

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

| Vol. LVIII.-No. No. 22.] | NEW •YORK, JUNE 2, 1888. | \$3.00 per Year. |
| :---: | :---: | :---: |



1. General View of Works. 2. Main Machine Shop. 3. Flanging Department. 4. Gorton Heater Shop. 5. Blacksmith Shop. 6. Boiler Shop. 7. Erecting Shop.

THE LIDGERWOOD MANUFACTURING COMPANY, NEW YORK-HOISTING ENGINES AND BOILERS-GORTON HEATERS.-[See page 341.]

## §rieutific ${ }^{\text {s.mmericam. }}$

ESTABLISHED 1845.

MUNN \& CO., Editors and Proprietors. PUBLISHED WEEKLY AT

## No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERIS FOR THE SCIENTIPIC AMERICAN.

 MUNN \& CO., 361 Broadwa

The Scientific American Supplement

 Wiomblined Rates.-The SCIENTIFIC AMLRICAN and SUPPLEMENT
will senfor one year, to any address in U. S. or Canada, on receipt of The safest way to remit is by draft, postal order, express money order, or Australia and New Zealand.-The Scientipic AmericAN and
SOPCEMENT will be ent for a little over one year on recelpt of eiz cur-
rent Colonial bank notes. rent Colonial wank notes.
Address MUNN \& Co., 361 Brosdway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JUNE $2,1888$.

Contents.


TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT
INO. 648.

## For the Week Ending June 2, 1888.

Price 10 cents. For eale by all newedealers
 I. ASTRONOMY.-Channes in the Stellar Heanens. By J. .E.GORE,


IV. CHEMISTRT.--POison of the Somalile extracted from the Wood of the ouabaio. V. ClVIVI ENGINERRNGO.-Tent of of Wrouht Iron Doublo Track

VI. ELECTRICTTY-Efiect of Chiorine on the Electro-motive Force



 The Application of Electrieity tw Likhiting and workiing:-By
${ }^{\text {VI }}$ WNTMOLOGY.-Systematic. Relations of Platypglius as de tribution to.entomological science, A paper read at the meetiog of
ViI. HYGIENE.-Reducing Obesity.-Note or general principles to

. MECHANICAL ENGINEERING.-Hydraulic Tube Press.-An


x. PHOTOGRAPHY.-Colored Photography.-Mr. J. E.MAYALL's






## position of the planets in Jone.

 MERCURTis evening star. He reaches his greatest eastern elongation from the sun on the 12 th , at $3 \mathrm{~h} . \mathrm{P} . \mathrm{M}$. , and on that evening, and for a week before and after, is visible to the naked eye under the most favorable conditions that occur during the year. He sets nearly two hours after the sun on the 12th, and must then be looked for three-quarters of an hour after sunset in the northwest, forming a triangle with Pollux and Procyon. An opera-glass will aid the observation. Mercury sets on the 1 st at $9 \mathrm{~h} .8 \mathrm{~m} . \mathrm{P} . \mathrm{M} . \quad$ On the 30 th he sets at 8 h .1 m. P. M. His diameter on the 1st is $\hat{6}^{\prime \prime} .6$, and he is in the constellation Gemini

## JUPITER

is evening star. He will lead the heavenly host during the month of June, being beautiful to behold as he makes his way across the sky. He is still retrograding or moving west ward, as observers may see who note the increasing distance between him and Beta Scorpii, the star he seemed almost to touch in May. Jupiter sets on the 1 st at $3 \mathrm{~h} .51 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 30 th he sets at 1 h. 47 m. A. M. His diameter on the 1st is $43^{\prime \prime} .2$, and he is in the constellation Scorpio.

## MARS

is evening star. He has now changed his course, is traveling eastward, or in a direct course, and will con tinue to do so until the end of the year. He passes near Uranus for the third time since the year commenced The conjunction takes place on the 6th, at midnight, Mars being 47 ' south of Uranus. Mars sets on the 181 at $1 \mathrm{~h} .41 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 30 th he sets at $0 \mathrm{~h} .2 \mathrm{~m} . \mathrm{A}$. M. His diameter on the 1 st is $13^{\prime \prime} .2$, and he is in the constellation Virgo.

