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NEW YORK, OCTOBER 4, 1884.
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## BAND SAW MILLS FOR LOGS.

wheel shaft. The high rate of speed-- 300 revolutions per $\quad$ works, and engine, are bolted down to a massive sole plate,
Some years ago we published a description of a band saw minute-at which the engine is required to run, calls for six feet wide and nine feet long, and the parts are made of mill arranged for sawing logs, erected in. New York city great care in this method of construction, but all obstacles such strength and rigidity as to insure the greatest stability. by the Atlantic Works, of Philadelphia. At that time such have been successfully overcome. The entire mill, feed The engine is proportioned throughout for bigh speed, the mills were little known, but the increasing demaud for something more efficient and less wasteful than the circular mill bas led to many improvements in band saw mills.
The wheels, the vital point of a band mill, are now eight feet in diameter, thus greatly reducing the flexure of the saw. They are kept as light as possible, consistent with great strength, these sistent with great strength, these
two points being essentialtwo points being essential-
strength to withstand the great strength to withstand the great
strain of the saw and lightness to reduce the force of inertia, and consequent sudden strain on the saw blade in entering the log.
The wheels are supported on steel shalts, and have bearings on each side close to the hub. The wheel shafts have ample provision made for adjustment in every direction, in order to permit of accurate alignment, and the adjustment of the upper wheel, which controls the position of the saw on the wheels, can be made while the mill is running.
The feed motion of the carriage is novel and beautiful, being powerful aod yet capable of very wide variation. It consists of a delicate friction device, which is at the same time so powerful as to move the heaviest logs with ease. It is so completely under the control of the operator, that he can change the rate of feed instantly from zero to full speed, or alter the rate by an almost imperceptible variation.

In order to avoid the loss of power experienced through friction and stiffness of belts, and as a superior mechanical construction, the mill is arranged to be driven by a vertical steam engine connected directly to the saw
 working parts being capable of standing as high a mean effective pressure as a locomotive engine.
The guides are bored true with the cylinder, and the cross head pin is central in the cross head, permitting the pin to assume the position of least strain. The reciprocating parts are counterbalanced as far as possible, and the compression of the steam is so arranged as to take up all the shock arising from the inertia of the unbalanced weight. At 300 revolutions, or 600 feet, per minute, the motion is perfectly smooth and free from tremor. The position of the engine permits the operator to bave complete access to all its parts without leaving the control of the mill. The engine is 10 inches bore, 12 inches stroke, and at 600 feet piston speed, with 70 pounds boiler pressure, will give ample power. All the parts of the en gine can be oiled while in motion, and the bearing surfaces are so large as to run cool without requiring undue attention.

The saws used on this mill are about 50 feet long, 6 inches wide, and of the thickness known as 17 gauge. In order to strain such a saw to the tension required for cutting, the column and framing are made unusually strong. At first sight the mill appears heavy, but when the size of the saw is remembered, and also the fact that the mill can cut a $\log$ six feet in diameter, the proportions are seen to be correct.

A very important improvement in this mill, and one found in the same form in no other mill, is an attachment known as the saw deflector. This consists of a device so connected to the saw guides that when the motion

of the carriage is reversed, the saw blade is automatically drawn back about one-quarter of an inch from the freshly cut surface of the log, and retained in that position until the forward motion of the carriage begins, when the saw is instantly restored to its exact former position. The advan tages of this are obvious. The saw does not scratch the surface of the $\log$ on its back motion, while at the same time the speed of the quick return movement can be greatly increased.
Before this attachment was made, the return motion of the carriage was twice as fast as the maximum forward feed; with the deflector attached the back motion has been easily increased to three times the forward feed. This may not appear at first sight so important, but the firm suggest the following calculation relative to this point: In a year of 300 working days, without the deflector, 200 will be spent in cut ting and 100 in running back the carriage; while with the deflector in use 225 days will be spent in cutting and only 75 days in running carriage back, a clean gain of 25 days' sawing.
The carriage on which the $\log$ is carried, together with the head blocks and dogs for supporting and bolding it, as well as the set works and rails on which the carriage runs, all merit attention. Four different kinds of carriages are made for these mills in order to meet the varying wants of customers, but the style shown in the illustration is the most complete.
The head blocks are each made of double wrought iron I-beams, planed true and carrying strong knees to which the dogs are attached. These knees are made to recede 44,48 , or 54 inches from the saw, as required. Motion is transmitted from the set works to the knees through a steel sbaft, carrying cut steel pinions working in cut steel racks. The ratchet wheels in the set works have forged steel rims, the ratchet teeth being machine cut, thus insuring the greatest accuracy in every respect. This set works is graduated to set to sixteenths. After the log bas been entirely sawed, the knees can be brought back by power while the carriage is running back, or a few turns of the hand wheel on the carriage will bring them back simultaneously.

The dogs used for holding the log are the celebrated Knight's patent upper and lower dog. These dogs are so well known that it is only necessary to say that the upper and lower dogs can be adjusted separately or together, and that they will hold a log or flitch when nearly cut up, so that it is impossible for the board to spring away from the knees, thus permitting a $\log$ to be cut up true to the last board.

The trucks under the carriage are strong and heavy, to stand the strain of loading and turning heavy logs, and the rails on which the carriage runs are made of railroad iron planed true. The rail nearest the saw is planed to a $V$-sbape, while the other one is flat.
These mills are made also to be driven by belt instead of direct engine, and can then be driven from any suitable source-of power
Band saw mills as above described are suitable for cutting the finest lumber in the country-walnut, poplar, pine; saving a large amount of lumber whici would otherwise be cut into sawdust by the wide kerf of the wasteful circular mill. Their capacity is rapidly approaching that of circular mills. Messrs. London, Berry, \& Orton tell us that with good logs they can already average 20,000 feet of lumber per day, and expect soon to see the day when 30,000 feet will be cut on band mills. Those who are interested in the subject should write Messrs. London, Berry \& Orton, Atlantic Works, 22d Street above Arch Street, Philadelphia, Pa . They make the entire plant for band saw mills, including all described above, as well as log turners, edgers, cutoff saws, and saw mill machinery generally

## The American Institute Fair.

The fifty-third industrial exbibition of the American Institute was opened in its great building on Third Avenue, New York, on Wednesday, September 24. There was an audience estimated at 5,000 to listen to the opening address of the President, Cyrus H. Loutrell, who was followed in a most interesting speech by Hon. Abram S. Hewitt. The latter declared that the wealth of the world had been multiplied a bundred fold within a hundred years, by the aid of intelligent invention and the work of skilled mechanics. Science, he said, and not legislation, was the great lever which produced happy men and women; science revolutionized society for the better.

The lists of exhibits and exhibitors at this year's fair out number those of any previous year. The central part of the building, which is an eighth of a mile in circumference, bas a concrete floor. Conterno's Ninth Regiment band is to give a concert each afternoon and evening. The machinery will be in motion from 10 to 12 o'clock in the morning, 2 to 5 o'clock in the afternoon, and 7 to 10 in the evening. One of the most interesting exhibits is an incubator in which chickens will be hatched; the eggs have been placed in at such intervals that chickens are expected to be batched bourly, when they will be placed under an artiticial mother, so that on the last day of the fair, it is counted, there will be chickens hatched by artificial means on the premises from one hour to two months old.

The prediction of M. Ch. Montigny, of Brussels, that the past summer would be a very dry one-a prediction founded on his observations of the change in the character of stellar scintillation-has been fulfilled to the letter.

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## THE GREAT TELEPHONE SUIT

After four years, of preliminary work, the great telephone suit between the American Bell and the People's Telephone Co. has reached a bearing. In the interest of the inven tions themselves, in the magnitude of the amount involved, and in the number of witnesses and size of record, the sui has no parallel. 'The four years' work and the accumulation of the vast amount of testimony is amply justified from the standpoint of the first two considerations.
The history of the litigation may be briefly stated. It is a suit brought by the American Bell Telephone Company upon letters patent issued to Alexander Graham Bell, dated March 7, 1876, and January 30, 1877, against the Peodated March 7,1876 , and January 30,1877 , against the Peo-
ple's Telephone Company, of this city. The possession of ple's Telephone Company, of this city. The possession of
these patents has given the Bell Company the control of the these patents bas given the Bell Company the control of the
telephone market. They sue the People's Company as intelephone market. They sue the People's Company as in
fringers. In their defense the People's Company allege priority of invention on the part of Daniel Drawbaugh, and the issue of infringement is waived, the defendants practically admitting that they do infringe upon the Bell patents. The defendants claim that the invention of these patents was made at a period long prior to their date of issue, by Daniel Drawbaugh, of Pennsylvania. Hence they say that the paDrawbaugh, of Pennsylvania. Hence they say was not the
tent should not have been issued to Bell, as he was first inventor. In this way the Bell Company is put on the defensive to protect its own patents, and the nominal defendant is really the aggressor.
Daniel Drawbaugh was a native of Pennsylvania. He was born at Eberly's Mills, in Cumberland Co., where be alway resided. He was a mechanical genius of the universal type, turning his hand to a variety of work in demand in such a country region as the one be inbabited. He repaired guns and clocks, made furniture and machinery, and painted the wagons, and the portraits of their owners, for the surrounding region. In this way he made his living, devoting hi eisure time to electrical experiments. He was never well off, and bad much of his small stock of money swept away by the war.
In the year 1860, it is claimed be first conceived the idea of conveying buman speech by electricity. He describes almost pathetically one of his early troubles. He needed a co-operator, some one to talk back and to listen at the experimental telephones. This assistant he found in bis daugh ter, a girl only six or seven years old, who bas since died. Her voice, the Drawbaugh people say, was the first human intonation heard through a telephone. In her, Drawbaugb says, he found an obedient and docile assistant, and a com panion in his work that would not laugh at his dreams.
Various sketches and primitive apparatus bave been pro duced by the defense, showing what are claimed to have been the early inventions of Drawbaugb; among them are a telephone transmitter made out of a tea-cup, designed to work in connection with an equally primitive receiver, in whose construction a tin mustard-can plays a prominent part. As shown these are not "lcver's telephones" by any part. As shown these are not "Icver's telephones" by any
means, but are genuine electrical ones. The early date of means, but are genuine electrical ones. The early date of
1866 is assigned to this tea-cup and mustard-can combination. 1866 is assigned to this tea-cup and mustard-can combination.
But the inventor kept on the road to perfection, aud for the year 1867 or 1868 we are presented with a more highly developed production, a transmitter made out of a jelly tumbler. All the apparatus thus far described was designed for use with a battery. In 1870 it is claimed Drawbaugh found out that a battery was not needed, and substituted therefor a permanent magnet. A borseshoe magnet was used in contact with the cores of two parallel bobbins. Then for two years the inventor is said to bave devoted his energies to reducing the size of the instrument. In 1873 or 1874 he is said to have produced a very compact and efficient transmitter, which is still in excellent working order. It is in the shape of a flat cylinder, and is about five inches in diameter. During the time of the trial it has frequently been used on telephone lines with good success. A still more compact instrument is shown, which is said to have been made in January, $18 \% 5$. In this a spiral magnet is employed, and the instrument is only three inches in diameter by an inch and a balf thick. A pair of these in perfect working order are still in existence. Finally a very perfect and compact carbon transmitter, attributed to the early part of 1876 , is shown, along with a larger one dated in August of the same 1 year. The latter has recently been tried, and found to trans mit sound uttered twenty-three feet from its opening.
One very impressive feature of these claims is the state ment that such perfection as above described was reached at so early a date by Drawbangh. For the first Bell telephones, exhibited less than ten years ago, were quite indis linct, and hard to use. The early perfecting of the inven tion, under the disadvantages due to isolation and poverty, if proved, will render Daniel Drawbaugh's name forever
if if proved, will
most illustrious.
The People's Company, alleging these facts in their de fense, aver that Bell's patents are invalid and void from wan of priority of invention, and aver that Drawbaugh was the prior inventor, and entitled to the broadest possible patent for the telephone and the telephonic art.
The Bell Company of course disputes all the pronfs, and is fighting for the life of its own patents. This brief resumé of the Drawbaugh claims gives some clue to the line of re buttal adopted by the complainants. Witnesses bave been produced by them who testified that Drawbaugh could not have had the telephones in working order and in successful operation at ihe period mentioned without their knowledge. The examination was conducted in various places, princi
pally in Pennsylvania. Drawbaugh gave his testimony, in
answer to ex-Judge Lysander Hill's interrogatories, in a little attic room in Harrisburg. Mr. Chauncey Smith, of Boston, conducted his cross-examination, extending through upward of one thousand questious and answers. The direct examination of the alleged prior inventor occupied some three weeks, while five were devoted to this cross-examination.
The testimony was mostly taken before one examiner, Mr. Frederick M. Ott, of Pennsylvania. He received some hundred pages of manuscript of testimony taken in Boston, and since then las written out the enormous number of eight thousaud pages of testimony. This represents over eig reams of law-cap paper, and certainly beats the record.
Now, after these four years of work, the case has come to be heard on its merits in the Circuit Court of this district, before his Honor Judge Wallace. An immense amount of matter is presented for his consideration. The testimony and record as printed fill a number of large octavo volumes. They contain mucb besides the examiner's record, as they include various matters stipulated into the case. Probably over ten thousand pages are filled by the two sides.
The interest of the suit is, as before stated, largely due to the subject matter. The telephone is so marvelous a conception, that expatiation on the greatness of the original invention is superfluous. If all of Mr. Drawbaugh's claims be proved, a veritable chapter of romance will be added to the already romantic annals of invention.
The magnitude of the moneyed interest is also impressive. One hundred millions of dollars is given as the amount in controversy. This is no fanciful amount; the Bell Company really control and monopolize the telephone supply. If their patents are broken down, they will lose the monopoly, will bave to enter the field against fierce competition.
The public is apt to consider itself benefited by the break ing down of any monopoly. They do not realize that the quasi monopoly of patents is instituted for their profit, and insures them most advantageous results. Hence public sentiment will probably be found to favor the Drawbaugh claims, in the hope of breakiug down the Bell monoply, and getting cheaper telephones. But this view, if taken, will be apt to prove a wrong one. The extensive development of the art is due to this protection, now menaced, and it is quite probable, if the Bell patents are declared invalid, that directly or indirectly the public will be the loser.
However, this is no place to argue the riglts or wrongs of the case; the testimony is now before a United States Court, and a decision may be looked for at no very distant day.
The argument began on Monday, Sept. 22, 1884. It will last probably two or three wepks. The case for the complainants was opened by Mr. J. J. Storrow. At the present writing the defendant's side is being argued by ex-Judge Lysander Hill. The case was opened in the regular court room of the equity term of the Circuit Court, but the crowds that attended made a removal to a larger court room necessary. The noticeable feature of the attendance is the large assemblage of lawyers, as participants or spectators, within the bar. It is seldom, even on motion days, that the space is so crowded.
A note of the personnel of the trial is in place. The Bell Telephone Company is represented by the following array of counsel: Hon. Roscoe Conkling, Ed. N. Dickerson, Chauncey Smith, J. J. Storrow, and C. T. Howson. They produced as experts the following gentlemen: Prof. Charles R. Cross, of the Massachusetts Institute of Technology, F. L. Pope, Arthur W. Wright, and W. W. Jarnes. On the other side appear as counsel Hon. Geo. F. Edmunds, Hon. Lysander Hill, N. W. Jacobs, T. S. E. Dixon, and Melville Cburch. The expert was Mr. Park Benjamin. Both Prof. Bell and Mr. Drawbaugh have been present at times during the argument.
The total number of witnesses was over five hundred, of which nearly three hundred and fifty testified for the defense.

