned in

Willam T. Dormproved Furniture Spring.
urnish an impruved spring York city.-This invention has for its object te farniture. The invenpring for chairs, bed bottoms, and otherartucles o combination, with each other, of the case,made in two parts oscillating upon each other. To one part are attached rigld blocks, and in the face of the other part is formed a recess to recelve them. In the Inner part of the latter plate ts also formed a transverse groove to recelve a cross bar, between pass around the rubber blocks and are interposed. Open metallic band pass around the rubber blocks and the projections to prevent the former
from spreading when under pressure, and also to prevent the wear of said rubberblocks by friction. By this construction, as the one part of the case is oscillated or turned back and forth upon its plvoting point, the rubber blocks will be alternately compressed by the bar.

May 3I, 1873.1







Improved Lock Hinge.
Mortimer C. Lee, New York city.- The invention relates to an improved
hinge for locking window blinds and shutters, the lower or ilintle portios having two shoulders or foothol.is, with which a pawi, pivoted to the uppes
portion of the hinge, engages when the blind is swung open. It ts adapteo portion of the hinge, engages when the blind is swang open. It is adaptec
for use upon either side of a window. The patentee would ilke to correAddress 358 East 62 d street, Nem York city Improved Paper
Robert Henning, ottama, Ill., assignor to himself place. -The invention consists in the improvement of paper fles having guards to prevent the loss of the flled bills or other papers. A rectangulat plate of brass, bronze, or other sultable material is applied by screws on
otherwise to the walls or other conventent place wi hin reach of the opera tor. A filttened conical shoulder is casi to the plate, and has screwed int
its lower end the fle hook of strong metal wire, which bends upward and Its lower end the file hook of strong metal wire, which bends upward and
terminates in a sharp point so that the papers may be placed over the same terminates in a sharp point so that the papers may be placed over the same.
At the upper end of the shoulder the guard lever is pivoted with its arms to a quadrantal projection, and rests, when closed, on the projectiug shoul
der. The lever, by fits welght, drops down on the hook as soon as the message files are placed thereon and the pressure for holding up the lever it
rellnquished. The guard lever thereby effecrually closes the flle, and pric vents the loss of mase

## Improved Machine for Dressing Stone.

Gents in stone dressing machines, in which steel or other cutters or chisels ments in stone dressing machines, in which steel or other cutters or chisels-
are mounted In a rotary cuiter head, which is monnted on a support on the ends of radial arms, by which it is adjusted vertically to the work which is
automatically fed ulong under the cutters. The sald cutter head is caused automatically fed along under the cutters. The sald cutter head is caused
to traverse laterally on its support by a feed screw, and the radial frame is adjusted vertically by screws geared with a worm shaft for turning sald :screw. ; and the worm shaft is mounted on bearings so pivoted as to
allow the screws to oscillate while working in nuts pivoted to the radial frame, to admit of the vibration of the screws necessary for the working o Improved Snow Shovel.
Henry c. Cole, Wallingforl, Vt.-The invention cons
Henry C. Cole, Wallingfort, Vt.-The invention conslats in the improve.
ment of snow shovels. A thin blade of wood Is arranged at right angles to :ment of snow shovels. A thin blade of wood is arranged at right angles to
the handle and parallel with the edge, fo that the handle, which is attached to the front or upper face, extends across the grain, which ts the best way
of conuecting them and arranging the grain for the prevention of spilting. - of conuecting them and arranging the grain for the prevention of spiltting. 'on the bevel face, the edge, and a narrow margin of the upper side, to make : a strong edge, capable of cutting hard snow, and protecting the wood from
: pilitting. U-shaped thin metal bars strengthen the ends of the blade. This incumbered by the edge of the protecting strip, whith is liable to spring up Incumbered by the edge of the protecting strip, which

Improved Fireproof Floor and Chimney Connection.
William Neracher, Cleveland, Ohio.-For the connection of foors wit chhmneys, so as to insure the protection of the wood work from fre when :the chimneys are overheated, the Inventor proposes to shoe the joists at the
-ends and some distance therefrom with cast fron socket pleces, thereby chimney, and the sides exposod to the heat outside thereof for a suitable chimney, and the sides exposo to mech wider than the joists, with holes
'distance. The sockets are to be much
:through the upper sides through which the spaces not flled by the joists :through the upper sides through which the spaces not filled by the joists
:are packed with cement or similar material, the sald spaces belng on the
:sides exposed to heat. In case of chinneys having fre places metal bars :sides exposed to heat. In case of chirneys having fire places, metal bara
eextend from one socket plece to another in front of the brickwork, and irest on a rib in each socket plece a uittle below the surface of the floor, so as
ito support a hearth of cement or other non-combustible material as far from to support a hearth of cement or other non-combust1.
the brickwork as the hearth need extend for safety.
Phillp Krumschetd, Boston, Mass.-This Invention has for its object to improve the construction of wash bollers. Two plates are secured to the
sides of the boiler, near its ends, so as to form tubular spaces between sald plates and the ends of the boller. The upper ends of the plate are bent outward and are secured to the ends of the boller so as to wholly close the
upper ends of sald tuoular spaces. In the plates, just below the flanges, are formed a number of small holes for the water to escape through. The
lower ends of the plase, a little above the bottom of the boller, ars bent in. ward. Other plates have their outer edges secured to the sides of the bofler in a horizontal position, and are bent downward and outward till they reach
or nearly reach the sides of the boller, so that the water can readily pass Into the space between the plate and the boilcr. Ansther plate is arranged the side parts of which rest upon the last mentioned plate, and the end
parts of which slip in beneath the flanges. add inserted when desired. In the middle part is formed a hole, which is covered upon the under slde by a cap plate, the ends of which are bent up-
ward and are secured to the under side. With this construction the clothcs are kept from getting into the hole in the plate and thus impeding the ope-
ration of the boiler by the cap plate, and the water i. kept from bolling up ration of the boller by the cap plate, and the waterit kept from boliling ap
through the hole in the plate, while it can flow down freely to Deheated and construcion the bolling water cannot be forced up around the false bot construction the boiling water cannot be forced up
tom, but must alwass be forced up through the tubes

Improved Bolt Mechanism for Prison Doors.
as R. Pullis and John Pullis, St. Louis, Mo.-The object of thrs
and Invention 1 to to provide a mechanism by which the doors of prison cells may be locked simultaneously, allowing al the same time the opening and closing
'of each door separately. The invention consists of a horizontal bar, placed above or below the doors of a series of cells on one stde of the passage, proFided with plvoted arrsa and hortzontal friction rollers, locked to the bar
by a padiock, the whole bar traveling horizontally in suitable guide supports by means of a screw end and female screw applied in proper manner to tho wall, or partition, or frame at the end of the passage. By taking out
the padiock, the arm with friction roller may be swung outward from the the padiock, the arm with friction roller may be swung outp

John P. Whipple, Whitewater, Wis.-The invention John P. Whipple, Whitewater, wis.-The invention is an improvement in
the class of couplings wherenn pivoted spring hooks are employed. The forward ends or the bumper heads are slotted vertically, a bar belng left at the lower part of theif ends to receive a hook and sastaln the draft. The
rear end of the hook is pivoted in the tnuer cad of the slot in the bumper rear end of the hook is plvoted in the inuer cnd of the slot in the bumper
head by a pin, which passes horizontally through a hole in the bumper head and in the sald hook. The pins are locked in place by amall pine, which pass down vertically through a staple and through a hole in the forward end of
the pin. The staple keeps the pin from turning, and thas prevents the possibility of the small pin dropplag out. The forward end of the hnok is in-
clined, and is extended upward so that, as the cars are run together, the inclined end of the hook may strike against the small pin, rise, pass over, When the train is made up, the connection between the cars is forthe secured by two links, one end of each of which is sccured to the opposite sides of the opposite bumpers, so that their other ends may be passed over
staples attached to the other bumpers, when they are secured in place. Pins are passed transerssely through holes in the forward part of the bum.
per, above the free end of the hook, to prevent the sald hook from becoming aocidentally detached. The butt ends of all the pins have eyes formed upon them for heads, so that they may be readlly withdrawn by a hooked
rod, which is made of such a length that it may be used from the top of a car for uncoupling.