## URANUS

is evening star. He is chiefly interesting for his third and last meeting with Mars on the 6th. The two plan ets will not be in conjunction again until Mars has com pleted another revolution and returned once more to the neighborhood of his brother planet. Uranus sets on the 1st at $1 \mathrm{~h} .46 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 30 th he sets at 11 h. 52 m. P. M. The diameter of Uranus on the 1st is $3^{\prime \prime} .8$, and he is in the constellation Virgo.

## SATURN

is evening star. He is moving eastward, and will pass Praesepe during the month, grazing the cluster in his passage. His light grows dim as he approaches the sun the west, east of Pollux and Procyon. Saturn sets on the 1st at $10 \mathrm{~h} .51 \mathrm{~m} . \mathrm{P}$. M. On the 30 th he sets at 9 h . 8 m . P. M. His diameter on the 1 st is $16^{\prime \prime}$, and he is in the constellation Cancer.

## VENUS

is morning star. She rises on the 1st only 32 m . before the sun, 'and is of course hidden in his rays. Venus rises on the 1st at 3 h .53 m . A. M. On the 30 th she rises at 4 h .15 m. A. M. Her diameter on the 1st is $10^{\prime \prime}$, and she is in the constellation Taurus.

## NEPTUNE

is morning star. He is near Venus on the morning of the 1st. Neptune rises on the 1 st at $3 \mathrm{~h} .54 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 30th he rises at $2 \mathrm{~h} .3 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. His diameter on the 1st is $2^{\prime \prime} .5$, and he is in the constellation Taurus.
Mercury, Saturn, Uranus, Mars, and Jupiter are eve ning stars at the close of the month. Venus and Neptune are morning stars.

## The Kansas Clty Elevated Railroad.

Mr. George H. Pegram; the engineer who designed the above structure, writing to the Railroad Gazette, says:
The road was built in the summer of 1886. Coming 10 years after the New York roads, the structure might naturally be expected to embody some improvements, and it is believed that it does.
The material is steel, used at stresses ordinarily allowed in iron, which gives it a large reserve strength. The standard span is 48 feet (about 20 per cent longer than in New York)
The main feature of the structure is the absence of cross ties. Each rail is supported in a steel trough formed of two channels, connected together with bent plates near the bottom at short intervals in the length. Upon these plates rest wooden blocks $11 / 2$ inches thick, and upon these the rail, confined by bolts passing through the blocks and tie plates. The blocks may be replaced from below without removing the rail. The wood is used only as a cushion, the amount in an entire span being but little more than is contained in one cross tie of the New York roads.
The trough carrying the rail forms the top chord of the longitudinal truss, which has an eyebar bottom chord and triangular web bracing, all connected with large pins, or in order to avoid secondary strains and to prevent wear
The troughs are stiffened and braced laterally by angle iron diagonals riveted between them.
There is the minimum obstruction to light, through the disuse of cross ties, and the tunnel-like appearance
of the street under the structure is avoided. At the same time the greatest'safety is insured. The wheels same time the greatest safety is insured. The wheels
being in troughs are prevented from leaving the rails, and in the event of a broken axle the truck drops on what is in effect a pair of steel skids.
As was predicted, on account of the small amount of wood used and general character of the structure, the passage of trains is accompanied with very little noise.

## Cholera on the Pacific Coast.

The recurrence of cholera in Chili will surprise no one who is acquainted with the nature of many of the South Americancities and towns, and with the attitude of the Chilian and neighboring governments last year in imposing quarantine restrictions instead of commencing works of real sanitary improvement. During the three months ending March 17, the disease, which had been lying comparatively dormant during the cold season, broke out again, and led to a terrible mortality The number of cases announced from official sources during the preceding twelve weèks amounted to 3,338 , and of these 1,357 terminated fatally. But these statistics afford no true indication of the extent of the disease, and Dr. Gacitua has reported that between December 25, 1887, and March 3, last, there cannot have been many less than 5,000 cholera deaths in Val paraiso. No real abatement of the epidemic can under existing circumstances be expected until the advent of his year's cold season.-Lancet.
Nothing could be easier than transportation of this contagion from Chili to Panama, and thence to New Orleans, New York, and California. We hear of no precautions as yet taken.