## GRINDING MATERIALS.

The finest of emery cuts and leaves minute scores in the metal, particularly if the metal be sof $t$; it is impossible to produce a good, polishable surface on silver with flour of emery; burnishing would be necessary to make a surface, and even then it would present a striated appearance under reflected light. Other grinding substances are required for some fine surfacing work. Moulding sand, that has been used in the foundry for some time, makes an excellent material for surfacing light brass-brass that contains a large proportion of zinc. Some excellent results are gained by the levigation of the saud-rubbing it under a muller on a stone (marble) slab, as paints are ground for the artist. By this means the foundry sand may be reduced to an impalpable powder, which, however, retains much of its abrading quality.
There is a manufacturer of fine tools in an Eastern city who uses coal ashes to give the last surface, before polishing, to his hardened steel tools. He takes the ashes of Le high coal, pours them into a tub of water, stirs them up violently, and, when the water is turbid with the fine ashes held in suspension, he draws it off into a shallow tank and allows it to settle. The sediment is his polishing powder. If a bigher degree of fineness is required, the operation of stirring, and washing, and settling is repeated. The material thus obtained makes an excellent surfacing material.
In the manufacture of silverware (solid silver) the surfacing before burnishing is done by a blue clay, tenhnically
called "grit." It is found in several localities, particularly
in the Connecticut River valley up to fifty miles from its mouth, in the vicinity of Middletown and Hartford. This clay appears to be the substance of which blue slate is formed, but is usually obtained in a seni-liquid form, and is dried for use. It is not surface clay, being found below the alluvium and sometimes below gravel, its depth or thickness of bed having been discovered, by boring for artesian wells, to be in some places more than sixty feet. Its identity with slate substance appears to be suggested by its behavior under heat, it assuming a stratified, porous form. It does not scratch pure silver, nor copper, nor mar coin gold, but it will not give a polish. It griads without leaving a shining surface; this is produced by burnishing, by rubbing with whiting, chalk, or even with the bare band.

## aspects of the planets for october.

 jUPITERis morning star, and by far the most brilliant of the shining throng that adorns the eastern sky, outmeasuring and outshining his fair rival Venus. The paths of the two plavets lie near each other during the whole month, and their prox imity affords the opportunity for some of the most charming exLibitions that these celestial wanderers are capable of producing.
Jupiter now rises about a quarter of an hour later than Venus. As he is apparently moving westward, and she is moving east ward, it is plain that with each successive rising the space between them will lessen until they meet. This event occurs on the 6th, at $11 o^{\prime}$ clock in the morning, when Jupiter is $1^{\circ} 15^{\prime}$ north of Venus. The planets are invisible at their nearest point of approach, but they will be near enough to each other on the morning of the 6th to make a lovely picture on the celestial canvas. They will rise together soon after 2 o'clock, and continue side by side on their shining course till the glowing dawn conceals them in the ethe real depths.
On the morning of the 7th they will present a new phase Their relative position will be clanged, Jupiter being west of Venus. The distance between them will go on increasing as each planet pursues its appointed course in a seemingly opposite direction. For Jupiter is approaching the earth in his progress toward opposition, growing all the while larger and brighter, and Venus is approaching the sun while receding from the earth, growing all the while smaller and less brilliant as she draws nearer to superior conjunction. Astronomers will bave to lay aside Venus for the present as a subject for telescopic observation. Her white spots will shine no longer, for the rapidly waning crescent-the form
she now takes on-will effectually bide her delicate markshe now takes on-will effectually bide her delicate markings from terrestrial observers.
There is, however, a compensation for those who take pleasure in the study of the queen of the sciences. When one planet retires from the field, another comes into prominence. Jupiter is now in favorable condition for the telescopist to wrest mighty secrets from his giant grasp. Has the great red spot vanished entirely beneath the all-eucompassing clouds that swell his limits to such buge dimensions, or will another rift open a new path of exploration to his glowing neucleus; or what new discoveries will be noted in
the process of world-making that is there taking place? We the process of world-making that is there taking place? W
are sure to learn all the tidings that the best instruments in the hands of practiced observers can reveal.
When we speak of the conjunctions of two heavenly bodies, we mean that they are in the same right ascension or longi tude, but not in the same declination or latitude. They will then rise together, but one may be north or south of the other. Thus, in the present conjunction of Jupiter and Venus, the planets are in the same right ascensiou, and will rise at the same time; but Jupiter is $1^{\circ} 15^{\prime}$ north of Venus. If right ascension and declination are the same, in the case of planets, stars, and the moon, an occultation takes place instead of a conjunction. In the case of the sun and moon, the hiding of one luminary by the other is called an eclipse. These varied aspects are all illustrated on the October sky For within the limits of the month, specially favorable for star gazing, there will be the conjunction of the two brightest planets of the solar family, the occultation of a bright star by the monn, a total eclipse of the moon, and a partial eclipse of the sun.
The right ascension of Jupiter on the 1st is 9 b. 58 m . his declination is $13^{\circ} 13^{\prime}$ north; and bis diameter is $31^{\prime \prime}$.
Jupiter rises on the 1 st about balf past 2 o'clock in the morning; on the 31st he rises a few minutes before 1 o'clock.
venus
is morning star, and though ber brilliant face is becoming dim for a time, she still retains her power to plewe. Her path lies so near that of Jupiter that the history of the one during the month includes that of the other. We bave already described the meeting of the $t w o$ most brilliant gems
of the planetary brotherhood on the 6 th. The principal of the planetary brotherhood on the 6th. The principal
actors have a companion of lesser renown. The first mag nitude star Alpha Leonis, or Regulus, is a near neighbor of hoth Venus and Jupiter, during the first part of the month, the yellow star contrasting finely in tint with the deep gold of Jupiter and the softer bue of Venus.
Venus is in conjunction with Regulus on the 7th, at 7 o'clock in the evening, being then 55 south of the star. At this time the bright trio will be almost in line, Jupiter being farthest north, with Regulus nearly between him and Venus.
The right ascension of Venus on the 1st is 9 h .44 m .

Venus rises on the 1st about a quarter after 2 o'clock in the morning; on the 31st she rises about 3 o'clock.
mercury
is morning star during the month. He reaches his greatest western elongation on the 5 th, at 3 o'clock in the morning, being then $17^{\circ} 58^{\prime}$ west of the sun. It is the last time during the year when be is favorably situated for being seen with the naked eye as morning star, and only sharp-sighted observers will succeed in picking him up. He must be looked for $8^{\circ}$ north of the sunrise point, and $20^{\circ}$ southeast of Jupiter and Venus. The best time for observation is an hour before suntise.
On the 9lh, at 3 o'clock in the morning, Mercury is in conjunction with Uranus, the latest comer among the morning stars, seeming to pass $1^{\circ} 10^{\prime}$ north of his distant neigbbor.
The right ascension of Mercury on the 1 st is 11 h .33 m . his declination is $3^{\circ} 56^{\prime}$ north; and his diameter is $7 \cdot 4^{\prime \prime}$.
Mercury rises on the 1st about half past 4 o'clock in the morning; on the 31st he rises not far from half past $6 o^{\prime}$ clock. saturn
is morning star, and as he rises now at half past 9 o'clock in the evening, will soon be in convenient position for easy observation. His high northern declination and increasing brightness make him a promiuent object, and one easily recoguized. He has wandered away from the neighborhood of his last year's companions, Aldebaran and the Pleiades, but has now established himself midway between two bright twinklers, Capella on the north and Betelguese on the south. He is preparing his forces for a brilliant career in the coming winter.
The right ascension of Saturn on the 1 st is 5 h .55 in .; his declination is $21^{\circ} 51^{\prime}$ north; and his diameter is $17.8^{\prime \prime}$.
Saturn rises on the 1st at half past 9 o'clock in the evening; on the 31st he rises at half past $70^{\prime}$ clock.

## neptune

is morning star, and is in gond position for telescopic observation. He may be found in the constellation Taurus, about $7^{\circ}$ south of the Pleiades, and remains nearly stationary during the month. A good instrument directed toward that part of the sky will quickly reveal the presence of the far a away planet in the form of a small round disk.
The right ascension of Neptune on the 1st is 3 h .24 m . his declination is $16^{\circ} 47^{\prime}$ north; and his diameter is $2 \cdot 6^{\prime \prime}$.
Neptune rises on the 1 st soon after balf past 7 o'clock in evening; on the 31st he rises soon after half past 5 o'clock. uranus
is morning star. He encounters Mercury, who is oscillating eastward toward the sun, and they are in conjunction on the 9th, the only contribution made by Uranus to the incidents of the month.
The right ascension of Uranus is 11 h .58 m .; his declinaion is $0^{\circ} 56^{\prime}$ south; and his diameter is $3 \cdot 4^{\prime \prime}$.
Uranus rises on the 1st about 5 o'clock in the morning; on the 31st he rises about half past 3 o'clock.

## MARS

is evening star, and enjoys the distinction of being the sole planet on the sun's eastern side, his six companion planets being congregated on the sun's western side as morning stars. He may be found in the constellation Libra early in the evening, where be shines as a faint reddish star.
The right ascension of Mars on the 1 st is 14 b .40 m .; bis declination is $16^{\circ}$ south; and his diameter is $4 \cdot 6^{\prime \prime}$,
Mars sets on the 1st at 7 o'clock in the evening; on the 31st he sets at half past 5 o'clock.

The October moon fulls on the 4th at 5 o'clock in the evening, standard time. The moon is in conjunction with Neptnue on the 7th, and with Saturn on the 9th. She makes he nearest approach to Jupiter on the 14 th and to Venus on the 15th, when the brilliant planets and the waning crescent will form on successive mornings pictures which one never tires of beholding. On the 16th the moon is near Uranus, on the 17th near Mercury, and our fair satellite completes the circuit by paying her respects to Mars three days after her change.
On the 26th, the day before her fapricorn
On the 26th, the day before her first quarter, the moon occults the third magnitude star Beta Capricorni. If the weather prove favorable, the interesting phenomenon will be easily visible. The immersion of the star will take place at 19 minutes after 9 o'clock in the evening. Washingtun mean time. The occultation will last 58 minutes, and the immersion will take place at 17 minutes after 10 o'clock. The observer will see the star suddenly disappear behind the moon's dark edge. It will remain hidden from view nearly an hour, when it will suddenly reappear on the moon's bright edge, and star and moon will rapidly recede. The moon is frequently occulting small stars, but she does not often capture so large a prize as Beta Capricorni.

## total eclipse of the moon

There will be an eclipse of the monn on the 4th, visible as a total eclipse in Europe, Asia, Africa, and the Atlantic Ocean. Dwellers in this vicinity will enjoy the later par of the show, for the moon will rise eclipsed, and the eclipse will end about $6 o^{\prime}$ 'clock.
eclipse of the sun
There will be a partial eclipse of the sun on the 18th, in visible in the United States, but visible in Western Europe and Asia. Our loss in being on the wrong side of the earth when the event takes place in not very great, ns only 0639 of the sun's diameter is eclipsed.

## AN IMPROVED AXLE.

The under portion of the journal, $A$, is made flat, and the outer end is screw threaded in the ordinary way. Applied to the flat surface is a wearing plate, $B$, which is held in place by the washer, C, collar, E, and by the screw, G, which enters a countersuuk bole in the plate, as shown it the cross section, Fig. 3. The nut, F, fits within the collar and screws upon the end of the axle to hold the wheel in place; by means of the set screw, $H$, the collar may be confined to the nut at any desired position. In ordinary use the nut and collar act together as a single nut, but when the thimble, D, becomes worn at the end, the collar may bestov-


GregG's improved axle.
ed forward upon the nut by loosening the set screw. When the wearing plate becomes worn so as to be too small for the thimble box of the wheel, it can be easily removed and replaced by a new one, thus always insuring the true running of the wheel.
This invention has been patented by Mr. T. E. Gregg, of Mineral Springs, S. C.

## AN IMPROVED CULTIVATOR.

In the wheeled cultivator patented by Mr. E. R. Ham, of New Market, Ga., a number of plow beams are secured to the axle and arranged side by side with flexible connections, to adapt them for various movements independent of the axle and of each other. The axle has a central arch to which the tongue is rigidly secured, and is furmed with slots ou each side of the arch, which are equal in length to the greatest distance between any two of the beams, which are flexibly connected to loops pivoted to the axle by bolts and nuts. This permits both a vertical and lateral movement of the beams, which is very desirable in stumpy land, and where the soil is wet and softer in some places than in others. The beams are connected to each other by flexible cross bars made of sheet metal. These bars are pivoted to the beams so that by moving one of the outside plows by its handle all the beams will be moved simultaueously in the same direction. This construction is important, since both bandles owing to their distance apart, cannot be held by one man a the same time. The standards to which the plows are at tached are slotted to receive the beams. The tongue is pro-


HAM'S IMPROVED CULTIVATOR.
vided with a rear projection, upon which the beams are sup ported by means of hooks when the cultivator is not in actual use.

## Membrane of Egg for Skin Grafting.

In a case of extensive burn unbealed after six years, Dr Frank C. Wilson, of Louisville, Ky., in Med. Neors, says "I made use of three different kinds of skin grafts, namely, from the skin of a young rabbit, from the human skin, and the three he much preferred the egg membrane as being much more readily obtained, and one egg will supply any much more readily obtain
number of grafts needed.

Remarkable Intelligence and Heroism of a Dog.
The large Newfoundland dog Heck, belonging to the St. Elmo Hotel in the oil town of Eldred, Pa., was known throughout the northern oil field for its great strength and almost human intelligence. The porter of the hotel, a kind hearted but intemperate person, was an especial favorite with the dog. The porter, a small man, slept in a little room back of the office. The dog slept in the office. On the night of Sept. 18 last, the porter was drunk when he went night of Sept. 18 last, the porter was drunk when he went
to bed, and soon fell into a beavy sleep. Some time in the night he was awakened by the loud barking of Heck, who was jumping frantically ou the porter's bed and seizing the pillow with bis teeth. The still drunken and drowsy porter tried to make the dog go away, but the animal persisted in his efforts, and it finally dawned on the befuddled mind of the porter that the house was on fire
His room was full of smoke, and he could hear the crackling of the flames. He sprang from the bed, but was still so drunk that he fell to the Hoor. The faithful dog at once drunk that he fell to the floor. The faithful dog at once
seized him by the coat collar, the porter not having removed his clothing on going to bed, aud dragged him out of the room and half way to the outer door of the office, when the man succeeded in getting to his feet, and, unlocking the door, staggered into the street. The fire was rapidly spreading over the building, and the hotel was filled with guests, not one of whom had been aroused. The dog no sooner saw that bis helpless friend was safe than he dashed back into the bouse and ran barking loudly upstairs.
He first stopped at the door of his master's room, where he howled and scratched at the door until the inmate was made aware of the danger and hurried out of the bouse, as there was no time to lose. The dog gave the alarm at every door, and in some instauces conducted guests down stairs to the outer door, each one of these, however, being a stranger in the bouse, which fact the dog seemed to understand in looking out for their safety. All about the house seemed to have lost their heads in the excitement, and it is said that the hotel dog alone preserved complete control of himself, and alone took active measures to save the inmates of the house. In and out of the burning building he kept contiuually dashing, piloting some half-dressed man or woman down stairs, only to at once return in search of others. Once a lady with a child in her arms tripped on the stairs while hurrying out, and fell to the bottom. The child was thrown on the floor of the hall some distance away. The woman regained her feet, and staggered in a dazed way out of the door, leaving the child in the midst of the smoke that was pouring from the office door. The brave dog saw the mishap, aud jumping in through the smoke, which was now becoming almost impassable, and seizing the child by its night clothes, carried it safely out.
Notwithstanding this rescue, the mishap that made it ne cessary led to the death of the noble animal. The mother of the child on being restored by the fresh air first became aware that the child was not with her, and cryiug out wildly that "Anna was burning up in the house!" made a dash for the building, as if to rush through the flames to seek iner child. Heck had already brought the little one out, but it had not yet been restored to its mother. The dog saw the frantic rush of the mother toward the burning building and heard her exclamation that some one was burning up in the house, and, although the building was now a mass of smoke and flames inside and out, the dog sprang forward and, as a dozen bands seized the woman and held her back from the insane attempt to enter the house, disappeared with a bound over the burning threshold. The faithful animal never appeared again. His remains were found in the ruins. There is no doubtin any one's mind that but for the intelligence and activity of Heck the fire in the hotel would not bave and activity of Heck the fire in the botel would not bave
been discovered in time for a single inmate to have escaped from the building with his life; and that the no ble animal from the building with his life; and that the noble animal
understuod from the balf-crazed movements of the cbild's understuod from the half-crazed movements of the child's
mother that there was still another one in danger, and to mother that there was still another one in danger, and to
rescue whom he gave bis own life, is accepted as certain. The remains of Heck were given a fitting burial, and his loss is regretted as that of a useful citizen might be

## Diamond Turning Tools.

It is sometimes desirable to reduce the dimensions of a hardened steel article that has received a lathe finish with out first drawing the temper, as this necessitates a reharden ing and retempering. The usual method of lathe reducing of hardened steel articles by corundum wheel grinding is necessarily confined to straights or tapers, no offsets, collets, or shoulders being amenable to this style of work. A model maker and bright mecbanic bas succeeded in utilizing the black diamond, or bort, as a turning tool for hardened steel. He places a crystal in the end of a piece of iron or brass for flat turning, and one on the side of the end, or on a corner of the end, for side or sboulder turning. He has succeeded in doing some good work with these crude-looking tools.