Demey C. Morris, New Sharon, Iowa.- This invention has for its object to Curnish an improved car coupling, which shall be so constructed that the
zars shall couple themselves as they are run together, and which cannot be :ome accidentally uncoupled, and thus break up the train when running. In coupling cars wita this improved coupling, the link is turned up against he end of the car. Then as the bumpers strike each other, as the cars are
un together, the concussion will throw down the llnk, which will drop into un together, the concussion will throw down the link, which will drop into
she notch of the bumper of the other car, and thus complete the couping. After the train has been made up, the attendant can pass along the train ect safety. When into a groove, thus hold lunk may be allowed to hang lown beneath the bumper head, so that it cannot be injured or broken hould two cars be run together.

## Improved Saw Machine.

Charles H. Smith, Faribault, Minn.-The Iavention consists in the improve ind of wood sawing machines. The platform is mounted on car wheels nd has a hand crank, which gears with one of the axles for moving the
nachine up to the plie of wood from time to time. A couple of circular awsare mounted on an arbor, near one corner of the platform, and raised
n saltable supports above the platform. One saw is on the end of the n suitable supports above the platform. One saw is on the end of the
urbor and directly above the edge of the platform. The other is as far oward of the platform as the length to which the wood is to be cut, and Iriving belt, which works on a pulley, from a large pulley on the driving haft, to which the engine which to to be mounted on che platiorm will be
onnceted. The inside collars, for clamplng the siws onnected. The Inside collars, for clamping the saws on the arbor, are
lightyly convex, and the outside collars are correspondingly concave to ff wood will not bind at the ends with the saws, particularly along the midlie. The collars are screwed up against the saws on threads pitched, so nscrew aud release the saws. A wood rack projects forward from the space between the saws and inclines upward, on which the wood ts placed as it is taken from the pile to be presented to the saws. At the bottom of
this rack is an endless carrier, which takes the long pleces of wood laid on he rack one by one and carries them up to the saws, and carries the middle leces to a point where it discharges them to the elevator. The end pleces
call down chutes to the same elevator. and all are carried and delivered to illers. A platform or stana projects from the side of the platform under he ssws for the sawyer to stand on for overlooking the saws and adjusting
the wood. The roller of the carrier is driven by the belt and countershaft and the elevator ts driven by the belt, which works from the crank shaft on to a pulley on the upper roller. The guard over the saws to protect the
attendants from them consists of a llght frame of two bars and cross bars xtending from one to the other over the saws. A cord hange down where
it is conventent to be reached by the sawyer to swing the frame up away it is conventent to be reached by the sawyer to swing the frame up away
from the saws when they are to be fled. The presser bars, for holding the wood on the carriter and controlling it, consist of a number of right angled bars plyoted at one end to the under slde of the guard frame, near the front
of the sams, and extending rearward at the other ends along the space between the saws, about to the rear of them. They are so numerous and of such
different lengths that they are adapted to pleces of wood of alr sizes within hese bars before the pleces of wood are carried against the pass under them, and the bars then rest on the pleces untll they pass beyond the saws.
Improved Bntton.
Frank Washbourne, Brooklyn, N. Y.-This invention has for its object to nuch more serviceable without increasng the cost of manufacture order to insert the button into the bosom or sleeve of a shirt, the back or
inner plate should be frst turned as far back as possible upon the shank and then it can be put through the button hole from the outside withou ifffculty. After Insertion the base or inner plate of the button is turned
into a position at right angles with the shank by pressure of it against the erson of the wearer or otherwise, and thus the button ts prevented from becoming casually detached.

Improved Watchman's Time Check.
Theodore Hahn, Stuttgardt, Germany.-The object of this invention is to
simplify tine construction of watchmen's time detectors and to lessen the expense of the same so that they may come :vithin reach of all who heretofore avolded the use of time detectors on account of their great expense
and complexity. The invention consists in using in connection with a roeys, and whic a plercing tool, which is acted upon by several diferen size nearer to or further away from the center of the dala, and which is jonting
so that to can be swung up by the keys to plerce the dial. This tool or so that it can be swung up by the keys to plerce the dial. This tool or
piercer st provided or connected with two springs, one of which serves to eep it down and to hold the plercing points away from the paper, while
the other swings it outward to its greatest distance from the center of th dial. Above the dial support is, furthermore, employed a stationary pointer or hand to show the time on the movable dial, said pointer being,
ference, slotted to admit the plercing pins through it from below.

Improved Paper File.
Cincinnati, o. - This inventio
Charles D. Lindsey, Cincinnati, O.-This invention relates to apparatus or securing or holding papers of various kinds, as letters, bills, or other
papers. The frame is made of metal consisting of a bed plate and an up Ight back of any desired size. The center of the back is raised and slotted. he back so as to be allowed to rise and fall. Both the clips of each plate may be put through the sheets, but at such point that the sheets will b
held securely. The clips stand vertically, and are polnted and pass through les in the clip plate as the latter is pressed down on the paper to be flled ttached to the lug of the cllp plate. The ends of the spring are confined to Attached to the lug or the clip plate. The ends of the spring are conined to
the back by hooks. The clip plate is ralsed for the fillng of a letteror pape

Hetnrich Metdinger, Carlsruhe , Coal Stove.
Fick Gutzkow ind lower part of fuel chamber with o crescent shaped throst plate ; an th connecting with sald plate a bottom plece having a mouthplece, and in conIIde. To work this stove, min inner piece by a hinge so that the former can heches below the flue hole with coke or coal. A wood fire is it on the top, he heating cylinder is closed, and a sllding door opened. The combustio or by a ventllator-that is, by admittance of alr elther into the stove or int the chimney. The burned fuel is replaced by fresh, filled into the heating cylinderwhen require, and the ashes are removed once or twice during handle, into the ash pit. This grate rests and moves on sildes that may b prevent the burning fuel from settung whille the grate serves merely and is afterward withdrawn. Owing to the absencs of grate bars and the sept better collected and the fire reguiated with such minuteness as to kee It going when its effect is barely felt and the stove appears quite cold to th ing, and may be brought to the highest blaze or a mere glimmering within few minutes.