## Wood Fiber for Paper.

The extent of the manufacture of ground and chemical wood fiber for paper makers' use is not appreciated by those who have not investigated this industry. Certainly the Democratic members of the ways and means committee who have put this manufactured product on the free list, in the face of the fact that the duty now is only 10 per cent-less than it ought to be to protect the industry from Canadian and Norwegian competition-could not have fully understood the justice of such a step.
From a statement presented to the House by Congressman Dingley, it appears that wood fiber is manufactured in 21 States. The capital employed is about $\$ 20,000,000$, number of men employed 22,000 , tons of fiber made 225,000 ground wood and 112,500 chemical wood, value $\$ 12,375,000$, cost of wood on the stump $\$ 1,235,000$, and the remainder of the cost largely abor
In Maine alone there are 84,000 pounds of ground rood fiber and 188,000 pounds of chemical wood fiber made daily. The ground wood fiber is made as follows

| gi | .10,000 |
| :---: | :---: |
| Indurated Fiber Co., North Gorham. | 12,000 |
| Alvin Record \& Sons, Livermore Falls. | 10,000 |
| W. R. Shurtleff \& Co., Skowhegan. | 4,000 |
| J. S. Clapp, Snow Falls. | 4,000 |
| Sebago Co., Sonth Windham | 18,000 |
| Kennebec Fiber Co., Waterville | 20,000 |
| Total | 84,000 |

The daily production of chemical wood fiber in Maine is as follows:

| Poland Pulp and Paper Co., Canton | 0,000 |
| :---: | :---: |
| Somerset Fiber Co., Fairfield. | 20,000 |
| Penobscot Chemical Fiber Co., West Great Works. | 40,000 |
| Lincoln Pulp and Paper CO., Lincoln. | 14,000 |
| S. D. Warren \& Co., Cumberland. | 40,000 |
| S. D. Warren \& Co., Yarmouthville... | 40,000 |
| Poland Pulp and Paper Co., Mechanic Falls. | 14,000 |
| Total |  |

The production and use of mechanical wood fiber began about 1868, and within a few years has rapidly in creased. All the patents have expired except those on a recent process known as sulphite. The fiber has been greatly reduced in value, ground wood now bringing only $11 / 4$ cents per pound, and chemical $31 / 2$ cents. The cost of paper has been reduced from nine cents before the war to about $41 / 2$ cents, in consequence of the development of the manufacture of wood fiber.
Before 1883, the duty on imported wood fiber, which is made in Canada, Norway, Sweden, and Finland, as well as in this country, was 20 per cent. In 1883 the duty was reduced to 10 per cent, and since that date foreign competition has increased. In 1886 there were imported 18,000 tons, in 1887 the importations were 32,000 tons, and this year about 53,000 tons will be imported. If wood fiber should be placed on the free list, as proposed by the Mills bill, our wood pulp mills would be speedily swamped by Canadian and Norwegian competition, as the labor costs only half as much in those countries.-Lewiston Journal.

## The Sun an Incendiary.

The Chemist and.Druggist (London) records the fact of a chemist shop just opened, at 16 High Street, with show bottles in the windows, which, acting as a burning glass, set fire to the store. It was discovered before much damage was done, but serves as another warning against placing show bottles where the sun can reach them in show windows.