The chips taken from the bardened steel are literally chips, not turnings, and are very minute. But viewed under the microscope they are seen to be cut from the hardened steel, and not merely disengaged crystals. One of the specimens of work with these bort tools is a well finished -thread, about 32 to the incb. Two differing crystals of the diamond were employed to cut and true the thread. An adaptation of bort tools to the planer is evidently possible, and there seems to be no reason why its use might not be extended with economical results in the treatment of hard ened steel and of chilled iron.

## IMPROVED FAUCET.

The faucet showp in the engraving is so constructed as to prevent the water from standing in the pipes after the supply from the main bas been shut off. The fancet may be of the ordinary pattern. The outer case of the automatic draining attachment is arranged at the lowest point beneath the body of the valve, and may be cast with the faucet or attached to those already in use. When made separately, it may have a jaw-like form (Fig. 1) on its upper end to hug the sides of the body, to which it may be held by set screws. A valvular vent-stem is arranged to close an oritice in the bottom of the body, and is kept closed by the water in the


ALLWOOD'S IMPROVED FAUCET.
faucet when exposed to the full pressure of the supply. The stem is raised by a spring when the pressure is reduced by shutting off the supply; and by means of an adjusting screw upon which the spring rests, the tension of the latter may be so regulated as to adapt the device to different pressures. The screw and spring are contained within an inner tubular projection, within the case, which serves as a guide for the stem. Outside of this projection is a passage communicat ing below with any number of escape holes in the bottom of the case.

When the supply is shut off the valve stem will be raised by the spring, thereby allowing the water to drain out of the faucet and its connecting pipe, the escape being made through the orifices. In this way the device is automatic and frozen water pipes within the building are prevented, supposing all the faucets to be similarly constructed
Further particulars may be obtained by addressing the patentee, Mr. Arthur Allwood, of 381 Pleasant Street, Fal River, Mass.

## DUMPING CAR

The car herewith shown is for carrying coal, grave!, etc. and is so made as to permit dumping of the load at either side. The body is composed of ends and sides, which are binged at their upper edges to side rods connecting the ends. The lower edges of the sides are curved inward, so that they unite when closed to form a tight receptacle with a rounded


SHERROD'S DUMPING CAR.
bottom. Fixed to the frame beneath the body are slide boards placed to form a double incline, the apex ot which is at the center; these slides extend out far enough to carry the material beyond the wheels and track. The sides ar beld closed by pivoted bars, that engage notched pieces at tached to the ends. The shape of the body is such that the pressure on the sides will throw them open as soon as the latches are released. It will be seen that the load may be thrown upon either side, or may be divided by opening both sides at once. Each end of the car is provided with a han dle and book, for band use and borse power respectively. This invention has been patented by Mr. B. W. Sherrod P. O. Box 156, Birmingham, Ala.

## COMBINATION TOOL.

A combination or universal tool for household use re cently patented by Mr. George B. Gable, of 1518 Jones St., Omaha, Nebraska, is shown io the accompanying engraviug. The batchet las a malleable iron handle, and is made with a notch for drawing nails. The outer end of the handle is curved to one side, and an arm of corresponding shape is pivoted to the handle, so as to form a boot jack and box holder. The extreme end of the handle is of flat form for use as a stove lifter, notcbed to serve also as a tack pullcr, and at one side is a hook for lifting pots. Ou the outer end of theother arm is a straight hook for use in regulating

gable's combination tool.
stove doors and for use as a screw driver; this arm has a roughened tail piece for use, in connection with the bandle as a nut cracker or wrench. The tool thus constructed is inexpensive, and can be used for twelve distinct purposes, most of which are generally performed by separate tools.

## Porosity of Wood

An unpainted wooden pail showed some of its staves saturated and others nearly dry. Experiments with wood of the same character-the cucumber wood-showed that pieces sawed from the same board differed in their absorntive qualities as one end or the other was set in water, the trials appearing to suggest that when the wood was placed in water as it grew, butt downward, the water was absorbed more rapidly than when the position was reversed. As a further test two pieces were taken from the same board, and both painted on the outside-both faces-but one had the top end also painted, and the other the bottom, or butt end, painted. The one with the unpainted butt filled and sauk, while the other floated. Perbaps differing results

## SEAT AND FOOT BOARD FOR ROW BOATS.

The sliding seat, of the usual construction, slides between two tracks held on a suitable frame. From the back of the seat projects a rod whose rear end is pivoted to the upper end of an upright lever pivoted to a bar projecting from the rear of the frame. A spiral spring, surrounding the bar, is held between the rear of the seat and a cross piece. The foot board is secured to a cross piece sliding in longitudinal grooves formed in plates in the boat. The lower end of the lever is connected by rods with the foot board. The pressure of the spring can be varied by a collar on the rod back of the seat.
When the oarsman makes a stroke, the seat is moved back and the spring is compressed, and the rod is moved in the same direction, when by means of the lever the foot board is moved in the opposite direction. As the oarsman recovers, the spring expands and pushes the seat back while the foot board is drawn forward, thereby relieving the oarsman of the necessity of pulling back the seat, and enabling bim to expend all his force and power on the stroke. The recovery being very rapid, fast rowing is admissible
This invention has been patented by Mr. James J. Tur pel, of North Starr Street, Halifax, Nova Scotia, Canada.

## IMPROVED "RAPID" CUPOLA.

The cupola illustrated by the accompanying engravings is made by Messrs. Thwaites Brothers, of Bradford, Eng. under Stewart's patent. It will be seen that it is of the receiver class-the receiver is separate from the cupola.
The shcll of the cupola is of plate iron with butt joints, covered with strips and rings, and riveted together with cup head rivets outside, the heads inside being flattened to allow the brick lining to fit close to the shell, which is of one diameter and parallel inside. There are several rings of angle iron inside shell in the length of the cupola to support the lining. To the sbell is attached an annular air belt. Referring to the engravings, which are from The Engineer, it will be seen that on each side of the air belt is secured a cast iron quarter bend blast pipe, and to each bend is connected a turned shut-off valve. Inside the shell, and communicating with the air belt, are three rows of cast iron tuyeres. The two bottom rows each consist of three tuyeres, and the top row of tuyeres. All the tuyeres are fastend to shell with bolts and an asbestos ring Opposite ach shell with bolts ad au asbestos rivg. Opposite each of the top tuyeres in the air belt is fixed a cast iron shut-off turned plug val.ve. The plugs of these valves come through cover plates fixed upon the top of belt. All the plugs are fitted with small sprocket wheels, and are connected to each other with Ewart's malleable chain, so that all can be controlled from one handle at any convenient position. Oppo-
bottom door, in halves, opening from the center. Each half of the bottom is connected to a sbaft, on which is fixed a wrought iron hand lever. A strong wrought iron bolt is shot across the door when closed, securely retaining it in position. A fettling door is provided at the back of the cupola. The base plate of the cupola is supported by fou cast iron pillars upon a strong cast iron bed plate. The re ceiver shell is also made of plate iron, with angle iron ring top and bottom, and cover plate on top; and provided, as shown, with tapping hole, spout, and fettling door, slag


TURPEL'S SEAT AND FOOT BOARD FOR ROWBOATS.
hole and spout, and hot air pipe and plug to convey hot air rom the top of the receiver into cupola
Several advantages as attending the use of this cupola are laimed by the makers, not the least important of which is its speed. According to the experiments of Dulong, 1 pound of carbon, combining with the necessary quantity of oxygen to form carbonic acid, develops 12,906 units o heat. The specific heat of cast iron being about 013 , the melting point 2,190 degrees, and the coke containing 82 pe cent of carbon, then to heat a ton of cast iron of a temperature of say 40 degrees to a temperature of 2,190 degrees would require

Heat Iron Sp . heat
$2190-40=\frac{2150 \times 2240 \times 0.13}{12906 \times 0.82}=59 \cdot 1 \mathrm{lb}$. coke


## IMPROVED RAPID CUPOLA.

would have been obtained with differing woods. The fact $\|$ site each tuyere is fixed a seat with sliding door, fitted with This is supposing that the whole of the carbon is conof position affecting saturation seems to be recognized in the blue tinted glass peep holes. In front of eacb glass is a verted into carbonic acid; but if by any means carbonic frequent custom of reversing fence posts from their natural position and in the driving of piles.

If a man empties his purse into his head, no man can take it away from him. An investment in knowledge always pays the best interest, - Franklin
blue tinted glass peep holes. In front of each glass is a
mica disk. Upon the air belt is a blast pressure gauge to indicate the pressure of air in cupola. The upper part of cupola above the belt is provided with charging door-fire brick lined-and with damper door and shield at the top on one side. The cupon stands upon a cast iron base plate This base plate is fitted with a wrought iron hinged drop
verted into carbonic acid; but if by any means carbonic
oxide is formed, a very different result is obtained. Then 1 pound of carbon burning to carbonic oxide only evolves 4,453 units of heat. If, bowever, by admitting air above the zone where the oxide is formed, we recover 4,478 units this $+4,453$ gives 8,931 . This is a little over two-thirds of the available heat to be got out of 1 pound of carbon, allow-
ing 10 per cent for moisture in the coke, 10 per cent for ra diation, or 40 per cent in all. The amount of coke per ton of metal should not exceed 112 pounds, although the actua consumption is usually much higher. On this point we may quote the following result of a blow made on the 8 th of March last at Messrs. Rushforth and Co.'s, St. James Foun dry, Bradford, with a cupcla 4 feet in diameter and 19 fee length of shell:

|  | Time. |  | Charge of <br> coke inlb. |
| :--- | :--- | :--- | :--- |
| Charge of |  |  |  |

The speed of the blower was from 425 to 430 revolution per minute, and the pressure varied between 29 inches, 32 inches, and 37 inches of water. The above figures show that 8 tons of iron were melted with 1,232 pounds of cok in one hour and a balf, time from starting to finishing blow ing. The time taken to melt the iron after having take away the first ladleful of metal from the receiver to taking away last metal was 55 minutes. This gives 14.54 pound of iron to 1 pound of coke, or, taking the coke used, exclu sive of the bed coke, namely, 896 pounds, and weight of iron melted, 17,920 pounds, we have 1 cwt . of coke per ton of iron, and the makers say that the cupola will never " make up" if care is taken in charging 1 cwt. of coke pe 18 cwt . of iron.
It is unnecessary to say anything further as to the economy of the cupola in working, but it may be mentioned that it is claimed that less blast is used, as it has not to traverse so heavy a mass as in the ordinary cupola, that the wear and tear is less, and that the melted metal is obtained freer from impurities, while it is made hotter.
In their description the makers observe that the bottom of the cupola is raised up to the tuyeres, so that the metal as fast as melted runs straight into the receiver. "The hot blast also enters receiver at the same pressure as the in side of cupola furnace. This blast agitates and mixes the metal in receiver, and then the hot air from receiver is carried back through a vertical pipe into the cupola, above the belt, and is by this means utilized in heating up the iron in upper part of cupola. The receiver, which is applicable to new or existing cupolas, enables such a quantity of molten metal- to be stored up and kept to a proper temperature that with an ordinary sized cupola large steam hammer blocks may be cast with the same ease and certainty as smaller castings, and at the same time the metal may be held in reserve for any required length of time while the moulds are being prepared. It will be noticed that as the blast is diverted in its course, and does not entirely pass through the charge, the coke or fuel is not consumed before it is required for melling the metal, and bence a much smaller quantity of fuel is required to melt a given quantity of metal." Some of the cupolas are being fixed in France for the Thomas-Gilchrist steel process, and they bave also beeu introduced for smelting copper ores. The metal, in the latter case, is run into large portable receivers, and is then taken to other refining furnaces, or run iuto the ingot direct.

The following, on introducing fine slack coal in the blast as mentioned by the makers, is of interest: In the United States pulverized coal and nine slack have been used in cupolas. The practicability of this utilization of a comparatively waste product was discovered in the following manner: There bad been some trouble through scaffolding in the cupolas, and, to melt down the "salamander," the manager withdrew the tuyere pipes, rammed in a lot of small coal through the tuyere holes, and again put on the blast. The scaffolling was removed in a very short time, and the work proceeded as usual. The blast pipe was then perforated, and a small quantity of fine coal was supplied to the cupola through the tuyeres, which it was found not only prevented scaffolding, but caused the cupola to work much more rapidly. The great waste in melting iren in a cupola usually occurs at the zone of the tuyeres, on account of the large quantity of air blown in, and the absence of carbonic oxide at that point. What little carbon the air comes in contact with at this point forms carbonic acid, which is almost as destructive to the iron as free oxygen. The principal waste of the metal occurs after its fusion, and in its passage through this carbonic acid aud atmosphere. By the in:jection of the fine coal with the blast its combustion is secured at the zone of the tuyeres, producing carbonic oxide, and thus preventing the oxidation of the desceuding metal. Beyond saving the waste of iron by this improvement, a much larger percentage of the carbon which the pig contains is transmitted to the converter, an advantase which would also be of great value in all cupolas for melting iron for castings; as the chief difficulty in that line is that the carbon is burnt out of the metal, and metal thus
prepared is said to run more fluid and to produce finer and
tougher castings than that melted in the ordinary manner The following from the directions for lining is also worth quoting: "The durability of fire bricks depends largely upon the amount and quality of the fire clay used in lay ing them, and the way they are fitted together. If wid spaces are allowed, and too much fire clay used, there is shriukage in the first beat, the bricks are attacked on al sides, and the key or wedge of the brick is lost. Only use the best fire clay; thin it with water to the consistency tha will allow the brick to be dipped; fit the bricks so closel that, being dipped, they will take up sufficient slip to make the joint when rubbed together; fill all spaces with the thi slip, and dry with a slow fire.

## SELF-ACTING SPRING LEG BRACE.

The engraving represents a self-acting spring leg brace which the inventor guarantees will cure any knee-sprung or ankle cocked horse in a few weeks.
Laced at the knee joint is a strap, to the opposite sides of which are attached the ends of a metal band which is so curved that it touches the band only at the ends. Secured to this band are the ends of two springs which pass down


COTE'S SELF-ACTING SPRING LEG BRACE.
and under the foot, being kept from spreading by a metal clasp, and being held securely in place by being passed through holes in the rear corks, nuts being screwed on the ends. The construction of the device and the way it is applied are very clearly shown in the cut. The tendency of the springs is to force the knee back to its normal position, and straighten the leg.
Further information may be bad by addressing the patentee, Mr. Alphonse Cote, 850 Seventh Avenue, New York city.

## The Ohio Earthquake of September 19.

The earthquake in England, April 22, and that along our eastern seaboard, August 10, have now been followed by one whose effects were felt in every quarter of the State of Ohio, about half of Indiana, and the southern part of Michigan. It covered an area of about 100,000 square miles, although in many places within this area it was not noticed at all, and in many others so slightly that people did not suppose there had been any shock until informed of its ocurrence in other localities.
The time of the earthquake is variously given at from 2:40 to $3: 30$ on the afternoon of September 19, the differences in time being prohably somewhat owing to the differences in timepieces. In Cleveland three distinct shocks were re ported, the vibrations seeming to pass from west to east, and lasting from fifteen to thirty seconds. At Defiance, Obio, it is said the swaying of buildings was so violent as to cause much consternation, and that a Methodist conference in session in one of the churches immediately adjourned, the members rushing to the street. In Cincinnati there was only a slight shock.
In Indiana the shock was felt at Indianapolis, Fort Wayne, Seymour, Lawrenceburg, and many other places, the effect being very plain in Lawrenceburg.

At Detroit, Mich., the shock was plainly felt, the Chamber of Commerce building being violently rocked, while in several buildings men rushed out on the streets in their shirtsleeves, looking anxiously around as if they expected to see the structures toppling to the ground. At Dresden and London, Canada, the most northerly points where the earthquake was felt, the tremor was but slight.
The observations made are locally reported in a very in definite and unsatisfactory form. Even though no materia damage seems to bave been done at any point, this earthquake may well serve to direct more carnest attention to the study of these disturbances. Instruments for registering earthquakes have now been so perfected as to antomatically register the slightest vertical or horizontal movement, giving.
their direction, with the duration and exact time of occur rence, and such instruments are now in use in many place in Europe. With their aid there would be no difficulty in determining the extent and force of an earthquake wave and we trust our leading educational institutions will not hereafter think them entirely unworthy of a place among their scientific apparatus.