Improved Refrigerator Water Cooler
Thomas Smith, Brooklyn. N. Y.-The object of this invention is to conefrigerator in use, by which the liquids are cooled and drawn off at pleasure volding thereby the admixture of ice water and its impurities with the liquids used for driuking purposes. The inventionconsists in a rectangular
hollow casing around the ice chamber of the refrigerator, Into which the inquid to be cooled is admitted by a cunnel shaped opening and drawn off by faucet, the bottom part of the cooler belng inclined so that the cooled
iquid may be drawn off completely at the lowest point, and the cleauing of liquid may be drawn off completely at the lowest point, and the cleauing of
the cooler be fally accomplished.

Improved Butions.
Mary P. Carpenter, New York city.-This inven urnish an rom the head, passed through the cloth or leather, and again secured to ye had, rendering sewing unnecessars. The invention consistsin a button ye made of a plece of wire bent into proper form, and having its ends
attened and pointed, and a screw thread cat upon them above the taper
Improved Water Wheel Gate.
John M. Burgherdt, Great Barrington, Mass.-This inve
ode of discharging, Great Barrington, Mass.-This invention relates to a dapted for the turbine wheel, with the head of water resting on the curb of the curb, rests upon it and recelves a rotating motion thereon by means of a rack and pinion applied to its projecting flange. The flange is a segment which passes beneath the flange of the curb. The power for operating
he gate is applied to this segment flange. The movable chute or tongue he gate is apples plect in the curb. The movement of the gate is limited by the water apertures.
When thegate is turned in one direction, the chates come in contact with the stationary chute which cuts off the water. By an opposite movement the water apertures may be made of any desired sizc. By this arrangement
of the chutes, the water is directed to the wheel in unbroken columns, and is brought in direct contact with the buckets. The water apertures are made varlable, and the gate may be adjusted to discharge more or less
according to the quantity of water or the power required, while the shape

## Improved Loom for Weaving Wire

Samuel Foldsworth, Maspeta, assignor Whimself and James Black, Brook triangular pleces of metal, and are plvoted at the apex side by side on a rod race, and lower corners resting on am roller so that the upper corners can be thrown up between the warp wires by the spirally arranged ribs of the cam roller. There are two of these ribs to correspond with the two
throws of the shuttle during each revolution of the drive shaft, and they are spiral to cause the blades to act successively. The shuttle has a T shaped projection on one side fitted in the notches of vertical plates, form the plates a little below the notches, and having the radial pins arranged in
a spiral row and working in an oblique slot, in the bottom of the shuttle o force it up ward and back, the roller belig turned to theright for moving the shuttle across in one direction, and to the left formoving it in the other
direction. Thismotion is imparted to the roller by a reciprocating pice arm, and wheels, the sald sllding plece belng worked to and fro in ways on the loom side by a crank on the shaft of the roller, and having a slot throush which the arm projects at the free end. In practice the slattle will have ia
circular cavty or socket in the upper surface for a flat clicular spool or oobbln, and it will have a hole through the fron to the arms of a rock shaft. At one end of the rock shaft, and outside of the loom frame, is a weighted arm extending upward and passing through a horizontal sliding plece arranged in ways on the side of the loom framo. and worked by a crank on the end of the shaft of the roller. The slot in this silidng plece, through which the welghted arm passes, , is long enough
to allow the arm to complete the changing of the harness by falling after it has been raised to snd carrifd a little past the vertical line by the slide, and the weight of the arm is sufficient to continue the motion without the ald
of the silde a also to hold the harness in position after the shifting. To effect the shifting the weighted arm has only to be raised to the vertical
line or sllghtly beyond by the silde, in which it is greatly aided by the tenthe of the warps, so that, its weight belng only inttle more than the force of without mneh frietion; also, in holding the harness there is no loss by friction. For letting off the warp and taking up the fabric, a small roll is placed
a little in advance of the warp roll, around which the warps are carried a littie in advance of the warp roll, around which the warps are carried
one turn ; another roll is arranged at the front of the loom, over which the fabric passes, and another one alongside of the cloth roll, under which the bearings as to constantly bear against the sald roller, no matter what is the size of the roll of fabric on It , and so recelve a uniform motion from it. Improved Cnltivator.
Jack Felm, Hochhelm, Texas, assignor to himself and Charles Timm, of
same place.-The invention consists in an improved mode of connecting eveners with a pair of gang plows or cultivators. Two gangs of two cultigether at the rear by a cross plece attached to vertical standards rising from the top of the beams, which separate the plows from each othher the requi
site distance. The outer beam is connected to the outer end of the evener by a chain, which also assists in keeping the plows separate at the rear by its tendency to pull the outer one away from the other laterally. The two cultivated is not very high ; but when more advanced, a yoter is substituted at the front for the stralght bar. The screw threaded standards attached hese devices. The plow beams are provided with vertical standards for being connected by the short cross pleces, also, by the long jolnted hort cross pleces when the corn Is too high for the use of the jointed cross bar. They are also connected bs the yoke, which is bolted to the top of the laterally too much, as well as separate from each other the distance required. The two gangs of plows are allowed to work forward and back
relatively to each other, as neceesary on account of the uneren action of Willam H. Holdam, Crab Orchard, Ky.-The
mprovement of churns. The churn body is made crindion consists in the to the bottom ts pivoted the lower end of the dasher shaft. To the sides of the dasher shaft are attached a number of radial arms, which aremade wide
and are tnclined laterally. A curb or short tube is made of such a size as to surround the dasher and allow said dasher to revolve freely within it. The ormed upon or attached to ft , the outer edges of which rest against the Inner surface of the churn body so as to keep the curbs securely in place
and accurately centered. The mllk has a free passage beneath the lower and accurately centered. The milk has a ree passage beneath the lower
edge of the said curb. In using the churn the curb is adjusted so that the upper edge may be a ilttle above the surface of the milk to be churned. and project it outward over the edge against the sides of the churn body, its place being immediately supplied by milk flowing in beneath the lower
edge, thus producing a continuous circulation and a vioient agltation of the mllk, bringing the butter in a very short time.

## Improved Mnsic Notntion.

Ebenezer P. Stewart, Cotton Plant, Miss.-The object of this invention is The impiry the method of writing and to facilitate the reading of music
The invention consists in writing music in figures whichindicate the length of tone, and in writing canceled notes or figures for pauses, or, rather, rests
so that each canceled note will indicate the position and length of rest to so that each ca
be produced.
Improved Lamp.
George Brownlee, Princeton, Ind.-The object
er for coal ofl lamps by the obsect of this invention is to con prevented, a quick extingulshment of the flame be obtained, and clearer on the end of a lever connected with a tubular wick silide, which extinguish es the flame, elther by the pressure of the oll gases or at will by jerking the lamp or incining the same. If the lamp is inchned in any direction to an ngle of more than ar from the perpendicuar, or is let fall a few inches, or person might produce with his breath, the light is extinguished. This is all
done by one and the eame device, consisting of three parts a a wire spring, done by one and the eame devicee, consisting of three parts : a Fire spring, a
sllde on wick tube and an L shaped welghted lever,