## The International Electrical Exposition. Philadelphia.

(FOURTH PAPER.)
European visitors to the Exposition bave expressed, from lime to time, no little surprise at the discovery of improve ments made by American electricians and mechanicians in apparatus which were invented in their own countrie only a short time ago, and introduced there, though in a somewhat crude form. At various points of the building is to be seen that which only through the interposition of Yankee ingenuity las been enabled to completely accomplish what was evidently in the mind of its original de igner. That idea, incomplete, was his. It represents, per haps, years of mental labor. But the mechanism by which it is adjusted with nicety to its work, and made to fulfill its mission, was perfected by a man who, it may be, neve lad an original thought, or, having one, knew not how to express it in wood or iron or steel. It is readily conceded that, in making practical what before was little more than an idea, be performs a valuable work, as does every man who produces that which tends to increase the happiness or lighten the labors of his fellows. But, when it is remembered that the same mind which conceived the im provement or laboriously plodded it out by experiment might, if properly trained and directed, have originated something of equal value, it is to be deplored that it should be restrained within the narrow limits of practicability.
On the other hand, the foreign exhibits, when compared with our own of similar character, are for the most par cumbersome and intricate. The American electrician, lik the American mechanic, is always seeking after simpler methods and reduction of parts. He is so well known for his success in this pursuit that American mechanical models are, in some fields, used abroad as criteria
In engine building, for instance, this is especially true American engineers, though perbaps less scientific than those of England or the Continent, have improved and modified engine building all over the world.
Even at this late day new objects of interest appear in the various sections of the Exposition, so that he who returns to a favorite locality after a week's absence may discover still other apparatus to claim his attention and awaken his interest. Up to Tuesday night, the 23d inst., 117,000, people bad visited the Exposition. Now the attendauce is still greater, a veraging about 7,000 daily
Among the exhibits which have but recently appeared is an electric railway in full operation. It is laid bet ween the main building and the annex; and though the line of rail is too short to permit of estimates of efficiency or economy being made, it deserves, by reason of the novelty of its design and the smooth working of the parts, some little at tention. Readers of the Scientific American will remember that three types of electric railways were exhibited at the expositions at Munich, Paris, and Vienna. These were the charged-rail system, the overhead contact-motor, and the secondary battery system. All these systems are now in op eration in different parts of the world, but it is very doubtful if any of them can be economically operated, save where the road is short and connects two thickly populated cities, or where the power required to run the motors is gathered from running water along the route or at the mines, where coal is cheap. On the clarged-rail and overhead contact-motor systems, there is a large and sometimes ruinous loss of current while in transitu, and the secoudary battery has not yet reached that point of perfection at which a fair amount of the power originally required to charge it may be recovered in the form of electrical energy. It should not be inferred from this that the type of railway now in operation in the International Exposition is either more economical or more efficient than the better known types just described. It has not as yet been tried on a sufficiently large scale to determine either of these two important points.
It consists of a new method of conducting the electricity along the line for the use of the motors and also for lighting. By the method employed in transmitting the current, it bas been found, it is said, that it can be economically distributed along the line of the road for purposes of illumination and even for power. In other electric lines, where electricity is transmitted to the motors from a central station, large losses of current take place, owing to the exposure of the conduct ors to atmospheric influences. When cold rains, sleet, and snow prevail, such lines are utterly unreliable. In the system at the Exposition there are tubes running aloug each track-one for the outgoing, the other for the returning current. This arrangement, it is said, protects the current from all exterior and foreign influences, while a slot cut along the bottom permits the entrance of a contact-rod from the motor, and allows of a nearly perfect contact, which, even under the most favorable conditions of weather, may not be had in the systems now in use.
The uncertainty of charged-rail currents, either on the surface or overhead, may, not inaptly, be likened unto the uncertainty of the arc light currents when first introduced into the streets of the city of New York. On wet and stormy nights these currents proved unreliable, because they were
transmitted over unprotected conductors. Now, however, since the conductors have been properly protected, this is not the case. But to thoroughly isolate and insulate the rails of an electric railway is both costly and difficult. In the tubular system, however, since there is no pressure whatever upon the tubes, the process is both inexpensive and simple. As a result the losses from leakage and induction are, if no mistake has been made in the figures, but slight, being only 10 per cent, as against from 25 to 75 per cent in the charged-rail and overhead contact-motor systems. This saving of current would be immediately apparent in the smaller number of dynamos and decreased horse-power required to operate the line.
As said before, an arm reaches down from the motor to the tubular conductor; the crook thereon, armed with wheels or brushes, reaching underneath and making the contact. 'The current after leaving the motor passes to the wheels of the negative conductor, thence to the tubular conductor on the same side of the track, and returns to the dynamo. During this operation it may be iutercepted by attaching wires to the negative tube, and led off to different points on either side of the road, where it should be needed to light up towns and houses, and operate small stationary motors.
The contact between the tubular conductor and the running motor is said to be so perfect that only a comparative. y small amount of current is required. When the motor is at a standstill, the current passesthrough the switch to the negative cond
along the line.
For elevated roads, or those running through the country, the conductors are attached to wooden guards placed on the ties between the rails. These can be planked over at street crossings; a slot being left for the arm to pass through.
The projectors of this system claim that, when in good running order, it will prove much cheaper than the ordinary steam railway, and that a twenty-ton electric motor on their line will do as effective work as a sixty-ton steam locomotive. For ordinary traffic, electric-motors of from six to ten tons will, they say, readily haul from three to six cars at a high rate of speed. For street cars, they think a motor of five hundred pounds, giving five horse-power, would be all that is required. On street railways, the tubes are placed in a conduit having a slot through which the contact arm receives the current.
'Ihere is an exbibit near the center of the great hall which, though remaining almost unnoticed, is, from a bistorical rather than from a scientific standpoint, one of the most curious and interesting groups of apparatus to be seen along any of the corridors. It is marked "Wallace Exbibit," and consists of several roughly put together electric machines that wear a weather beaten appearance, as though they had been left out in the storm. One of these machines is composed of an electro-magnet having the poles arranged vertically.
An armature, shaped like a Pacinotti ring, and made up of a series of wire coils placed at different points about a cast iron circle, revolves between the eularged poles. The bushes on the commutator are adjusted through the agency of a worm gearing. Next to this machine comes that used at the Centennial for lighting purposes-a crude device in which an armature revolves in a field of force of antique pattern. Then there is an electroplating machine of somewhat similar construction, and, lasily, a magneto-electro "telemachon." Joined together in a field of force so as to make
one magnet with multiple winding, there are twelve maguets, between the poles of which revolves an armature. Many thin plates of iron, each insulated from its neighbor, compose this armature.
For Mr. Edison, this so-called "telemachon" must have a peculiar interest. It is the first dynamo machine he ever saw, and the magnificent possibilities of such a contrivance, or rather of a further development of the principle on which it is constructed, changed the current of his thoughts, there is reason to believe, indeed he has avowed as much, into channels of scientific research where before be had been a stranger.
A brief narrative of Edison's first introduction to the dynamo machine may possibly not prove devoid of interest in connection with this bistorical exhibit at the Exposition. It was about six years ago that Edison and some friends, upon the invitation of Prof. Barker, of the University of Penusylvania, visited Ansonia, Conn., to examine a power transmitting machine, as the "telemachon" was called. Being Sunday, the Wallace factory on the bank of the river was deserted, and one of the work-rooms was used for the exhibition. Electricity was generated by the rubbing together of two wire brushes, and six or eight large arc-lights were kept aglow. The amount of power recovered at the end of the second machine of that applied to the first was variously estimated, but it was sufficient to demonstrate to Edison the feasibility of the project of collecting the power of running streams and transmitting it to a distance in the form of electric energy. The operation of the machine filled Edison with delight, the genuine, unalloyed delight of the child when first in possession of a new and ingenious toy. It is alleged that Edison was never known to be enthusiastic, but the writer, who was one of the party that day, can bear witness that this allegation is unfounded. There is reason to believe, however, that the thoughts of the wizard wore straying far beyond the walls of the Ansonia factory. In all likelihood, it was more than the mere working of this crude machine that filled his mind. It was its future possi-
bilities-the development of the principles and laws upon hich it was constructed.
Some weeks later this " telemachon" or a similar one was sent out to Menlo Park, and thereafter his attention was directed almost wholly toward improving the dynamo, and in discovering a means whereby its current could be economically subdivided.
The Edison dynamo and the mechanism of the incandescence light are the results of his experiments and investigations in this direction.
An electric cigar lighter is shown at the Exposition, which has the merit of not costing anything for current when not in use. It is not designed for use with a primary battery, and very properly, because this would render it at once expensive and troublesome.
It is made to hang between two incandescence lamps of the sixteen candle power type, and diverts a sufficient quantity of the current to feed itself, while at the same time not taking enough to appreciably lessen the intensity of either. As may be inferred, this cigar lighter is designed for use only where there is already an electric installation.
It consists of a circuit breaking device somewhat similar to that used in the telephone, the weight when it is hung up breaking the connection. The weight of this cigar lighter is sufficient to keep the connection broken at all times when not in use, and bence, as said before, there is no loss of current. The act of raising the handle to light a cigar switches in the current. This acts upon several fine strips of platinum set in a plug of cement.
These platinum strips are placed in series with the incandescence lamps overhead. The handle in which they are set bangs by a flexible cord, and, so far as appearance goes, does not differ from that usually employed with gas.
If only a tithe of the instruments for indicating distant temperatures, relative humidity, specific gravity, height of water, etc., shown at the Exposition ever come into general use, the average citizen may, not unreasonably, be expected to become something of a scientist. He may keep himself so exactly informed of the conditions of air and water afar and anear, and the strength and direction of prevailing winds, as to look upon weather reports as upon old almanacs and the bureau whence they come as a purveyor of obsolete intelligence. Some of these instruments on exbibition are good but not new, while many have the commendable quality of novelty without the necessary adjunct of efficiency. With a multiplicity of indices over his head, indicating the temperatures of his dwelling, his office, and his country-seat, the height and temperature of his ponds and wells and the boilers in his factory, the average man is likely to fall into grave errors. The sudden fall in the temperature of his cellar, as indicated in the index over his head, might throw him into a towering rage, under the impression that the cook bad let the furnace fire go out, whereas it is only a burglar climbing in through the cellar window; and the delight experienced in seeing by his office index that the spirit barrel in his wine closet has suffered no diminution would be turned to bitterness in discovering, upon a personal examination, that this height had been maintained by his man, by pouring in water to make up for the liquor that he had abstracted.
The telethermometer shown at the Exposition may be relied upon, as its name implies, to indicate temperature at distant points. In breweries, malt houses, distilleries, oil, sugar, and other refineries, refrigerators and the like, it will prove of great service; but that it may be relied upon to indicate the presence of icebergs at sea, as its projectors declare, there is very excellent reason to doubt. It is likely, at sea, to prove about as valuable as the ordinary thermometer, and not more so. The fact is, as masters of ships bave frequently testified, but little confideuce can be placed upon any type of thermometer so far as indicating the approach of ice is concerned. Sailing gradually from the cold wall of the Gulf Stream into its warmer waters, the thermometer will invariably rise, though large masses of ice are abead, because the warm influences of the Stream are stronger than the cold influences of the ice. Given a dead calm or a head wind, that is to say, a wind blowing against the course taken by the ship, and the thermometer will indicate the presence of icebergs ahead, because the wind baving come from their direction has felt their influence.
But it bas often been demonstrated that, where a fair wind prevails-a wind blowing in the same direction the ship is going-the fall of the mercurial column, if it takes place at all, will be so insignificant as to prove no waruing whatever. Hence it is that masters of ships place little reliance upon thermometers for indicating the approach of ice; and as the telethermometer can only indicate distant temperatures when the distant point is connected by wire, it would prove, as said before, no more reliable aboard ship than any other good thermometer. The telebarometer indicates and records electrically barometric pressures at a distance, and like the telethermometer is valuable in all continuous meteorological observations. The telemanometer indicates and records automatically and continuously the pressure in a boiler. The telehydrobarometer indicates and records the heights of water in reservoirs, storage ponds, rivers, lakes, dams, and tanks.
A valuable use for this instrument is that of recording at one point the beights of water in various sections of canals,
and recording at one point simultaneous tidal observations taken at differen parts of a river or bay. In other words, it might readily be made to take the place of the self-registering tide-gauge, which bas been used for years to keep a record of the tides of various localities. It is worked auto-
matically by clock work; a pencil being made to draw a curve upon parchment, the high points indicating high water, the horizontal lines slack water, and the low points low
water. The telehydrobarometer, despite its name, is of simple construction, and does its work in much the same manner as the self-registering tide-gauge, save that, as said before, it can send its readings, electrically, to a central station
The official tests of the various exbibits, from which so much is expected, have little more than begun, and it is not easy to understand at the present rate of progression how even a small portion of that which should not be permitted to depart without critical examination can be tested before the Exposition closes its doors. Of course there is much that does not require very elaborate tests, and still more the projectors of which are by no means enthusiastic to bave compared with similar apparatus. But it was understood, indeed proclaimed, at the start that everything would be critically examined, and an official report made thereon by the Committee; a certified copy of which would be given to the proprietors of the apparatus.
Many persons are looking forward with not a little curiosity for the official reports to be made of the several apparatus, because, since the committee having the matter in charge are in no wise interested, save scientifically, in what they are to pass upon, and are abundantly able to get at the real measurements, cold facts are likely to appear in a somewhat phenomenal profusion, and that is likely to be learned regarding the efficiency of certain apparatus of which the projectors have not, up to the present, given even a bint.

## Rapid Progress in Electric Science.

The Philadelphia Ledger makes the following note of progress in the application of electricity: "Only twelve years ago Professor Tyndall gave his course of memorable lectures in Horticultural Hall. He bad with him as a part of his apparatus an arc light. The lamp was regulated by clockwork, and cost probably ten times as much as the lamps made to day. It was imperfect in every way, the light being very unsteady, and several times got out of order at critical moments. The current was supplied from a voltaic battery, at a cost that precluded its use for any but lecturing purposes. The battery, besides being costly and troublesome, required the constant work of an attendant for a day or two to 'set up,' and it also was very apt to get out of order. Dynamo machines were not unknown at that time, but they too were costly, and for lecturing purposes the battery was considered best. Looking at the display of lamps in the exbibition, and the great variety and number of dynamo machines, it seems almost incredible that it is only twelve years since such a man as Professor Tyndall was well pleased, rather than otherwise, to be able to exbibit his poorly regulated clockwork lamp, run by some hundreds of cells in a voltaic battery!'

## The First Telegraphic Instrument.

At the Electrical Exhibition a large display of models from the Patent Office, under the charge of Mr. J. M. Churchill, are exhibited. Among the two hundred and fifty pieces is the original Morse telegraphic apparatus, patented April 11, 1846. The transmitter is mounted on a pine block, and is very crude. The armatures are wound with very coarse and poorly insulated wire, and the sounder consists of an ordinary piece of stick, which strikes against a piece of iron. The clockwork which operates the cylinder, about which the perforated paper was wrapped, is of a more im proved pattern. On the card attached to the exhibit is the following, said to be an effusion of a clerk at the Washing ton office:

Thesteed called Lightning," says the Fates,
Was tamed in the United Ste
Was tamed in the United States.
'Twas Franklin's hand that caught. the horse
That was harnessed by Professor Marse

## A New Carbon Battery.

A new voltaic battery has been brought out by M. Tommasi and M. Radiguet, in which peroxide of lead surrounds the carbon plate as it lies on the bottom of the cell. The other plate is also of carbon, covered with fragments of retort carbon platinized. The two plates are placed one above the other, but separated by a slieet of parchment paper which divides the containing vessel into two compartments. A saturated solution of cbloride of sodium, or common salt, is filled into both compartments until the upper carbon fragments are partly immersed in it. The electromotive force is 0.6 volt. The negative pole is that carbon plate which is not in contact with the peroxide of lead. If other saline solutions, such as sulphate of ammonia, sulphate of soda, chlorhydrate of ammonia, or even dilute sulphuric acid, be used instead of the solution of salt, the electromotive force does not sensibly vary.