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## HMuse texaries

J. V. D. asks for the process of stainin
$\underset{\text { Email Hherry to carry one person. }}{\text { E. }}$ What material 1 s the for that purpose?
A. L. asks how to lay out a division plate for a shaptng machine. Wh
number of holes to use?
W. H. Y. asks: How can I take rust off any
pollighed articie and replace the pollah? I have at lot or
salt water rust.
G. W. asks for a recipe for making a size
mixed with clay, such as 18 used in the makling of paper II Lave made Alize of starch and clas, but find that, iff it stands amhilearter betng boiled, the starch and clas
sink to the bottom, learing nothtng but water." P. asks if there is a process for hardenin
gold, copper, brases, etc., other toestan hammerng ordara
 Iy removed by heat whle under repatr. Can tit be re-
J. H.S. asks for the most approved mode of

 elding cast Iron."
P. J. E. says: We have a mine locomotive wout $\%$ of an tnch, leaving a They have worn down he tread which mak eesit bad to run over castlings. The ors of new tires 19 expensire, besdides the disad rantage
of the loss in time in sending oft to have it done. I would ike to know whether there 18 any way in whtch wecould
E.P. asks if any lasting evil effects are ex-
erienced from the taklng of gunane, such as weakness renced rom the takiag or stiffeess of the jontas or limbs. If a person takes too

much at once or too often, it will produce ringing in the | ears, etc., and if continued, other and more serlous ef |
| :--- |
| fects $\begin{array}{l}\text { will be produced. But if taken in moderate doses }\end{array}$ |

H. W. M. says: As the correct setting of the ilide valve of common steam englines is one of the
most important duties of the engsineer, and as I have Yound no simple and correct scientifc methoc in any of
the books and papers, I would ask englneers to give
 J.s. asks if wire bells, so much used for
 al plane, such a bell would take up too much space: but he space woild be very much reduced if wound in
pherical form, and it tsof interest to the public to know ow the sound would compare with that of other church
J. E. G. Wishes to put in steam to help in a
all during buas times, put objects to the danger from rild durng busy tmes, but objects to the danger from
re from the
moke re trom the emoke etack. Does any ine know or a gyb
tem by which the smoke and pparzs from the tack can be made harmeess? It it proposed to lead the stack tnto
he tall race of the mill ; would the outhowing wate the tall race of the mill; would the outhowing water
Ive drafte enough, supposing the end of the stack to be Sive draft enough, supposing the end of the etack to be
nutrely under water?
Or would a fan blower, which ould be run at any time by water power to zet up steam

H. B. Bays, in reference to the question of
allug fasterthan the etream: During an experience of many years in the nerig gation of the Alleghany ynd onto aster thana log or plece of drift wood, and that an oll

 or ti. Oill barges in Penensylvania were run out of on Creek by what are called pond freshes. There was, at or
 Swed up therreets." The orl barges, when hight, wee Shppers wourd club together and " "buy a fresh," that tis, hey wouldaire the mill owner to "cut the bracket" ${ }^{\circ}$ When the creek was farly full of water the oll shlipere would start their barges on plenty of water; but the
 ver,

## 

J. C. R. can coat his iron articles with black Japan by following the directions on p. 2 203, vol.
28.-E. F. L. Bhould write to the author; we published his adress. - s. H. \& Co., wili find full drections for tempering steel for all purposes in the recent number inning fron on pp. 212 and 313 of our vol. 26. - C. . H. I. Will find hat question as to lose of power by use of a
crank answered by our reply to G . W. L. on p. 235 , curr
C. H. F. asks if an iron or brass wire electro
plated with copper will convey electrictty as well as plated with copper will convey lectrictry as well as
copper wire of the same aize. Answer: No. The cop er wire would be a much better conductor. Electrictit竍 in and throughout the Wtrac
T. D. \& Co. ask: How long would it take one man, working 10 nours per day, to do the same work
that could be done with an engine using 1 tun of coall Answer: An engine of small powermay use ten pound tine may run on two pounds. A man power is equal to
average. L. asks what carbolate of lime is. Is an excellent disinfectant, although to oome the odor
is unpleasant. It can be made by putting 8 ozas. carbolic cild in 12 quarts lime
with this preparatto
J. T. D. asks: At what distance should the
crank of an engine be from the stralght" when the stamo Arrat enters the port? Answer: In a slowly run-
ning engtne, the steam valve should open fuat as the rank reaches its center. In a quick moving engine, a that or 10 ocomotive, tit it given consdderable lead, and
should be pene to the extent of pernaps Alve sixteenthe of an inch when the platon commences tis stroke. opme well known engineers disent from the genera
pas expressed above, and belleve that lead tse nder no circumstancees, beneicicial.
G. T. asks: By what rule is the horse power
nominal and actual) of a marine engine of the com. pound and surface condensingsystem determinead? An-
swer: Prectisely as in any other case. By determining he mean pressure in each cylinder, multiplying by pis.
J. L. asks: 1. Which will propel a boat the
faster, the padie wheel or the screw wheel? I belleve the grew wheel propels a boat the faster, and 1f 8 o, why
18 1 not used on river boatts? bota draw on the averake? How many do ocean steam-
ers? $A$ nswers: 1 . The screw in veeseels of deep dratt the paddle wheel
feet ; 15 to 20 feet.
E. A. V. asks why some water backs in
 Answer: Such cases are uually due to some exceptional
cause, which has rusted the water back badly, and the
fifleulty generally disappears after a time. Some kind
water vill, however, be more likely to produce rust han others. Water from raplaly running streams whic Sborb conidderable free oxygen 1s more likely to cause
uast than water from wells, or from rivers havingas alug tish current.
A STUDENT IN CHEMISTRY asks: 1. Will the oxyhydrogen blow pipe burn a hole tn a thlck plece
f tron? 2 . Will gunpowder burst any thickness of tron if confned in the center, or could there be strengt nounh to prevent t trom exploding? Answers: 1. Ye
Experiments with ordnance have developed a pressure by fring gunpowder as high as 222 , to 40 tuns per gquare
hich. The latter pressure would burst an iron vessel ot ny thickness, but might be confined by steel of highe enactit than 40 tuns per suare inch, as good tool stee
or Bessemer metal of very high quallty and contanining nore than $x$ yer cent carbon. No thicknegs whateve
can be made tow withtand presures per quare inch ex. dopted.
 recting with 40 feet of $2 x$ tinch cold rolled shartung. Is Sinch cold rolled strong enough? The shaft ts to re
olve 110 in a minute ; how shall we determine the mount of power we are getting? 2. How many horse
2emer power do we reaure for $t$ wo 0 4) Inches run of fouring
burrs, and a so nchees middungs, run with ordinary boltIng, elevatitg , cleanting, etc ? Answers: 1. Two and a hal eed amount of power, but we should prefer 8 inches,
Thirty horse power should do the work 1 feverything go
W. F. says: For some time past I have
notced that tron castings molded in our shop have a ifferent color atter beling cleaned; some of them have Lee color on the eurface, anc others are of a clear gra
olor. What tis the cause? Those havting the gray colo re molded in sand mixed with pure Sydney coal fo
sactng. Id not know what the blue ones accing. I do not know what the blue ones have mixed
with the sand, unless ittis a small portion of Cumberland coal. A short time ago isara short editorial of your
 lackening and other fintsh for molds. No workman
 Answer: We are gliad to hear fron an intelligent and
mbltiousa pprentice, and will try to help pim. Wepreme that the Sydney coal blackening gave color to th bue on other castings may be due to bitumnous matte
rom the Cumberind coal. For black wash, mix cha
 lackentng at ill. Select Ane, clean, sharp sand For larg er work blacking is necessary; llack lead is leastaffected by heat, anthracte and charcoal next, and bituminous he sand, and, if too fine, clogs its pores. Bituminous lackening opens the sand and weakens tt , but if it 18 properly us
N. M. says: We have in our establishment
the following machinery : Two rip and 2 cross cut saws, planer and matcher, 1 tenoner, 1 scroll saw, 1 stccker, engine, 10 inch bore, 8 finch crank, making 70 turns per ninute. We have to carry 60 libs. of steam, and even at at t118 very hard mork for the enggne to drive the ma (which I run on a large saw table) together. Our bolle
 ubes. 1. Do you think the boller would make stean ough to run theengine Lould a boiner of those dimensions make steam enoug
or run an engline of that size at that tpeee? 2 2. How is the heating turface of a botier calculated, what is termed
the grate surface, and what is the fre surface? $I$ have wenty-four volume We should speed up the engtine and also carry higher
team tr convenlent and sate to do so. Some beneft hould be expected from both changes. 2. Measure the of all surraces of the boller Thusa tube 4 inches dameter would be one foot in cit comference, very closely, and would have a fheot of by multiplying its length by its breadth. We are please o hear from our old friends and readers of such long tanding.
J. H. says : I wish to construct a small
team engine and bonler, for the purpose of running a mill sewing machine, for my wife, and wish to ask: inches length, with cast tron heeds $\%$ inch thick, having
 aine of 11، by 3 tnches cylinder? The motli gowe is to be a gas fame from an ordinary burner.
Wha pressure would auch a boller suataln betore rup ture? 3 . What pressure would be required to run the
sewng machne? 4 Where must the water line be?
5. What m must be the size of opening for safety vaive in boller
. Will such a ooller and e the opentngln boller be for the pump? Answers : 1 . Yee Dut the heating surface is too small for economy. W\%

loubt 18 a a ingle burner would give sumflent heat. | Without joint, it should sustain 1,500 pounds on the |
| :--- |
| square tnch. Actually, the $\begin{array}{l}\text { riveted } \text { joint and possible }\end{array}$ | weark spots in the metal would probably reduce itt trength to about 750 lbs. We shovid set the safet . We can only gueses-20 1bs. The restistance would b quite as much, or more, in the engine itself as in the

sewng machnine. 4. Alitte above the midale Ine. 5 . Three sixteenths, if of same stroke and number of rev
olutions per minute as the engine. 6 . One quarter tinc dameor. . T. Yes, as safe as any ordinary steam engine
and bule. Near the back kend.
G. E. B. Asks how carbons for Bunsen bat
certes are made. Answr: In the manutacture of inuminatting gas, the retorts become coated with amorphou minating ges, the retortit become coated with amorphous
carbon
from this retort carbons aremade. There are seeveral processes; one s
to cut it into smape, another is to preess the pulverized
 he mold, so that the carbon will cast on it. the alm be of to hold the material together with the eeastamounc
of cementing substance, as is the case in the manufac
D. C. M. asks for an explanation of the
and a
W. A. C. asks: 1 . How many gares of water
should be carried in stationary tubular boilers, where the water used is clear and the force pump works well ? Does it require any more fuel to drive the same machin
ry by carrying the water in bollers at frrst, second o 0
 ake more respectively? 2. Forty libs. pressure wit
tve our machinery the reaurred motion ; how many libe would be advisabie to carry to be economitcal? 3 . Where is necessary to transmit steam through pipe some dis tance, what is the best way to cover and pack the plpe, ansmittling steam from boller to eng'ine sttuated 250 fee part more than if close by? Answers: 1 . The lower the water is carried, the drier the steam ; the higher it is abitually kept, the siater againat accicents from 10 ater over the crown sheet. The gages should be a placed that the middie one should be at about that line The lower should be above the level of the crown shee The higher the pressure and the drier the steam, the reater the economy, where boller and steam plpe ar in every instance. Try it, if safety permits carrying higher stenm. There is a pressure, giving maximum conomy, which can only be determined by experimen
Halr telt, for low temperatures, as of steam an Hair
bs., and for for higher pressures, ashes, plaster, and the the patent cements sold for the purpose,are effective as covering. 4. Properly covered, the loss from the steam pip A. L. K. asks: Is there any kind of an in distinctly or nearly so? Answer: Ncne except the lan A. E. L. says: Will you give us a descripusing 1t? Answer: Consult Hamilton's "Useful Infor