## Isaac Newton.

Isaac Newton, chief engineer of the Croton Aqueduct Department, New York, committed suicide Sept. 25, in a fit of temporary insanity, said to have been caused by over work. He was in his forty-seventh year, and a brother of the late Dr. Henry Newton, the geologist. He studied mechanical engineering in the Delamater Iron Works, made a survey of the shoals of the upper Hudson, was engaged in the construction of the orignal Monitor, and was an engineer on board during her combat with the Merrimac. He was a member of the American Society of Civil Engineers and a member of the American Society of

## THE METROPOLITAN RAILWAY OF PARIS.

The project for a metropolitan railway submitted by the State for the examination of the General Council of Bridges and Roadways, as well as to that of the Municipal Council of Paris, has been definitely adopted by the Govern ment, and declared of general interest. It will probably be the object of a concession to a special company, which will undertake its construction and operation without requiring either any subvention or guarantee of interest.
According to the proposed scheme, the railway will be subterranean for the greater part of its length. Starting from Puteaux, the passenger will pass under Grande Arme Avenue, the external boulevards, Rome Street, Boulevard Hausmann, and the great boulevards, and will not emerge into the open air until be reaches the Bastille. Such is the principal route.
The city will gratuitously concede the subsoil of the wide streets that we have just named, and it is owing to this that the cost per kilometer will be reduced to the expense of constructing the long tunnel and the two tracks.
The passenger will descend to a depth of about 8 meters, and will travel beneath the earth, just as if he were in the Saint Gothard Tunnel.
Is it possible to give the public of Paris, which is essen tially artistic, completer satisfaction? Can it be offered easier and more rapid travel than it has at present? On another band, can it be shown at the same time in these multiple routes the different panoramas of the great metropolis? Yes, most certainly, provided that more is spent, and, consequently, that the company is subsidized or guaranteed a minimum of interest.
The entire question of elevated or of an underground line is reduced to this question of cost. It is well said, it is true, that underground traveling is performed at London; but it is not always added, when this question is being discussed, that the London company is making enormous sacrifices every year to bring to the light and air every part of its line that it is capable of getting out of the darkness and sulphureted atmosphere that fill this long tube.
And then, should we not offset the example of London by that of New York, Berlin, and Vienna, where traveling is everywhere done above the surface? Should we copy the old English city railways, or should we do like the American and our neighbors across the Rhine? Such is the question, and the answer to it does not appear doubtful.
However this may be now, or a little later on, when the subterranean will be doubled by an aerial one, there is one side to the aerial problem which bas served as a theme for partisans of the underground project, and that is the one relating to traversing the boulevard. It bas been contended that this aerial road is impracticable because it will injure the aspect of that thoroughfare.
of the Metropolitan, or by reaching it through houses whose interior, heing of less value than the parts in front, may be traversed without necessitating so great expenses.
It was in order to try one of the thousand possible solutions of such a mode of crossing the avenue that we some time ago took up our pencil and made the sketch which is herewith reproduced.-Le Genie Oivil.

## PARAFFINE BRUSH.

Crude petroleum in its passage through pipes deposits paraffine on the surface of the pipe, thereby obstructing and sometimes stopping the flow. In very short pipes it is a simple matter to remove the deposit by means of rods or scrapers, but it is impracticable to clean out long lines by ordinary methods. The object of an invention lately


## THOMAS' PARAFFIN BRUSH

patented by Mr. Henry C. Thomas, of Rock View, N. Y. is to provide means of clearing away the paraffine by mechanical agency without the use of solvents or heat. The clearing device is made in the form of a hollow cylinder, to which is attached a series of wire cutters projecting radially from the exterior. One or more blades, made of metal in spiral form, are arranged within the cylinder, as shown in the engraving. The cylinder is so proportioned that it length is about four times its diameter.

The cleaning device is inserted in the pipe, where it is pushed forward by the flowing liquid, the projecting wires it. | pushed forward by the flowing liquid, the projecting wires |  |
| :--- | :--- | :--- |
| loosening any paraffine that may slightly adhere to the walls | it. In the course of several epidemics in which miik has |
| acted as the vehicle of infection, it has been noticed that |  |

The following synopsis, by the Sanitarian, of a paper by Dr. Dougall, of Glasgow, detailing experiments conducted with a view to discovering the absorptive power of milk on various volatile substances, will be of interest:
Dr. Dougall inclosed in a jar a portion of certain substances giving off emanations, together with a uniform quantity of milk, for a period of eight hours. At the end of that time a sample of milk was drawn by means of a pipette from the lowest stratum of the vessel exposed in the jar; and we find that the following were the results of his experiments:

| 䢒 | Smell in milk. |
| :---: | :---: |
| 1. Coal gas | distinc |
| 2. Paraffine oll | strong. |
| 3. Tnrpentine | very strong. |
| 4. Onions. | very strong. |
| 5. Tobacco smoke. | . very strong. |
| 6. Ammonia. | moderate. |
| 7. Mnsk | faint. |
| 8. Asafetida | distinct. |
| 9. Stale urine | faint. |
| 10. Creosote. | . strong. |
| 11. Cheese (stale). | distinct. |
| 12. Chloroform. | moderate. |
| 13. Pntrid fish. | ... very bad. |
| 14. Camphor. | moderate. |
| 15. Decayed cabbage | distinct. |

It thus became obvious that the milk had absorbed the emanations of all the substances to which it bad been exposed, and it further transpired that all the specimens examined retained their distinctive odors for as long as fourteen hours after their removal from the glass jar in which they had been exposed
Cream, according to Dr. Dougall, may be regarded as acting in much the same manner as milk; indeed, although it contains less water than milk, yet it has special qualities of its own, which may perhaps make it even more liable to retain offensive and dangerous emanations than the parent fluid itself. Abundant evidence has, however, been given to show that far more care is needed in connection with the storage of milk than has heretofore been regarded as necessary, and this especially where milk or cream is kept in apartments or wards occupied by sick persons. If the emanations to which the milk is exposed are of a diseased and dangerous quality, it is all but impossible that the sample can remain free from offensive and dangerous properties; and it shouid become an invariable rule to keep as little milk as possible in sick rooms, and never to allow a supply which has been thus exposed to unwholesome emanations to be used for food.
Under these circumstances it has been lately held desiraact


It goes without sayıng that it scarcely seems possible to construct an elevated railway longitudinally to this so frequented avenue, which, although it formerly appeared to us so spacious, has become insufficient because of the ever increasing travel therein.
Moreover, it will not do to hide the Madeleine and the Opera House, or the gates Saint Denis and Saint Martin. It is necessary, then, to cut this principal artery perpendicularly to its axis, either by new streets opened for the peculiar needs
of the pipe. Should the wires come in contact with a deposit of sufficient thickness to check the motion of the brush
or to stop it, the force of the current will then act upon the spiral blade,
obstruction.

OUR Government has now $\$ 170,000,000$, or 600 freight car loads, of silver dollars piled up in its treasury vaults, and isstill manufacturing at the rate of two millions a month. or to stop it, the force of the current will then act upon the spiral blade, causing the device to rotate and cut away the

## THE METROPOLITAN ELEVATED RAILWAY, PARIS.


persons who had only consumed it after it had been boiled escaped all ill results, whereas other members of the same family or community, who had not taken that precaution, had been attacked with disease.

The Men Who are Promoted.
The Manufacturers' Gazette, in a recent editorial, made the following statements, regarding young men and their advancement, which others than the class to whom it is addressed will do well to heed:
" The young men who receive promotion are the men who do not drink on the sly. They are not the men who are always at the front whenever there is any strike, nor are they the men who watch for the clock to strike twelve, and leave their picks hanging in the air. They are not the men who growl if they are required to attend to some duty a few minutes after the whistle has sounded. They are the men usually who pay the closest attention to the details of their business, who act as if they were trying to work for their employer's interest instead of to beat him at every crook and turn. They are the men who give the closest attention to every practical detail, and who look continually to see whether they can do any better or not. This class of men are never out of a job. They are scarce. They never strike, they never loaf, and they do not ask for their pay two or three weeks before pay day."

## THE EDIBLE CRAB.

The life history of the crab is extremely interesting. The strange little animal that escapes from the egg resembles in no respect the parent crab. Its form is lengthened, ending in a forked tail; on the back is a long spine curving backward, and on each side a short spine directed outward. The eyes are large but not projecting, and the head is armed with a mosqui-to-like rostrum. This firstestage of the crab is called zoea. After remaining for a certain length of time in the zoea form, it comes forth from its infant skin an entirely changed animal. Here the eyes are very large and projecting, the body squarish, without the long spine seen in the first stage; it has eight perfect legs and two claws; the "tail" has become short, and turned "tail" has become short, and turned
under; and yet it has no resemblance under; and yet it has no resemblance
to the mature crab. This second form is called the megalops or great-eyed stage. When it again changes its skin, the body assumes a much broader shape; a distinct spine appears on each side, and the tail-like process is doubled up under the body. When its skin again becomes too tight for it, it at length comes forth a small but perfectly formed crab, Callinectes hastatus. The crab is obliged to moult or cast off its shell many times during its life. This moulting appears to be an unpleasant ordeal to pass, for they often die during the act. When we see that they are not only obliged to escape from the carapax or shell, but also from the hard covering of their legs, delicate mouth parts, and even gullet delicate mouth parts, and even gullet-turning themselves inside out, as it were-it is not surprising that they perish duriug the ordeal. The crab crawls up into some secluded nook or cove in shallow water to moult, out of the way of its hard-shelled relatives, for the helpless, newly moulted, or "soft shell crab," if found, is devoured by them, as well as by several species of fishes.
Fortunately for the crab, the soft covering hardens rapidly, and in a few hours it has a new and strong armor, and it then goes fearlessly out into the deeper water among the eel grass.

Crab fishing is an amusing but not always exciting sport. You simply row up into some shallow cove or bay of the seacoast, which has a muddy and grassy bottom, cast anchor, tie a good sized piece of meat on a strong line, lower it to the bottom, and wait for a bite. When you perceive a tug at your line, pull it up gently until the crab is visible; you must not attempt to lift it out of the water by means of the line, for then the crab will quit its hold and escape, but with one hand quietly but adroitly get the dip net under it, and with a dexterous sweep land it in the boat. Frequently two or three crabs are caught on the line at once.
Should you chance to go crabbing with a party of ladies, be extremely careful that they do not overturn the basket of lively crabs about their feet, for if this happens you will have your light skiff almost or entirely upset by the ladies jumping up and standing upon the seats, and you will get your fingers pinched, perhaps until the blood comes, as you recklessly endeavor to catch the crabs as they wildly scamper about the bottom of the boat. I have learned this from experience.

The edible crab of our coast can always be known by two long lateral spines of the carapax. The claws are blue above and whitish beneatb, and the carapax above is of a dull olive or bluish color. It is called the "blue crab" by the fishermen of the New England coast.
C. Few Seiss.

SADDLE MEN.
In Nepaul, India, there is a class of natives who serve as "saddle men," and take the place of saddle horses. Strapped around the waist and fitting into the curve of the back is a padded ledge. It is supported vertically by shoulder straps.
The rider rests on the ledge, in the position shown in $\mid$ than one 8 in . above the ground; that a gauge 22 ft . above the the engraving, which is from the Graphic, and repre- ground collected $101 / 2$ per cent less water than one 8 in. above sents the Duke of Portland, and the Earl De Grey, going the ground, and that a gauge 314 ft above the ground on a bunting excursion. Ladies of rank in this part collected 6.7 per cent less water than one 3 in . above the of India are carried on "saddle women," in the same ground. style.


THE EDIBLE CRAB.
Rain and snow.
A paper giving results of experiments with rain gauges differently located, and of experiments as to the ratio of depth of snow to the depth of same when melted, by Edmund B. Weston, was lately read before the Amer. Soc. of Civil Engineers. It was found that in a number of experiments extending over considerable periods of time a gauge ments extending over considerable periods of time a gauge
14 ft .8 in . above the ground collected 9 per cent less water


SADDLE MEN.
actly. Oue $\log$ may give five bags, or it may give ten. It sells, well, that is, pretty tolerable. I reckon I clear about $\$ 8$ or $\$ 9$ a day out of it-perhaps more. I never figured it up. What's it good for? Good many things. It's used to stiffen paper, but if you put in too much the paper gets brittle. Paper stock is much dearer than poplar flour, and that's why they put it in. If you mix the flour with lineed gum and 'biled' oil, you may get a kind of oil cloth Some folks mix it with meal to give to pigs and other animals. I guess it's good, but I never give it to my hogs, and even those fellows give it to some other fellow's critters, and not their own. Yes, I heard that some bad contractors mixed it with meal for army and Indian supplies, but I don't take much stock in the story, because they could buy sour meal as cheap as poplar flour. It wouldn't pay to mill pine, cedar, or hemlock; they are worth too much as timber. But any wood that isn't used that way can be milled into flour. I use poplar almost altogether, but when I run short of logs I grind up buttonball, birch, elm, or willow.'
The farmers dislike the new industry, as it promises to play havoc with the for ests, which are both an attraction to the border and a protection to agriculture. The tanneries years ago used up all the oak and hemlock; the lumbermen have stripped the country practically of pine, cedar, and walnut; the cbair factories are consuming the hickory and maple; now the wood flour mill promises to grind up what remaining trees there may be.

## Opening of Great Grain Regions.

Russia has resolved to develop her sys tem of railway communication on an enormous scale, and for this purpose bas just contracted a loan of $\$ 75,000,000$, to be ex pended during the next few years. India has already built lines of railway penetrating the furthest provinces. Australia has also made long strides in the same direc tion. Next in order is the Argentive Confederation, in South America, which is building four additional trunk lines of railroad at a cost of $\$ 28,000,000$, to connect Buenos Ayres, her principal seaport, with the vast granaries opening up in the pampas of the interior. In every case the ultimate purpose is to overcome all impediments in reaching the central grain mark ets of Europe. And, in spite of all this, says the British Trade Journal, American grain speculators continue their efforts to artifi cially maintain the price of wheat, as though there were a great deficiency in the supply of the world, and the nations would eventually have to come to them begging the privilege of being allowed to purchase some of their surlege of
plus.

The Cost of Making Stoves At the late semi-annual meeting of the National Association of Stove Manufacturers, Mr. Jobn T. Perry, of Albany, who probably knows as much about stove manufacture as any one, made the following statement of the estimated cost per ton of making stoves in the United States in 1884: Founciry Cost.

| Iro | \$20.00 |
| :---: | :---: |
| Mounting material (nickel panels, rails, etc., not included) | 8.00 |
| Fuel for all purposes. | 2.75 |
| Moulding sand and clay. | . 40 |
| Facing. | . 25 |
| Patterns, flasks, and lumber material | .75 |
| Shipping material ............................... ........ | . 10 |
| Freight and expressage. | 1.25 |
| Machinery and tools. | 1.75 |
| Repairs. | . 40 |
| Gas and oil. | . 20 |
| Stationery and books. | . 10 |
| Rent. | 1.00 |
| Iusurance. | . 40 |
| Taxes. | . 25 |
| Miscellaneous and pilferings | . 40 |
| Castings broken and discarded that have been paid for.... | 1.00 |
| Total. | \$39.00 |
| Moulding........ ................. | \$24.00 |
| Mounting. | 8.00 |
| Patteru making. | 1.45 |
| Pattern fitting and repairs. | 1.50 |
| Pattern moulding. | . 25 |
| Carpenters.. | 1.25 |
| Cupola men, breaking iron, etc. | . 75 |
| Cleaning and filing | 2.00 |
| Engineer... | . 30 |
| Shipping. | 1.05 |
| General labor.................................... ...... | 1.00 |
| Watchman. | ,20 |
| Foreman, moulding, and mounting | . 50 |
| Clerk. | . 50 |
| Trucking | . 75 |
| Miscellaneous and pilferings. | . 50 |
| To:al. | \$45.00 |
| Selling Expenses. |  |
| Allowances, various kinds. | \$1.25 |
| Attorney's fees .... .. | . 25 |
| Advertising, circulars, etc........ .. ................... | 1.75 |
| Bad debis | 2.00 |
| Clerks. | 1.60 |
| Freight on stoves delivered. | 1.00 |
| Gas and oil.. | . 10 |
| Insurance............... ........ ............... ........ | . 20 |
| Interest | 2.00 |
| Discount for cash. | 2.50 |
| Miscellaneous and pilferings | . 50 |
| Postage stamps and telegrams... | 1.00 |
| Rent | 1.00 |
| Stationery ... ........... | . 15 |
| Traveler's wages.. | 2.75 |
| Traveler's expenses and general traveling. | 3.25 |
| Taxes. | . 20 |
| President and Secretary . | 1.50 |
|  | \$23.00 |
|  |  |

In.connection with the above, Mr. Perry said: "Gentle men, everything in this world is imperfect, and so is this statement. Many of the items, I know, and you well know, are too low ; for example, $\$ 5.20$ per ton, or $\$ 15,600$ for the year, for patterns and flisks, on a product of 3,000 tons, should be put down at twice that sum. Some items may be too high, and in many cases should be excluded altogether from the list, yet I believe the average cost on the basis named, taking one year with another, will reach $\$ 107$, and generally more than that sum."

## Properties of Quicksilver.

One of the most curious properties of quicksilver is its capability of dissolving or of forming amalgams with othe metals. A sheet of gold foil, dropped into quicksilver disappears almost as quickly as a snow flake when it drops into water. It has the power of separating or of readily dissolving those refractory metals which are not acted upon by our most powerful acids. The gold and silver miners pour it into their machines holding the gold bearing quartz; and, although no human eye can detect a trace of the precious substance, so fine are the particles, yet the liquid metal will hunt them out, and incorporates it into its mass. By subsequent distillation it yields it into the hands of the miners, in a state of virgin purity. Several years ago, while lecturing before a class of ladies on chemistry, we bad occasion to purify some quicksilver by forcing it through chamois leather. The scrap remained on the table after the lecture, and an old lady, thinking it would be very nice to wrap her gold spectacles in, accordingly appropriated it to that purpose. The next morning she came to us in great alarm, stating that the gold bad mysteriously disappeared, and nothing was left in the parcel but the glasses. Sure enough, the metal remainin in the pores of the leather bad amalgamated with the gold, and entirely destroyed the spectacles. It was a mystery which we never could explain to her satisfaction.-Fireside Science.

Puscher, in the Chemiker Zeitung, states that the following cement resists kerosene, and is useful for cementing the brass collars to glass lamps. One part of caustic soda, three parts of resin, and five parts of water are boiled together the resin soap thus produced is mixed and well kneaded with half its weight of plaster of Paris. It hardens in about three-quarters of an bour. If zinc wbite or dry white lead is used, it hardens more slowly

## THE OCARINA.

For a few years past the fairs of Paris and its environs have been offering to amateurs of music a charming little instrument called the ocarina. Its name and those of the manufacturers affixed to it (Girola, Donizetti, etc.) tell us plainly enough that it is of Italian origin. The mountaineer who is said to have devised it, not only for his diversion but also a means of defense (since it may serve togive a blow with), scarcely thought that his rough invention would be patented, have the run of public places, enter parlors, and even figure in the midst of philbarmonic societies.
It is, then, not only a new plaything, but a genuine musi cal instrument that we desire to extol in enumerating the advantages that will everywhere cause it to be preferred to the wooden flageolet or the tin flute.


## Fig. 1.-MODE OF USING THE OCARINA,

At its debut the ocarina was merely a little glazed baked clay, having the form of a black radish externally, but hol low internally, provided at the side with a mouth piece and having nine or ten little apertures along it in place of keys (Fig. 2, No. I.). Its sonorous power ranged from $u t$, natural to $f a$ of the octave, passing through all the notes of the chromatic scale. It remained as primitive as this for a long time, and more than one amateur was enabled to for a long time, and more than one amateur was enabled to
draw from it lullabies and other music of the kind; but the programme that could then be got from its circumscribed range had its limit there.
A certain band of minstrels once passed through our northern towns, and their presence there has not been for gotten. This little troop had put aside the harp, the mandolin, and the violin, in order to give delightful serenades with well tuned ocarinas. It was original and delightful But although in harmony, their scores, since they varied only from the melody to the third of the same octave, did not have the same interest as if they had been rendered from a grave to a sharp tone; and this gave rise to the idea of manufacturing the instrument in different sizes. So there soon appeared the soprano ocarina, which was smaller than an ordinary carrot and clearer than a small flute, and the double bass ocarina, larger than a pumpkin and graver than he alto. The principle remaiued the same. But the


Fig. 2.-THE OCARINA IN PERSPECTIVE AND sECTION.
ocarina still bad one drawback, and that was that it could notaccord with the piano or the flute, from which it sometimes differed by one note. To obviate this, the instrument was provided with a piston, which, when drawn out or pushed in, raised or lowered the sounds by one uote (Fig 2, No. II.).
Finally, as a last improvement, a series of keys was add ed, symmetrical with the row of holes on the left side, thu iving a second complete scale.
The idea embodied in this simple instrument bas caused us to make an experiment that has proved quite successful. We took a pilgrim's gourd, aud first made some minute apertures in it, arranged something like those of the ocarina. For a mouth piece we affixed to it with wax
an old one from a clarinet that was provided with a reed. In order to obtain notes-perfect gamuts-we enlarged each of the apertures with a knife until it gave the tone, and we now have a sordine that in no wise cedes to the hautboy for solos which are not very complicated. The sounds thus obtained are preferable to those given by the ocarina, since they emanate from wood, and not from clay. The instru ment thus modified is shown in Fig. 2, No. III.-La Nature.

## Need of Improvements in Marine Signals.

Commander Gorringe has written a letter in regard to ships' lights, called forth by the Tallapoosa disaster, which contains valuable suggestions. He shows that not only are the red and green side lights now carried by vessels fre quently mistaken one for another, even by men who ar not color blind, but that the position in which they ar placed is such that in certain circumstances it is possible fo placed is such that course sixty degrees without giving any a vessel to alter her course sixty degrees without giving any
indication of the alteration by the appearance of her lights. In other words, the present system of lights is miserably defective, as is shown by the fact that it bas failed in hundreds of instances to prevent collisions at sea. In the place of the red and green side lights it is proposed tha every vessel shall carry four range lights. Two of thes should be placed forward, and two aft. Of the forward lights one should be a white light and the other a red light, the latter to be placed somewhat higher than the othe and some distance aft of it. The after lights should be arranged in a similar manner, except that the red ligh should be lower than the white light. This arrangemen would render it possible to ascertain from the appearance of a vessel's lights the course steered by her, and the direc tion and amount of the slightest deviation from that course It would also enable a steamer to avoid runving directly into the stern of a slower vessel where both are steering the same course, and no one on board the slower vessel has the forethought or opportunity to a display a "flare." One ob jection to this plan is the fact that most persons who are to any extent color blind are unable to see the red ray Were a blue light to be substituted for the red light, and were range lights to take the place of side lights, nothing except the grossest stupidity could bring about a collision between two vessels on a clear night.

## Ear Diseases

Dr. K. Buskner in a very elaborate paper in Archiv fur Ohrenheilkunde gives the results of bis clinical observation and those of twenty other aural surgeons. From these be finds that on an average out of every three individuals in middle life one does not hear so well in one ear as in the other, while from an examination of five thousand nine hun dred and five school children twenty-three per cent presented objective pathological symptoms of ear disease, and thirty-two per cent a diminution of hearing power. The following general conclusions are drawn from this immens mass of detail:

1. The most frequent causes of diseases of the cars would seem to be attacks of cold, affections of the nasal and pharyn geal cavities, and acute infectious diseases.
2. The liability to disease, of the ear increases from birth to the fortieth year, and decreases from thence to old age. 3. Men are more subject to affections of the ear tha omen, as three to two
3. The external ear is affected in twenty-five per cent, the middle ear in sixty-seven per cent, and the inner ear in eigh per cent of the total number of diseases of the ear.
4. The left ear is more frequently affected than the right as five to four.
5. The acute affections of the middle ear occur less frequently in the summer and autumn than in spring and winter.
6. Of the total number of cases of ear disease in the outpatient cliniques about fifty-three per cent are cured, about thirty per cent are improved, seven per cent. are unimproved and three-tenths of one per cen terminate fatally.

## Safe Lubricating oils.

The standard of a perfectly safe lubricating oil, free from spontaneous combustion, which was established by the experiments of the Boston Manufacturers' Mutua Fire Insurance Company, is as follows: A mineral or paraffine" oil, so called, bearing
1st. A fire test of $300^{\circ}$ or more.
2d. An evaporation of 5 per cent or less in twelve hours, at a constant heat of $140^{\circ}$.
3d. The greatest degree of fluidity consistent with keeping the oil upon the bearing.
There are now few or no oils offered to the members of the mutual companies by oil manufacturers of repute which do not meet this standard; but there are some of the members who prefer an admixture of fine animal oil to give more body to the lubricant.
To this end bigh-grade neatsfoot oil is sometimes mixed with mineral oil, and so long as the oils remain thoroughly mixed as much as 25 per cent of neatsfoot oil may be safely used. But five recent cases of spontaneous combustion (fortunately all extinguished without loss) bave called atten ion to a tendency in these oils to separate, so that the neats foot oil has apparently been applied nearly free from mine ral oil, and in such cases fire has ensued. Great care should therefore be taken that mixed oils are kept in safe condition by frequent agitatiou or stirring.

Anomalies of the Sewing Machine Business.
In an editorial in a recent issue of the Scientific Ameri CAN, under the above title, the following paragraphs ap peared, to which we have received a reply from a lady subscriber from Michigan
"A psychological fact, possibly new, which has come to light in this sewing machine business is that a woman wil rather pay $\$ 50$ for a machine in monthly installments of five dollars than $\$ 25$ outright, although able to do so.
"The curious processes of reasoning by which the feminine mind is led to regard the lapse of time as a cheapener and a hundred per cent interest as of no consequence, have not yet, we believe, been discovered."
Our correspondent replies: "She does it from policy, for if she says, 'Husband, I wish $\$ 25$ to buy a sewing machin with,' she expects a shrug of the shoulders, and is unable to obtain the money; but if she says, ' I can buy a sewing machine, and pay for it in monthly installments, only $\$ 5$ each month,' perbaps she can get the coveted machine. A psychological fact, but is it masculine or feminine?"

## Protection and Free Trade To-day.

An interesting paper under the above title was lately read before the Arkwright Club, Boston, Mass., by Robert P. Potter. The paper in full has been published by Jas. R. Osgood \& Co., Boston. It is full of valuable facts. We make a few extracts:
The abandoument of protection will in no way help the farmer, as the free-traders claim. It will stop immigration, and hence lessen the ever-increasing demand for food at home, while it will leave him in a much worse position than he now is in, in the matter of Indian and Russian competition. In the words of Judge Kelley, of Pennsylvania:
"The primary want of the American farmer is a quick, remunerative home market. When our mills, forges, furnaces, and factories were busy, and our operatives were well paid, we consumed nine-tenths of all the cereals we could grow; but with idleness prevailing in industrial centers, with the reduction of wages and the power to consume, and with great branches of industry expelled from the country, we cannot look to an increase in the home demand or the maintenance of past prices."
The American farmer must not forget that, besides the direct benefit he receives from the protective tariff in the duty on wool and all agricultural products, and the indirect benefits in the increase, as I bave shown, in the value of his land and the price of its product, and the continued cheapening of his manufactured goods, there is yet another advantage in this system too often overlooked by our farmers. The protective tariff prevents direct taxation. Abolish your custom houses, as the more fanatical free-trader proposes, and annually over $\$ 200,000,000$ must be raised by direct taxation.

The farmers of Michigan have been looking into this ques tion of direct taxation, and the curious results they have reacied will be of interest to farmers throughout the country. The statistician has discovered that the despised custom houses produced, in $1882, \$ 213,000,000$; that this amount, distributed among the several States of the Union, according to population, as the free-traders propose, would add the snug sum of $\$ 6,956,982$ to the annual tax roll of Michigan, an amount equivalent to $81 / 2$ mills on the dollar. To distribute this tax on the assessed returns would in some cases double, and in others treble, the present State and county taxes. For example, the State and county tax of Wayne County, Michigan, was $\$ 367,578$ in 1880, and the United States tax, by direct taxation, would be $\$ 1,116,700-$ more than threefold the State and county tax combined. In some agricultural counties of Michigan such a tax would exceed the State and county tax fivefold. A farmer assessed at $\$ 10,000$ would have to pay $\$ 85$ a year, and one assessed at $\$ 20,000, \$ 170$ a year, an amount about equal to the total store expenditures of many well-to-do farmers.
Betore our farmers vote to abolish the toll that foreign manufacturers pay for the privilege of selling their goods in the American market, it might be well for them to decide in their own minds whether they pay the bulk of the import duties, or the wealthy class who consume imported goods; and whether in the direct taxation scheme the farmer's land, or the bonds and stncks of the capitalist, would be most likely to escape the United States assessor. Any farmer can figure out this simple problem for himself. Under the new order of things be can even ascertain exactly his proportion of the tax. It is a phase of the tariff question that must not be overlooked.
How does this question affect the men and women engaged in manufacturing, mechanical, and mining industries and transportation in the United States? The time has come for this army of $4,400,000$ persons to examine free trade and protection for themselves. Our imported manufactured goods come chiefly from Great Britain, France, Germany, Austria, Italy, Spain, Portugal, Belgium, Holland, and Scandinavia. In these countries over $31,000,000$ men and women are engaged in manufacturing and mining pursuits. The average annual income of these millions is less than $\$ 4$ a week, or $\$ 200$ a year. Unless they emigrate to the United States, they have no hope to rise from the condition to which they were born.
The official returns of these countries bring out the astonishing fact that over $8,000,000$ persons, a number exceeding one-fourth of the industrial population, are returned as paupers, and that annually the taxpayers, already burdened with the immense cost of imperial armies, have to pay the enorm
ous sum of $\$ 150,000,000$ to prevent these people from dying wav I have attempted to present the facts, which must speak of starvation. Of this amount free trade Great Britain alone for themselves. As an inquirer after the truth, I have trav contributes over one-third, or $\$ 50,200,000$. So terrible has the fight for existence become in these countries, that every year thousands who can scrape together a few dollars leave their homes in the old world aud cast their lot with us on this side of the Atlantic. From the British Isles alone, during the last ten years, have come $1,333,247$, and from the other nations of Europe 2,359,468, making a total of $3,892,715$, equaling almost, in point of number, the population of Holland. With the same environments, with the same iustitutions to bring out their higher manhood, the citizens of the republic extend a welcome hand to this tre mendous army of emigrants.
But we are not ready to extend this same privilege of competition to those who still remain in other nations; to men who are living in different surroundings, who have no been educated up to the plane of the American workman but who are content to slave on through life as their ancestors have done before them; who are chained to the forge, the mine, the loom, and the despotic ruler; without hope and without future. Yet this is what free trade, or the denationalization of the United States, demands of the Ameri cau workmen. To support this demand, the workingman is made the victim of the most extravagant statements; he i told that the purchasing power of his wages will increase the moment he begins to compete even-banded with the
$30,000,000$ poorly paid workers of Europe. He is told the "pauper labor cry" is a myth, and yet before him troop the gaunt host of $8,000,000$ men and women dependent on charity. With wages varying from 50 to 150 per cent higher in the United States than in Europe, the workingman pays less for his necessaries of life.
I cannot do better than quote from Mr. Ellis Robert's re cent lectures before Cornell University, as be makes thi point remarkably clear. He said: "Beef, pork, and poultry are cheaper with us, and so, the country through, are tea, coffee, and even sugar at retail. The Liverpool market fixes the price, not of grain in general, as is often said, but of our surplus. Our own price determines whether there will be any surplus or not. The American buys his cotton fabrics as cheaply as anybody. Anything made of wood which is higher here than elsewhere must be a curiosity or something which takes value from age. We are constantly exporting leather and many of its products. In many of the products of irnn we excel other nations, and in steel we are at th forefront. In iron our progress is the most rapid. Many of our tools are cheaper than the English. Tea and coffee are sold in this country cheaper than anywhere in Europe, and certainly much more so than under the heavy Britisb duties. Sugar pays a very high duty in the United States, and yet such are the facilities for refining here that our retail prices are as low as those of Britain. At an equal distance from the mines, coal is sold as cheaply in this country as in Britain. The most careful study will prove that all articles of prime necessity, including food in the essential varieties and the comforts of life, are cheaper here, not only in their relation to wages, but in money, than in any other country.
"When a family starts to set up a home in this country, it will find that for furniture and cutlery, and the miscellaneous articles necessary, it will be charged as low rates as in glassware twenty per cent cheaper, coarse carpets and blankets are as cheap here as elsewhere. A like equipment for a house is to be bought for as little here as in Britain. The savings here on food will pay for the small share of the earnings appropriated to silks aud woolens, of which the price are higher. Rent is not more here than in Britain or Europe, under like conditions, though our people demand better accommodation, and naturally have to pay for it. Our studies show that for three-fourths of the usual expenditures of a family, the prices are in favor of the United States. The money cost is actually less bere than in the land of lower wages, and with like comforts the expense is on the whole lower in this country. Even the excentional articles tend downward in the United States as nowhere else."
Our experience vindicates the policy of protection; its strength lies in the prosperity it has given the nation; in the great industrial cities it has built up; in the prosperous and diversified industries it bas founded; in the profitable bome market it has given our farmers; in the varied employment it has given the men and youths of the country; in the homes and profitable work it has offered our kin beyond the sea.
In all that goes to make a nation strong and prosperous; in all that goes to make a country great and independent; in all that goes to broaden the horizon of the laborer, in crease his earnings, cheapen the cost of what be buys, and improve his condition-in all this lies the strength of the protective system. Firm in the convictions of our leading thinkers, deeply seated in the experience of the country, strong in the hearts of the majority of people, and laden with evidences of its rich fruit, it is not likely the American system, shaped by the same hands that built the republic, is to be wiped out for a system which in the earlier days of our national existence was known as the "Colonial Policy," and to-day as the "Manchester School," or "Free Trade." The cause of protection is the people's cause; it affects the vast musses of the people, and they must and will under stand it. It cannot alone be studied in the lecture room. It can be studied in the light of the experiences of other nations, and in the experience of our own country. In this
eled thousands of miles through the industrial regions of
Europe and our own country, and in this spirit of inquiry, and with no pretensions to political economy, I submit thi address, earnestly believing with Henry Clay that, "The cause is the cause of the country, and it must and will pre vail. It is founded on the interests and affections of the people. It is as native as the granite deeply embosomed in our mountains."
wages at home and abroad in some textile industries.