G. H. M. asks: If rails and drive wheels of slip, and two engines were built, simillar in everyrespect
with the exception that one locomotive had a 6 feet driver and the other a 3 feet, which locomotive will aul the biggeeloent Ans aill other things betn
J. W. S. asks: Will some one please inform me hew i can get a thin coating of rubber on a solld
object like a block of wood? Answer: Dissolve rubbe
blsulphide of carbon and apply as a varnish.
H. E. N. asks: How is bird lime made, es-
pectally that whtch is very tenaclous? Answer: Bird Hime is made by bolling the middle bark of the European
holly plants like misletoe, and other parasites, separating the gummy matter from the ilquid and learing it for a fort night in a moist, cool place, to become viscld. It is nex
pounded into a tough paste, and washed, and put aside or some days to ferment. Some ofl or thin grease is to be incorporated with it, when it is ready for use.
B. O. asks whether there is any known pro-
cess of coating glass with gold from solution, similar to the process of silvering the same by precipitatingmetal
ic silver. Answer: Three solutions are required fo ic silver. Answer: Three solutions are required for ozs. water. 2. $1 /$ dram grape sugar (glueose), 3 ozz. dis-
ulled water, $22 /$ ozs. alcohol of 80 per cent, $21 / 2$ ozs.aldehyde of sp. gr. 0.87 . S. Neutral solution of chlortde of gold,, $3 /$
dram gold to 37 ozs. water. Take 4 volumes of No. 3 nd 1 volume No. 1, mix and add 2 of a volume No Pour quickly into the hollow glass globe to be plated.
Five minutes or more is required. Do not warm above Five minutes or more Is required. Do not warm above
$140^{\circ}$ Fahr. Clean the glass with soda and alcohol, not
H. B. asks: How can I ascertain for myself
whether a substance is lime or magnesia, or whether it is a mixture of both? If the latter, how can I get them
apart? Answer: Lime, when in solution, gives with oxalate of ammonia a white precipitate. If lime and magnesia are to be separated, add to the solution some long as a prectpitate is formed. After Altering, add phosphate of soda, which will precipitate the magnesla if any be presen t.
C.R.asks: How are the eggs of the so-called
Pharaoh's serpentsmade? Answer: Pharaoh's serpents'
 the precipitate; wash and dry and mix with every pound of the prectpptate one ouncee gum tragacanth, soaked in hot water. Make a somewhat dry pill mass, and roll in
pellets of the desired size, and dry again. The fumes re dangeroud and must not be inhaled.
J. B. S. says: I am building an aquarium, mentioned on page 202, of your current volume, $1 t 18$ intended that the glass shall be let into the wood, or can the cement come only to the glass, forming the jolnt of
tself? 2 . What is the bet pollsh for black walnut, and howis it appiled? Answers: 1 . Use an angular beading of wood, outside the glass, and cement the edges of the
glass into the angle. 2. See page tiz of our volume XXVI
J. S. J. asks: Is there any friction gained by placing the rub of a wagon brake below the horizontal
center on the front side of the wheel, or above the center on the rear part, instead of on any other part of the
wheel? Answer: Not unless the pressure is, by that wheel? Answent, increased
C. H. wants to know what sized boiler is wanted to run two cylinders of 2 inches stroke $x \$$ inch
bore, to make 200 revolutions per minute. How thick must the fron be for a small locomotive boller, what diameter should the drive wheels have, and how many should
there be on a side? Answer: Measure the sizes of the first locomotive that you can convenientiy obtain access to; make all parts in proportion except the boller, which Rhould have a considerable excess of heating surface.
R. R. asks: How large pulleys should I use to run a i or $13 / 1$ inches band saw over, of 16 gage ? A J. F. W. asks: Will wood answer as a float ration better it for that purpose? I want it to operate a valve, and for certain reasons the common copper one will not answer. Answer: Wood in its natural state
would answer for a time asa float. But we should not wish to trust it as a permanent flost. We do not call to mind any preparation that would keep it waterproof under the heat and pressure of a steam boller
$\underset{\text { Aetties impart, to food cooked therent, any poisonous or }}{\text { A. }}$ kettles impart, to food cooked theretn, any poisonous or
unwholesome propertles? Answer: Zinc, with which the so-called galvanized fron is covered, is poisonous.
Galvanized Iron should not be used for culliary purpo-
J. \& J. T. say: We have in view the build-
ag of a flouring mill, and we propose to drive the bunn pindles by friction. A rough sketch of the proposed lan is enclosed, and we wish to have your opinion bout 1 t. The dotted hnes at each pair of pulleys show Hees, the pulleys belng brought into gear by a shor ope or chain fastened to an upright rod something like hand brake on a ralliroad car. The bottom of the ro me pressure, and sping or pulieys will have th to take them out of gear. The pair on the right han are in gear and the palr on the left are out. One grea dvantage will be that the driving pulley or engine nee ot be stopped to throw thim in or out of gear. W ings of thick paste or card board; we have used one now for more than a year to drive our saw millcarriage and it is quite true, smooth, and hard yet, and as goo s when made. It surpasses anything we ever tried
ur twelve years experience, and that alone has save us far more than 83, the price of your paper, from Which we got the Idea of paper friction pulleys. Pre
lous to that time we used iron, wood, rawhide, leathe ubber and rubber belt, but we find nothing like pape


A, C, cast iron pulleys on burr spindles, each 3 feet meter $x 6$ inches face. B, cast iron driving pulley, 4) eet diameter $x 6$ inches face. D, E, F, G, paper friction wer: The proposed arrangement promises well. A. F., Jr.; says : I have two Daniell's bat
teries, and I use dlluted blue vitriol and pure water in he porous cups, and insert the zinc. I have never suc ceeded in getting but a slight current, and find that,afte
few hours standing, the lower part of the porous cup re all costed with copper. What is the cause? Answer If you use a saturated solution of sulphate of coppe utside, to act on the copper, and nine parts of water to one part of sulphurlc actd, Inside the porous cup, to act
on the amalgamated zinc, it will be at least a month be fore you are troubled with the copper deposit.
T. A. N. asks for information concerning
he discovery of the anclent tablets pertaning to Scrip tural history, and the name of the student who transla ed them Into English. Answer : The translator is Georg mith, of the British Museum. A full acconnt may b J. E. H. says: In accordance with your re-
uest that some reader would furnish solutions to the questlons of E. C. M. and E. W. H., published in your 1 sue of April 19, 1873 , I submitt the following solution let $\sin$. of $45^{\circ}\left(=V \frac{1}{3}\right)=\sin .1$; then we shall have for the aclet $\sin$. of $45^{\circ}\left(=V \frac{1}{3}\right)=\sin . i ;$ then we shall have for the ac
celerative force, $f=\left[\left(w-w^{\prime} \mathrm{sin} . i\right)+(w+w)\right] \times g=[(5-6 \times$ $707107) \div(5+6)] \times 32 \frac{1}{n}=2 \cdot 21476$. Hence, the distancethe fir ody will descend in 10 seconds will be $t^{2} \times(2 \cdot 21476+2)=10$ $\times 2 \cdot 21476+2=110 \cdot 738$ feet, answer. The solution to the ques plication of the force, $P$, from the center of inertla of the body, $k$ its principal radius of gyration, $m$ its mass, $v$ its
progressive velocity, and $u$ its angular rotary velocity. Then we shall have: $v=\frac{P}{m},(1)$, and $u=\frac{\Gamma v}{k^{2}} \quad$ (2.)

R. L. B. says that A. McG., Who asks
how to get the bevel
on theback of the raft. ers of an octagonal
church spire, will find this dagram and expla-
nation sufflectent. Let C O represent the altithe base or font of the rafters to their apex then 10 will represen er. Through any $t$ tw $g$ draw the line $p n$ perpendicular to th
base line $C$ f. From
the point of tion $x$, with the proper radius describca circl tangent to the line
0. Through the poin y, where the circle in tersects the base line
f c, draw the lines $y p$
and $y n$; the angle $p$ yn It the pevel sought
It will be observe depends upon the length of $C O$ and $C f$, or, in $p$ other H. M. W. says in answer to W asked for a cement to fasten leather upon fron: 1. Use glue and gum ammoniacum; melt together, then add
attricactd. 2. Coat the clean iron with a hot solution galls. Put both together and subject to pressure. 3 . Put pulverized rosin to the fiesh side of the leather and
R. F. replies to J. G. K., who asked if corns were edible; I would say that in the southern that yleld a very pleasantly tasted acorn. I presume they may be found on this side of the Rocky Mountains, but Inever found them in the New England States. They
are very pleasant eating, elther raw or botled, are very pleasant eating, etther raw or botled, and seem
to be very nutritious. Whether they could be used as food In a regular way is doubtful, because of the fact that they are of a stringent nature; and I belleve that, when eaten raw, thes are an excellent preventive of
and cure for diarrhces.
W. W. replies to T. E. B., who asked how
o remove clinkers from stoves: Takean fron rod about half an inchin diameter, sharpened at one end to a point and with a hammer, drive it through the clinker, at such distance from the side of the stove as not to injure the the operation at the distance of an inch from the first, and if the stove be a cylinder, make a circle of holes, broken away, and the other part wil the cllnker can be broken away, and the other part will easily detach from
the frebrick, the vibration caused by the hammering
causing to to loosen.
H. M. W. says, in reference to artificial but est to your readers: 1 . The London Lancet, 1855 , p. 460,
ays : Sixty lbs. colza oll are put into a well tinned brass ofler (of about twice the capactty); add 2 lbs. potat arch and stir with a wooden spatula until the mixtur hours until the ofl has lost all disagreeable taste or mell. Decant and let cool. Add half its welght of clea et. 2. The Pharmaceutische Central halle, vol. 5, p. 157, ozs. of milk and stratned; there is then added theret x lbs poppyseed oil. Heat with 2 ozs. of bread crust, . mugwort and 2 siliced onions. Strain.
S. W. H. says, in answer to E. W. H., who Iven force applied at one end, at right angles to it ne for ever, itsaxis remaining at rightangles to the line of motion. Having no welght, it could have no inertia and there being no resistance of air or anvthing else, if The absence of inertia and all resistance would pre vent the upper end from getting the start of the lowe end. I know iltile of higher mathematics, and am per aps entirely wrong, but give my Ideas for what the
are worth. Since impossible conditions are allowable in problems, I would like to ask E. W. H. What the re sult wọuld be, should an irresistible moving body come