| occupation. | AVERAGE WEEKLY RATE OF WAGES PAID IN WOOL'.N FACTORIES. |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
| wool sorters. |  |  |  |  |
| Men.... | \$9.43 | \$5.82 | \$5.76 | \$5.50 |
| Young persons ................. | 5.12 | 2.70 2.00 | 2.40 1.80 | 2.50 1.90 |
| spinsers. |  |  |  |  |
| Men (overseers).............. | 12.00 | 6.50 | 6.00 | 6.60 |
|  | 9.05 6.18 | 6.00 3.00 | 5.00 3.00 | 5.25 3.00 |
| Young persous............... | 4.81 | 2.00 | 1.80 | 1.90 |
| Piercers ............ ..... ... | 5.00 | 3.00 | 2.50 | 2.40 |
| wesvers. |  |  |  |  |
| Men ................ ....... | 8.53 |  |  | 4.25 |
| Women..................... | 7.45 | 4.00 | 3.48 | 4.00 |
| Mechanics .................... | $\begin{array}{r}13.43 \\ 8.58 \\ \hline\end{array}$ | ${ }_{3.75}^{6.25}$ | 5.50 3.25 | 5.60 3.00 |

* Report of Bureau of Statistics, Maisachusetts, $188 \%$.
$\dagger$ Compiled by Consul Frisbie, from books of mannfacturers, 1882 \& Report of Robert Giffen, Statistical Department, Board of Trade, 188\%

We have a table here, founded on the car four responsible authorities. If they tell the truth, the fact is established that in the important woolen districts the wages of Eugland and the Continent are alike; that protec tive France and Germany, with their new tariffs, have in creased the well-being of their workpeople, while Great Britain has done the reverse by opening her ports. The table establishes that wages are about 100 per cent greater in this industry iv the United States than in any of the European countries. To abolish the duties that secure this to the workingman of the United States would result as it has done in England-in a leveling of wages.
average wages here and in great britain.
Below I print what Mr. Carroll D. Wright, of the Bureau of Statistics of Massachusetts, calls the general average weekly wages paid to all employes in Massachusetts and Great Britain in 1883:

| Agricultural implements Artisans' tools |
| :---: |
| Boots and shoes |
| Brick |
| Building tr |
| Carpetings |
| Carriages and wagons |
| Clothing |
| Cotton good |
| Flax and jut |
| Food preparations |
| Furniture. |
|  |
| Hats-fur, wool, and s |
| Hosiery. |
| Liquors-malt and distilled............... |
| Machines and machis |
| Metals and metallic |
| Printing and |
| Printing, dyeing, nleaching, and finishing cotion textiles. |
| Stone |
| oden |
| oolen goods |
| d goods |
| All industries |


| \$10.25 | \$8.85 |
| :---: | :---: |
| 11.80 | 4.89 |
| ${ }_{8.63}^{11.63}$ | 4.37. |
| ${ }^{14.69}$ | 4.16 |
| ${ }_{6} 68$ | ${ }_{4.11}$ |
| 13.89 | 4.89 |
| 1001 | 6.71 |
| 645 | 4.66 |
| 6.46 | ${ }_{2}^{2.84}$ |
| 11.04 | ${ }_{7.96}$ |
| 12.48 | 6.91 |
| 11.01 | 5.51 |
| 6.49 | 4.67 |
| 11.75 | 3. 6.96 |
| 11.25 | 7.40 |
| 11.37 | 5.52 |
| 8.67 | 4.94 |
| 14.39 | 8.58 |
| 12.19 | ${ }_{5} .66$ |
| 6.98 | 4.86 |
| \$10.31 | \$5.86 |

" Average " instead of " high " wages rates for Great Britain.
It will be seen from this table that the average wages to all employes for the twenty-four industries considered in Massachusetts was $\$ 10.31$ a week, while that for Great Britain is $\$ 5.86$ a week-the wages in Massachusetts thus being nearly double the average weekly wages paid in the same industries and to the same class of employes in Great Britain.

Some genius bas been calculating values as related to human energy in various departments of life, and cites the lollowing illustrations: " The British Poet Laureate can take a worthless sheet of paper, and by writing a poem on it can make it worth $\$ 65,000$; that's genius. Vanderbilt can write a few words on a sheet of paper and make it worth $\$ 5,000$, 000 ; that's capital. The United States can take an ounce and a quarter of gold and stamp on it an eagle bird,' and make it worth $\$ 20$; that's money. The mechanic can take the material worth $\$ 5$ and make it into a watch worth $\$ 100$; that's skill. The merchant can take an article worth 25 cents and sell it for $\$ 1$; that's business."
engineering inventions.
A sectional steam boiler has been patented oy Mr. Lawrence W. Chadwick, of Milnes, Va. This sectional boiler of the same inventor, and consists in sectional boiler of the eame inventor, and consists in
he combination' with the vertical pipes of vertical pendent water leg pipes depending from the upper chamber, and having a fire flue through the same and ateral connection with the other verlical pipe,
A railroad tie has been patented hy Mr. Arnold N. D. Deififs, of Bedfora, Tenn. The bed piece re made of belou concrete, so moulded as to have on or more iron rods or wires embedded in the materia extending through the whole length of the tie, th strengthen it, combining concrete, iron, and wood, to make a tie that
moderate cost.
A reversing gear for engines bas been patented Mr. Thomas Moore, of ${ }^{\circ}$ 'Fallon, Ill. A spiral shaft is journaled in disks on the shyft, having at one end a crank engaping with an eccentric disk, a spiral
shaft passing through a sliding disk ou the shaft. so shaft passing through a sliding disk ou the saft. so by sliding the disk the spiral shaft is turned and it
crank moves the eccentric disk and adjusts it as may crank moves
be desired.
A car coupling has been patented by Messrs William H. Adams and James D. Felthousen, of Albany, N. Y. The coupling head has flaring mouths and slots, the hook having a slot in its rear end, with two link eats in its throat and a projection on its lower side, so thecoupling will sustain the draught strain securely, nd the cars win couple automatically when run to gether.

## MECHANICAL INVENTIONS

A ring spinning frame has been patented by Mr. Jean B. Rolland, of Paris, France. This inven tion relates to parts adjoining the spindle, and has fo its object to facilitate the stoppiug of the spindle when
it is desired to join or piece broken threads, and to ef fect the thorough lubrication of the spindle.
A die block bas been patented by Mr. Geo. . Simmons, of Brockton, Mass. It consists of crossing each other, and a bolt passing through one o the apertures, so the blocks may be reversed to presen ny of their faces to form a new surface.
A bolt dresser bas been patented by Mr. Henry Egeberg, of Napa, Cal. It is a machine whic can be more conveniently applied to the bolt than the rdinary stocks and ies, and is composed of two hing d jaws having on one end removable dies and sprivg cover, in which dies of different sizes may sprivg
kept.

## MISCELLANEOUS INVENTIONS.

A surgical device for relief of hemorrhoids and similar affections has been patented by Mr. Lewis
Chamberlain, of Tarborough, N. C. It consists of a seat formed with an ovoid, concave, and a centra! ape An anchor bas been patented by Mr. Pete . Herman, of Dartmouth, N. S., Canada. The fluke project from the bottom and top surfaces in such a wa hat, in wiatever worl
A corkscrew has been patented by Mr. Mar in F. Wiliame, of Bastrop, La. In combination wit ver the bracket and a corkecrew held to turn in the ver, with various other novel feature
A detachable fur collar has been patented by Mr. Charles F. Butterworth, of 'Troy, N. Y. It i y, having its skin of increased fullness on one side he fold, the lining strips being cut and folded to pr
A hydraulic jack bas been patented by Mr. Elnathan Hall, of Latingtown, Glen Cove, N. Y. Th nvention consists of the adaptation of a former pa-
tented jack for lifting weigbts on a plane below itself thereby greatly extending the applications and uses to which it may be put.
A two wheeled vehicle has been patented Messrs. Enoch P. Hincks and George H. Johnso of Bridgeport, Conn. It has a three-sided front, tw of the sides of which are doors hinged in the rear open on or toward the whe
A shaft loop has been patented by Mr. Ed win D. Moseley, of Shopiere, Wis. It is made of met in its upper side, with a billet at the front and one on n its upper side, the claws being double or single ac cording to the kind of buckle used.
A razor has been patented by Mr. James P. Tryner, of Denver, Colo. This invention consists in mounting one or more set screws on the razor guard, and loosely connecting them with the back of the ra-
zor, so that by turning a screw the blade may be ad usted in either directio
A centrifugal machine for drying hides and kin, spent tan and olher matters bas been patented y Mr. Emil de Solminikac, of Pont Aven, France. I a rotary skeleton drum of spaced apart bars having circumference, the drum having a wirework lining. A broiler has been patented by Mr. George B. Siegenthajer, of in a stove hole closer to the fire than is the case wit ordinary broilers, thus enabling meat to be broiled or read toasted in less time.
A substitute for caoutchouc has been parented by Mr. John J. Haug, of St. Petersburg, Russia. It is prepared by boiling skins and glycerine under pressure. and mixing with the mass obtained glycerine and chromate or bichromate of potash or other salt
acted on by light, with or without the addition of acted on by light, with or without the addition of
ground cork, ox gall, and color.

A cartridge implement has been patented y Messrs. William G. Jesse and George E. Paston, o pent caps from discharged cartridge shells, and re cading and recrimping the same, the parts being easily
eparable, so that the apparatus may be conveniently carried by sporismen in the pocket.
A telegraphic transmitter for unskilled ope atives bas been patented by Mr. Theodore Ames, of Hackensack, N. J. By this apparatus a person wish-
ing to telegraph depresses the corresponding keys in he same manner as in operating a type writing mahine, but the rece
A corrugated pan for salt making has been The pan is made of boiler plates or of Auburn, N. Y. olted together with longitudinal corrugations, an the salt crystals are drawn from the bottoms of the Corrugations by endless belts of cloth or oth
A gas making machine has been patented y Messrs. Abel and Thomas Henning, of Sacrament Cal. This invention covers novel details of construc on and arrangement for an automatically workin as to give a steady supply, and so there will be no dan er of any gas escaping.
A drain and sewer pipe bas beeu patented y Messrs. John Cooper and Henry Bieg, of Brooklyn V. Y. The pipe section has at one end a flange form pposite end external annular a grooves, and at the neck, so the joints can be well cemented, while the pe is very strong and durable.
A transom lifter has been patented by $\mathbf{M r}$ Samuel A. Bishop, of Smithport, Pa. This inventio relates to devices for opening and closing transoms.
skylights, and other windowsthatare out of reach, and kylights, and other windowst that are out of reach, an
is a device for holding the transom when closed, to pply power advantageously in
A brick kiln has been patented by Mr homas M. Bannister, of Lone Pine, Cal This iny ion provides for furnaces arranged in the front and rear walls of a brick kiln, with top openings having
tiling automatically closing valves, and car racks arring a ranged along the
A fruit jar bas been patented by Mr. John . Quinby, of Armonk, N. Y. It has a long neck, cally opposite quadrant ridges a short distance below the shoulders, with a cover having a shoulder and simi lar ridges to hold the cover on the jar, and close vers tightly, to make the jar air tight.
An improved brick wall or pavement forms fie subject of a patent issued to Mr. Louis R. Sassinot, ng walledrecenta. The invention consists in form ain of the bricks edgewise, and afterward lining th hambers with a plastic substance, and filling the A hame has been patented by Mr. Danie . curve to suit the collar and the shape of the horse, neck, the central section having a removable plate and eye or staple for holding the hame tug, the staple be ing adapted to be adjusted for raising or lowering th raught.
An apparatus for securing animals whil being shod has been patented by Mr. James H. Lewi of Bismarck, Ill. It is made of hinged beams, with posts and braces; with bearings to receive rods attach ing a ratchet wheel, pawls, and a lever, for tightening the animal.
A projector stopper for bottles and flasks taichard, of Paris, France. Georges Pinaud and Pierre nd cork to use projecting the liquid, by pressure applied to a hollow India rubber ball if sed to the top of the stopper, where
by the liquid may be projected in one or more jets ac by the liquid may be projected in one or m
A means for assisting persons in putting up Sutton of Rushville Mo It consists Mr. Gree work with clamping jaws for holding the coat collar, treadle for operating the jaws, and hooks or supports for distending the sleeves of the garment, the appara les, or those not well able to wait on themselves. An air pump bas been patented by Mr Hermann Meckert, of Hannibal, Mo. It consists of an
outer rigid metal cylinder and an inner cylinder of flex outer riyid metal cylinder and an ineer cylinder of flez he outer cylinder and to a piston working one end that when the inner cylinder is being extended air drawn into it, and by compressing the cylinder the a os compressed and expelled.
A turn table for horse cars has been patentd by Charles F. Bollwitt, of New Orleans, La. It ha platform surrounding the turn table with catches on the he locking bolt, which can be shifted by devices op rated automatically by the turning of the turn table position.
An apparatus for distilling low wines bas been patented by Mesers. Nels Peterson and Henr tub over the still, a charge pipe communicating betwee the tub and the still, a vapor pipe communicating wit he stock tub, and various other novel features to be er adapt a distilling apparatus to the manufacture o A tru
A truck skid for railroad cars has been pais fitted to slide in is fitted to slide in ways beneath the car, and tied to
aving a ring at the other end, which slips along a ba axed to and runuing crosswise of the car, so the skid may be run out for use at either side of the car, and
may be run into the car to receive the load and out gain to discharge it.

NEW BOOKS AND PUBLICATIONS
The Magazine of Art (Cassell \& Co.
New York, for October is rich in papers and picture artoon by Lionardo, illustrase a cor Cist, from Cartwright. It contains descriptive and critical tex with sketches of some of the works in the last Roy Academy exhibition. There are several historical art les on art and frtists, and the usual good summa ort news in the concluding pages of the number. Scranton, Pa., City Directory. Lant
Silvernail, compilers, Valatie, N. Y. its business given in the preface furnish a chapt worthy of remark, even in this fast growing age and country. In 1860 the population was but 9,223 ; in 188 it had grown to 67,062 . The city is located in the cen ter of a great anthracite coal field, and coal, iron, steel, nd lumbermake the principal staples, which, wit he most ample transportation facilities, seem to give food pre.

## Harper's Magazine.

The October number is well stocked with interesting matter, and with its sixty well executed engraving ren ohn Macmullen, who has for a lifetime been engage interesting article on the founding of Kings College, hich title was the name n! Columbir/ College previo r. Macvolution. The aame ward changed in 1 scences of the college and its. presidents previous o the Declaration of Indepenircnce. According to he writer, the earliest mention of Kings Colleg on found is in 1803, when the rector and wardens Trinity Church were called upon by Lord Cornbury, rested in Trinity Church, had been intended for the proposed college. To th his well written article will have peculiar interest.