Minerals.-Specimens have been received from the following correspondents, and examined with the results stated:
O. M.-The mineral you send contalns silver.
A. . -The compoittion consists of pruasiate of po

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific America
cknowledges, with much pleasure, the reeipt of original papers and contributions pon the following subjects:
On the Patent Office Surplus. By F. D. J On the Retardation of the Earth's Motion the Tides. By J. H
On Girdled Trees. By A. D.
On the Scientific American. By C.H.D
On Solar and Sidereal Time. By J. E. H. On Saw Teeth. By C. H. B
On the Million Dollar Telescope. By A. D On Iron Shipbuilding in Philadelphia. By . H. B.
On Light. By C. E. T
On a Remarkable Astronomical Phenome on. By J.
On Concentration of the Sun's Heat. By C. F

On Boiler Explosions. By J. C
On the Ransom Condenser. By W. C. D. On Patents. By J. B. C.
On Deep Sea Soundings. By C. E. A
On Marine Carriages. By C. A. B.
lso enquiries from the following: A. de W.-H. E. N.-J. McC.-J.E. H.-P. K.-L. L. B.

Correspondents who write toask the address of certaln
manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find
partners, should send with their communications an mountsuffictent to cover the cost of pubilcation under the head of "Business and Personal," which is specially
[OFFICIAL.]
Index of Inventions
FOR WHICH
Letters Patent of the United States Were granted for the week mading April 29, 1873,
and each bearing that date.
[Those marked (r) are retssued patents.]

## Atr brake, steam power, H. L. McAv Atomizer bulb, H. D. Lockwood....

Axning frame, window, J.A.Allen... Axe boxes, gage for sett.
Bed bottom, M. A. Hunt.. Bed bottom, spring, E. G. Sherman Bed bottom, Bpring, W. Sta
Bed, cot, L. B. Morse, (r)..
Billard cushion, H. A.A
Brd cage, G. Günther.
Blower, rotary, J. A. Svedbe
Boat, IIfe, E. A. Barrett.
Boner, wash, J. Reinig.
Boller covering, J. M. A
Bolt dior D
Bolt, door, S. D. Arnold.......
Book case, revolving, L. B. Pe
Boot and shoe shave, D. Harrington...
Bottle for effervescing liquids, H. Codd
Bottles, mold for glass, C. D. Fox Box, work, W. Brace
Brick machine, R. A.Smis \& $\mathbf{W}$
Brick machine, R. A. Smith, (r) .................
Brush, blacking, Von Kessler \& Mendenwald
Brush handles, driving, P. Peartree
Buckle, harness, J. L. Selleck.
Calculating machine G. B. Gran
Candle mold tip, I. Cole...
Car axle box, S. F. Gates.
Car axle box, w. J. Manker
Car, dumping, o. M. Avery
Car ppring, J. B. Quirk.
Car starter, T. Cooper....

Car truck, C. D. Tisdale, (r)
Car seat, folidng, K. Egan.
Carburetting air, Judd \& Doty
5,882
138,821
Carpet stretcher, P. Kelly.
Carriage, glass mold. Bennett et al......................... 1388,450
138,30
Carriage spring, C. F. Hall.................................... 188,248
188,48

Cattle blinder, M. Backmayr.... ........................ 138,224
Chain links, making, E. I. Levavasseur........... 138,419
Chair, tilting, G. C. Winchester
Churn, rotary, F.E. Clarkson..
Coal screen, s. w. Woodward..
coffee, coating, J. T. Cooke, (r)..
Cooler, beer, F. Schmitt...........
Cooling rooms, etc., T. D. Kingan
ooling rooms, etc., T. D. King
Cotton chopper, Balley \& Bagby
Cradle, W. T. Doremus
Cultivator, C. Thede....
Dental engine, C. M. Curtis....................................138,31
138,30
Doors, threshold for, 0. G. Thomas...........
Dredger, A. C. Both....................................... 138,22
Dredger, T. Symonds......
Dress facing, w. H. Gallup
Ery goods stana, J. . .
Electical apparatus, F. . Varley
Electro magnetic coll, J. S. Cama
Elevator, Mageean \& Marka
Elevator, water, T . Bell.
Engine governor, marine, O. Marland
Engine lubricator, ,
Engine, rotiterson.. Engine, rotary steam, J. Lucas .......
Engine, rotary steam, w. C. Stlles... eather renovator, w. S. Grof Fert11zer, S. Whitehill...................... Fille, J. Brescription, A. D. Foster Fire arm, magazine, Rodier \& Bates Fire escape, W. Kegg Fire kindiling composition, J. C. Crumpton Fork, horse hay, L. Harverstick
Furnace, smelting, J. Neville
Furnace, pudding, J. Neville.
Furnitare pollsh, C. A. Llbby..
Gas apparatus, Brown \& West
Gas apparatus, Brown \& West...
Gate, automatic, L. Fllson....
Gate, automatic, J. P. Ponce
Gear, friction, F. Simmons.
Generator, steam, J. H. Mill
Hammer, power, J. Palmer
Harvester knives, tempering, J. F. Shippey
at, wirtg mat.................................
Hat wiring machine, etc., H. A. Whitting
Hatchway, J. D. Sinclair (r).............
Hinge, P. P. Lynch..............
Horse collar lining, D. Curtis.
Inhaler, Hunter \& Woods.....
Iron front for stone plers, J. Ab
IronIng board, R. N. Herring.....
Tronne board, R. N. Herring. ....
Key fastener, W. Weracher....
Knife, corn, G. Stevenson....
Knife, saw, and spring scal.............. Baggs
Ladder,extension step, a . B. Covert.
Ladder, fire escape, C. H. Whit
Lamp fller, H. H. V. Lilley....
Lamp filler, H. H. V. Lilley.................
Lamp, paraffin, H. Ryc.er.
Lantern,Connor \& Hyne
Lathe boringattachment, F. B. William Lathe dog, C.L. Wick ${ }^{\text {Latham }}$ for turning hubs, Wagner \& Fry....... Light house, floating, J. B. Stoner.
Light house, floating, J. B. Stoner. Locomotive head light, L. Michaels Locomotive recorder, J. D. Richard og turner, J.C. Moore...
Loom let off, Gahren \& Langlotz.
Lounge and bath tub, C . Wendel. Lubricator, J. Gates...
Lubricator, W. Morrls.
.ubricator, J. A. Osenbrüc
Lubricator, H. W. Regan.....
ualt kilns, stirrer for, E. Schmid
Match safe, C. H. Leggett..........
Mattress stuffing, F. A.Lane (r).
Mechanical movement, C. Meine Medical compound, G.Lucy. Medical compound, Phillips \& Reld. Metal, separating. S. J.Peet Metal stippling, W . Dimes ( r
Mill feed regulator, J.C.Dunlap Milling machine, $B$.
Mitten, F.L. Oakley
Musical instrument, I. Fiske. Nut lock, L. J. Mille
Paper, H. E. Wagner
Pencll case, W. S. Hicks (r).
Petroleum, refling, A. Farr
Petroleum, refining, A. Farrar.....
Photograph plate holder,
Plers, iron front for, J. Abbott. .
Pin hinge, Lyons \& Abrahams
Planchets, cutting out, J. Low
Planing machine, L. Gould
Planter, corn, L. Lacey
Planter, hand corn, H. Gortner....
Plaster for walls, Smith \& Harris (r)
Plasterer's head support, T. T. Wrig
Platirm, damplng, W.
Plow hande, J. T. Raftery
Plow, wheel, F. Hasbrook.
Press, w. B. Platte.........................
Press, hydrault wheel, G. A. Gras
Press, hydralic wheel, G. A.
Press, , lever clder,
H. Peters..
Pruning shears, M. C. Malone
Pruning shears, W. McCray...
Pulleys, turning, G. A. Gray,
PulverizIng soll, A. A. Tower.
Pyroxylin articles, J. W. Hyat
Quilting frame, B. Blackstone.
Refifitor, C. F. Jacobsen.
Refrlgerator J.
Refrigerator, J.J. Bailey........... 138,409
138,454 138,45 188,454
138,38
188,450
188,308与 8 38,224
188,413 138,461
138,299
188,355
1





Lects and ore crusher, C. Forster..
Sash holder, E. Knap
Saw gage, circular, C. H. Uhner........
Saw gumming machine,
Saw set, J. G. Tattershall.
Saw teeth, J. E. Emerson.
Saw teeth, J. E. Emerson..........
Gawing machine, band, H. siliman
Scale, bag hulder, Budge \& Russell.
Screw and nut, s. J. Peet ....
Screw s, forming, w. A. McC
Screws, adjusting ro
Scrubber, I.J. Emory.................
Seeder, broadcast. J. D. Huffiman.
Separator, middlings, H. P. Jone
Sewage, treatment of, F. Hill
Sewing machine, D.H. Coles.
Sewing machIne, E. H. Smith
Sewing machine cabinet, G. Range.
Sewing machine iolder, S. W. Wood
Sewing machine cover, E. F. French
ewing machine quilter, W. B. Heflley.
Sewing machine thread cutter,
Shaft for vehicles, $B$. Schroder.
Shingling bracket, L. W. Merria
splints, cutting, C. P. \& C. D. Clarke stereotype plate holder, F. Scholefeld tock reeder, portable, J. M. Spenc Stone, doublet, s. Bruhl...
Stool, store A. A. Murph
Stove plpe shelf, W. B. Elliott
Stud, shirt, O. S. Thaye
Syringe, fountain, H. D.
Syringe, fountain, H. D.
Table, H. W. Pearsall.
Table, auxillary, E. Johnson...........
Thimble, W. P. Slensley
Thrashing clover, etc., I. T. Bart on
ool handle, W. H. McCoy
Toy, C. Ball.................
Trap, animal, D. J. Owen.
Treadle, G. B. Kirkiam (r)
1 weer, G. Harrch...........
Type, distributing, M. Gally
Vacuum pan, A. P. Brown..
Valve, balanced, A. N. Hadley....
Valve, balanced slide, A. O. Frick
Valve, sllde, J. L. Brown ..............
vehtcles, stgn for, Clark \& Lillienda
Veneers, perfecting, A. H. Allen.
Wagon axle lubricator, w. Loewensteln
Wagon, dumplng, O. Gunnuldson
Wagon, dumplng, D. E. Haine
Washer, ore, T. Wren
Washingmachine, Brooks \& Har
Washingmachine, G. J. Colby
Washing machine, H. Dextor......
Washing machine, E. Dickermann
ashing machines, G. W. Fagaine
Washing machine,D. W. Helin
Watches, windinf cilick for, s. c. Smi.......
Water closet, P. C. Rowe..
Water closet bowls, J. V. Msthivet
Wells, grab tool for oll,
Wheel, traction, 0 . Hyde
Wire and rope, stretching, R. L. Taylo
Wood, transferring grain of, J. R. Crods (r)........ $\begin{gathered}188,317 \\ 5,377\end{gathered}$
APPLICATIONS FOR EXTENSIONS.
Appications have beenduly iled, and are now pending, Incs upon the respeetive applications are appointed for
the days herelnafter mentioned
24,915 .-CABTING Coppre 24,929.-Elevator.-G. A. Betteley. July 16.
$24,953 .-\mathrm{Meat}$ Cuttrr.-J.G. Perry. July 16. 2,j,061.-ELIEATOR.-O.Tutte. July 23. EXTENSIONS GRANTEI)
23,820.-ManvFacture of Watch Cabes.-J. Bobs
23,8i5.-LAMP Shade.-C. \& A. C. Wilhelm.

DISCLAI
DISCLAIMER.
3,ss3.-Sifate Fabtening.-J. Coe \& W. b. Snifln
DESIGNS PATENTED.
6,613.-GLAs8 Ware.-T. B. Atterbury. Pittsburgh, Pa.
6,614.-Knobs, ETc.-G. 6,615.-Stair Rods.-W. T. Mersereau, Orange, N. J. 6,616--LAMP STAND.-M. H. Mosman, Chicopee, Mass.
6,617.-HAPES Tor.-H. Beagle, Jr., Phlladelphia, Pa. 6,617.-HAMRs Tor.-H. Beagle, Jr., Philadelphla,Pa.


TRADE MARKS REGISTERED.
1,232.-Nredles.-Bridgeport Cold Swaged Needle Co.C ${ }^{+}$ 1,233.-Frillings.-Browett \& Co., Coventry, England.
$1,234 .-$ Brandy Bottle. -Cazade et al., New York city. $1,23 i$ i-Sraling Wax.-R. B. Dovell's Son, N. Y. ctty. 1,236.-Bdrnising Ink.-Fletcher et al.,Lynn, Mass.
$1,237 .-$ Mrdical Oil. -M.s.Goodrich \& Co. Flint, Mich 1,238.-Preparid FLoUr.-Hopkine \& Co., N: Y. city.
1,239.-OINTMENT.-F. H. Kimberley,Spring field, Mass. $1,210-$ RAEx HANDLEs, ETO.-Smlth el al., Galien, Mich. 1,241.-Harvestre.-D. M. Osborne \& Co., Auburn, N. Y.
1,242.-Bluing.-- Sawyer, Chelsea, Mass.
$1,219 .-G A B$ Burners.-Mrs. A. H. Wood, Boston, Mass. SCHEDULE OF PATENT FEES: On each Caveal..
un each Trade-Mar
on filing each application fora Patent (17...............................
On Issalngeach original Patent.
On appeal to Eraminers-in-Chief.
On application for Retssue........
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On an application for Design ( 33 years)
On an application for Design (7 years)
On an application for Deaign (14 years)

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