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Pa. Diamond Drill Co. Box 423. Pottsville. Pa. See p. 141. Catechism of the Locomotive, 625 pages, 250 engrav ngs. Most of railroad books. The Railroad Gazette, 73 B'way. N.Y. For best low price Planer and Matcner. and latest
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marked or labeled.
(1) M. J. B. writes: Can any of your correspondents inform me how and where an eel was gen-
erated A. The function of reproduction in the eel, and the general structure of the organs concerned in it correspond entirely with the same points in our othe ordinary osseous fishes. Much mystery has been attached to them in past ages, but the advance in ac-
curate knowledge of structure has totally dispelled it curate knowledge of structure has totally dispelled it. Eels breed as do cod, or perch, or shad. The first ac-
curate description of the female organs was made.by curate description of the female organs was made by
Mondini, in 1777, in a paper entitled "De Anguillae variis," which was published in the proceedings the Bologna Academy. But the structure of the male worked out by Syrski, in the proceedings of the Imperial Academy of Vienna, in 1874. The one point
which doubtless has helped in great degree to continue the mystery is the extreme minuteness of the oggs. They have only abe leaf-like folds of the ovaries are constantly associated with fat globules, from which it is not easy to distinguish them. The spermatozoa are even very much more minute, and can scarcely be detected except by a practical observer, using a microscope of high power. never ascend into fresh water; the eggs are hatched in the sea or brackish water, and the young ascend the
ivers in myriads, climbing waterfalls most wonder fally to do so.
(2) F. A. L. asks: What will take off the
bronze match boxi A. Washing with plenty of clean
water, accompanied with mechanical friction, is generwater, accompanied with mechanical friction, is gener ally considered the best means of cleansing bronze
articles. A dilute solution of the caustic alkalies is likewise recom
(3) O. J. P. asks: Is it best to oil belts running machinery-dynamos for instance? If so, what
kind of oil is best, and should it be put on inside (next pulley) or not? A. A little neatsfoot oil once i Whie, to keep the leather from getting too dry; ase a ittle as ken up by the leather.
(4) W. D. S. asks if a diamoud shaped block can be made of one piece, having eight diamond faces flat and all of one size, we think it cannot be done.
(5) C. P. writes: I have fixed up an old mahogany desk; after scraping I rubbed it with raw surface; what shall I use for a finishing polish? A. Mis equal parts of thick alcoholic shellac, varnish and boiled linseed oil, and shake well together before using. Rub small quantity of this mixture vigorously over the
ood until the desired polish is secured.
(6) W. H. W. says: I see in your paper of august 2, you say 6 square feet of fire surface for arface how large a horizontal boiler ehould I have hat is, what diameter, what size tubes, what llengt tabes, and what thickness iron for boiler! A. Fo yourboiler, a cylinder 12 inches diameter, $21 / 8$ feet long
with 12 tubes $11 /$ inches diameter, shell leads 14 inch thick, tubes in lower half of heads. iniature of the large horizontal tubular boilers.
(7) J. C. R. asks: How many foot pounds an be realized reane cubic steam and used through a steam siphon? A. From
$, 000,000$ to $4,000,000$ foot pounds theoretically. Yo will probably not realize more than one-fifth of this in steam siphon.
(8) C. M. W. asks about a formula for re moving blackheads. A. On page 52 of the Soientiric American for January 28, 1882, there is given very tion of comedones. The articles there given are no injurious to the skin.
(9) O.S. B. asks how much pressure he would gain under the following conditions: A tight
cast iron box is filled with air of $60^{\circ}$ temperature, at pressure of 30 pounds, and the intention is to heat 20 ${ }^{\circ}$. Air at $60^{\circ}$ and 30 poun.ds pressur and of a given volume, if
(10) H. W. T. asks how to construct umb waiter or elevator to elevate one or two hods o little exertion of strength. A. These elevators are nothing more in construction than a sort of hung platform or box partly balanced by weights, which most
good carpenters understand. We recommend you to good carpenters understand. We recommend you to consult with some builder in you
illustrate it in Notes and Queries.
(11) E. T. F. says: I wish to have some bells cast ; how can I make my models out of wood, in order to obtain the desired weight in iron? A. If there
are nocore prints, the casting will weigh 16 times the weight of the pine pattern, if solid. For core print and cores deduct 0.26 of a pound for each cubic inch completed weight of the whole
(12) G. H. says: I want to make a tele scope with a 3 inch object glass, 48 inch focus. What
length should the body be, and would brass tubing an eighth of an inch thick be strong enough? What diameter should the focusing tube be and what length A. Make the body of your telescope about 42 inchesin length, and your focusing tube about 10 inches inlength and $11 / 2$ inches in diameter. A tube on
an inch thick would answer for the body.
(13) A. A. asks (1) how to make a good and reliable rubber cement for soling and mending rubbe boots. A. Dissolve pure, unvulcanized rubber in bisul phite of carbon or in benzine of turpentine. 2. What would be the most substantial way of patching rubber that is nollow with great pressure, like a hose? A the patch and to the surface to be patched, and hold the patch in place with considerable pressure until the cement is set. 3. Could I not dissolve crude rubber
with odds and ends of vulcanized rubber and mix with sulphur and other articles, so as to make a solid doug or the composition hard and durable for soles for rub rnbber cannot be entirely dissolved. It may be soft ened by any of the solvents of unvulcanized rubber
(14) S. F. asks how to draw a picture on glass, for magic lanterns-the sabstances to beused fo pictures may be drawn for the magic lantern with an ordinary lead pencil on ground glaes, afterward var nishing the glass to render it transparent. If you desire to make colored pictures for the lantern, you may
use any of the transparent tube colors, mixing them use any of the transparent tube colors, mixing them
with varnish. You will find information on this subwith varnish. You will find information on
ject in SUPPLEMENTs, No. 423,173 , and 424.
(15) A. A. S. writes: I recently attended a lecture on "The Great Atmospheric Weight " on the
human being. Suppose a man could be so arranged as human being. Suppose a man could be so arranged a
to have the air entirely exhausted from aronnd his body can you tell what his feelings would be? Appliances would feellike so that if there were time enongh of sensation to have any feeling, for the air inside the
body would distend all and rupture a great many of the
cells.
$(16)$
K. O.-We know of no electric railway velocipede. We think it would hardly be practica-
ble unless you art able to generate current by means of ble unless you art able to generate current by means of
a dynamo as in electric railroads. We do not know that the limit of speed for electric tricscles has been
attained. It depends, of course, upon the power of the
engine and the currents applied to it. It will probably require s one horse power motor to drive an ording
(17) W. C. M.-Benzine or gasoline can be congealed by means of freezing machines, several of monia. As far as we can ascertain,the process is not practical one, as there is no commercial demand fo these articles in a congealed form. No acid would be The action is due toa frigorific and not to an emulsify

(18) J. S. T. asks if on the coast of thi country such fishes are to be caught as the importe if so, where? A. The menhaden or alewives, foun mostly on the coast of Maine and Nova Scotia, are ver imilar, although usually they are not so choicely put p. 2. Do you know any factory in this country pre-
serving such fishes? A. There are several factorie down East" for putting up these flsh, both as an
(19) J. W. T. asks (1) for a cement or past put patches and soles on rubber boots, and how which is, by digesting caoutchouc, cut in fine shreds, with about 4 volumes of naphtha in a well cover ndoors. 2. Is there a work that treats on the shoeing of interfering horses, and if so, where can I get its A There is a work by Russell on Horseshoo
cost 75 cents, that we can furnish you with.
(20) W. L. asks how to make oxymuriate of antimony, such as used by dyers as mordant cotton. A. The best method for preparing the oxy chloride of antimony is to boil the commercial sulphid $f$ antimony in fine powder with hydrochloric acid, till he liquid is saturated, hydrogen sulphide escaping al gitation, small portions of water till it bed to l , wit turbidity, then filter; mix the filtrate with 5 to 10 time its bulk of water, and wash the resulting precipitate thoroughly with cold water by decantation or on th
llter. The addition of a small quantity of water an itration before the complete precipitation is nece ary, in order to remove a small quantity of hydroge ulphide, which always remains in the acid liquid, bu is carried down by the first portions of oxychloride pre
cipitated and thereby removed; if allowed to remain, it
(21) A Reader writes: 1. I have two ligh ellow straw hats I wish to dye, one brown and the prpose, and will the hats be as glossy as news The Diamond dyes are not satisfactory for the purpose mmerse in a weak solution of hydrochloric acid to fly he color. For dark blue use a strong extract of indig. The gloss is produced by varnishing with shellac. 2
Ho $w$ ad where are plant bulbs obtaineds A. Of agrily and seed store
(22) J. T. W. writes; 1. Will the cure ormula, or receipt for removing pimples and blackuestion 8 injure the skin? A. It is not injurious uestion 8, injure the skin? A. It is not injurious. 2 ake agood color, and not tarnish, and how should it be melted? A. Oroide gold is made by taking 100 part of pure copper, 17 of pure tin, 6 of magnesia, 9 of tar tar of commerce, 3.6 of sal ammoniac, and 1.6 parts of
unslaked lime. The copper is first melted, and the her substances (except the tin) added, a little at me, and the whole well stirred for 30 minutes, so as in and stirred round until melted. The crucible is the covered and the fusion kept up for 25 minutes, and th cum taken off, when the substance is ready.
(23) H. M. writes: I am told that rease is or can be made from "dead oil," a residue rom distillation of coal tar, by some process of using lime with it. Can you give me any light on the sub-
ject? A. Axle grease is produced by a combination or variety of saponification between lime and resin; this ields a mixture too hard for use, and consequently iti hinned by means of dead oil, and thus made pliable of the resin oil, and a sufflient quantity of the dead oil is added. The latter is generally mixed with a little me and water first, and thengradually mixed with th resin oil, small portions being used at a time, and the mixing continued until the proper consistency
(24) M. H. F. asks as to a few method used in making mucilage. A. A good mucilage for
labels is made by macerating 5 parts good glue in 18 to 20 parte water for a day, and to the liquid add 9 part ock candy and 3 parts gum arabic. The mixture can the article on Cements, in Scientifio American Sup PLEMENT, No. 158.
(25) C. C. B. asks how to tin small articles, and the price of the material used. A. The "small washed in soda or potash water to free from oil, stirred in a bath of muriatic acid, in which scrap zinc has been dissolved, the acid being then drawn off and diluted with water so as to be only slightly acidulous to the
taste. Skim the articles from the acid bath, and throw taste. Skim the articles from the acid bath, and throw them in!o a box of powdered resin. Then throw the seconds, lift them out with a skimmer, and throw them against a screen of ateet iron to free them from super abundant tin. Good black "straits" or "Banca" costs about 22 cents a pound by the pig
(26) E. S. K. asks the best way of laying reet railroad on an improved roadway. Have abou count of its spreading. A. The practice here for stree railroads is to use ties with striptgers, all sawed timber with kuees of cast iron spiked to tie and stringer in
side and oatside of stringer. It is not necessary to
at each end; or if the stringers are sawed to a gauge
size, the ties may be notched to receive the stringers and a locust pin driven through stringer and tie.
(27) C. L. H. asks how to construct a sp ear pattern, proportion 6 to 1 , large gear 36 inch iameter, pinion 6 inches diameter; these gears to be roportioned so as to stand the strain of one engine per minute 350 . How large boiler should two steam cylinders have-6x8, revolutions per minute 300 , exhaust into the stack? A. For a pinion upon the shaft of the engine, make pinion 7 inches dianeter, pitch line inches diameter, bottom of teeth 47/8 inches diameter, han space betwen phe teeth, width of pinion 3 ince multiply by 6 for number of teeth and diameter pitch line for large wheel; other sizes same as for pinion. For further details we refer you to a smal work, "A Practical Treatise on the Teeth of Wbeels." (28) A. M wh
(28) A. M. writes: How or in what form can ate, dissolved in water cold or hot, and has it to be employed in connection with other ingredients? What proportion tothe fiour? A. By consulting the article by Dr. Graham on "The Chemistry of Bread Making,"
in Solentifo American Supplement, No. 222, you will get at the whole theory of raising bread by means of carbonic acid. The ammonium carbonate is
(29) H. J. asks (1) the shortest diameter of ailroad curves. A. $400^{\prime}$ radius on main tracks; 200
adius for terminals - not much used. 2. The largest possible difference of level or two coupled cars? A.
About 1 foot with special links; a few inches only with ommon links or couplings. 3. The maximal com pression of huffer springs? A. Spiral springs may be
compressed till the wires touch; rubber eprings vary compressed till the wires to
widely, according to quality.
(30) G. S. S. asks if there is a tool made or cutting tubes out of a boiler; if not, what kind of a hisel is best to use? size of tubes, 3 inches outsid iameter. A. Ir the tubes can be dropped to the han n ordinary thin cold chisel throng the Drop the tube, and pull out at the hand hole. Compre the expanded end of the short end in the head, with calking tool or blunt chisel, and drive it in. If a tube
is to be taken out through the tube hole in the head, he end may be compressed with a blunt chisel appli ed round the end of the tube, and with a narrow cape chisel carefully cut a groove; or in other words, slit the nd of the tube in 30 r 4 places, when it will easily com
press under the blunt tool so as to allow of its being driven out of its bearing at the other end of the boiler,
(31) J. W. F. says: I am dredging in salt arsh and have to boat my fresh waterfor boilera lon istance. What is the best form of condenser to con 25 horse power boiler? A. We understand you wis save the exhaust steam from your dredging engine, which for your 25 horse power boiler will probably use 00 gallons fresh water per hour. For the condensatio called in the pipe trade a pedestal coil, which may be ade of 1 inch pipe branching from w header of caliber equal to the exhaust pipe, with enough pipe rom the header to also equal the exhaust pipe are ipes wide, 6 pipes high, feet of 1 inch pipe, or 1 oil in a ta, ppes high, and 7 feet long. Place the ank by means of a pump.
(32) A. B. says: Replying to a correspond nt in your Notes and Queries of a recent number, you flled with pure hydrogen, to be 12 feet in diamete stimating on that basis, I find the size required to lit 500 pounds to be 21 feet in diameter, and given the
weight of the materials, oiled silk, cords, netting baskets, etc., at 150 pounds, two passengers 350 pounds 500. 1. Am I approximately correct? A. Yes. uitable receptacle with a hand pump when I wish to escend, instead of allowing it to escape, and allow expand into the balloon again when $I$ wish to rise weight of pupg with ballast? A. We think nol. Th probably be found an insuperable objection. 3 Coul the entire contents of the balloon be condensed whe the ascent is finished, and stored for future use? A. Yes, but would cost more than the gas is worth.
How much time would it be necessary to occupy in condensing the contents to avoid excessive heat in the reservoir, and excessive cold when expanding? A. Thi depends upon the size of the pump and power used as
well as the time. It is very slow and tedious work by and power. 5. What is the best material for confin ng hydrogen under pressure? A. The best materia or confling the gas is iron in cylinders. Answer on page 43, Joly 19, 1884, is correct; a balloon is not diameter. The rule for lifting power of a balloon is so found in Haswell, page 218, new edition.
(33) C. L. desires to know (1) if there is any olace in New York city where I could receive instruction . There is no place where electrical engineerin taught in New York. 2. Also is bee farming is ay with moderate capital? A. Bee farming in Cal ay with moderate capitals A. Bee farming in Calt Helen Hunt gives a favorable account of it on page 81 of the Century Magazine for October, 1883, ander the title of "Out Door Industries in Southern California. Success depends upon the individual. The outlay nee
(34) H. H. asks how much power and how arge a boiler it would take to run a skiff 15 feet long, veigh about 300 pounds wilhout machinery. and then ravel about 8 miles an hour. A. Kngine $2 / 8$ inches
cylinder and 4 inches stroke. Propeiler 16 inches to 18
acbes diameter, and 26 inches to 28 inches pitch. Boiler (35) G. B. S. asks: Will you kindly inform what quantity of liquid slate it requires to make a black board four feet high by sizty feet long, and how lating, to which we presume you refer is sold in condiion to be applied by the brush,and 1 gallon of the paint sufflient for 2 square yards.
Minerals, etc.-Specimens have been received from the following correspondents, and examined, with the results stated
Q. \& Co.-Bole is a fine, compact, argillaceous earthy Qineral which occurs in amorphous masses of various
colore, as yellow, black, brown, and bright red, all lors, as yellow, black, brown, and bright red, all robably disintegrated basalt. The expression is quite poosely applied, and the substance used by the North merican Indians to make their pipes from was designated as bole. For the putz pomade any soft, fine

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