## Modern Fortifications.

The London Times, in a recent article on metallic ortifications, says:
The plan of fortresses at present adopted-unknown to the public, but the divulging of which can do no harm, as it cannot remain secret-is very peculiar and quite opposed to any æsthetic or artistic conception. A fortress is henceforth composed of an immense block of concrete of incredible thickness. It will offer to the eye only a square, oval, or lozenge shape, the outside eye only a square, oval, or lozenge shape, the outside
being a mere block without projections or access. It is being a mere block without projections or access. It is by a trench, but all competent authorities in Europe seem to hold that one or several sheeted cannon shall move round the block, and as powder will in future be smokeless, this cannon, always in motion and escaping the enemy's aim, will fire on a tixed point. This movable sheeting will make up for the absence of trenches. At the angles of the block, moreover, if square, or elsewhere if it is round or oval, there will be sheeted reducts, which will cover the base of the block and make assault impossible. Of course the interior of the block will contain the equipments of a fortress. The entrance is underground, on the side opposite that where the enemy can appear. There will be air openings in the interior, which is lit up by electricity produced on the spot or at a distance. The magazine of duced on the spot or at a distance. The magazine of
projectiles is in a spot inaccessible to explosions caused projectiles is in a spot inaccessible to explosions caused
by shells coming from without. The stores of other ammunition and of victuals are similarly protected. The hiding places for the men, and, in short, everything that has to be under shelter, are underground, and so placed as to be quite protected from the besiegers. Electric wires, both for messages and light, as also telephones, beyond the reach of the besiegers, protect the fortress against isolation-that is to say, against abandonment and discouragement. The underground existence of the garrison may not be very lively, and it will be well to accustom as many men as possible to it; but that garrison will not exceed thirty or forty men per fortress.
A foftress thus equipped for resisting the enemy's attack and fire of course requires special means of repelling the enemy, preventing him passing, and doing him all possible mischief. These means are the plated turrets which form the second portion of the experiments at Chalons. The fortress will in general have two steel turrets, one on each side, which by their circular motion can fire in all directions. The frontier fortresses will be so arranged that their fires meet, which is easy with the wonderful range of modern cannon.

The turrets of Saint Chamont and of the Chatillon and Commentry company have just been undergoing artillery flre. The first part of the experiments was the firing from these turrets. The second consists in their being cannonaded and shelled. The Saint Chamont turrets are real turrets of cylindrical shape, with a rounded top, which gives no hold for projectiles. The Chatillon and Commentry turrets, projectiles. The Chatillon and Commentry turrets, while of cylindrical shape, are but slightly rounded
at the top, the surface of about six or seven square meters being slightly convex, but nearly flat, thus giving more hold to projectiles if they are supposed not to burst immediately on contact with the cupola. The Saint Chamont turrets project 90 or 95 centimeters from the surface of the block fortress, and are thus visible to the enemy. They can be only equipped, morever, on account of the shape of their cupola, by cannon of 155 millimeters, styled "cannons 155 short," whereas cannons " 155 long," which measure 4.40 meters, project 40 centimeters from the turret during three quarters of the time required by the rotatory movement-that is to say, during 45 to 90 seconds for each discharge. Both the Saint showing their port holes and cannons only at the very moment of discharge. The aim is no longer taken after ocular examination, but each fortress has a plan of its entire range of ofre, cut into divisions as numerous as is possible for the working of the cannon. The officer in command of the fire is stationed in an observatory inside, outside, or even, if necessary or possible, at a great distance from the fortress. He telephones to the officer inside the turret the numbered point on the plan from which the firing is to proceed. This order is transmitted to the pointer, and the cannon being placed on the point, the rotation begins. This movement to the point aimed at produces an electric shock, which makes the gun go off, while the turret continues to rotate, is again charged, and, altering its aim or not, begins a fresh fire.
The Chatillon company has made an important change in the arrangements of the turrets by adding to the rotatory movement an eclipse movement. In other words, the turret not only turns on itself, but by a counterpoise mechanism of extreme simplicity it drops down after firing. It does not then project above the ground more than fifteen centimeters, and can be easily disguised. It offers no hold on the sides, but only on the cupola, which is flatter than the Saint
Chamont one. As to accuracy of fire, the general opin-
ion, confirmed by the recent experiments, is that the eclipse turret is twice as accurate as the merely rotatory turret. With the latter the fire is never fixed, seeing that to conceal the cannons from the enemy the turret is forced to continue its movement and to come back to the point of contact where electricity causes the dis charge, whereas the eclipse turret, while rotative so as to fire in all directions, disappears after firing and reappears after being charged without rotatory move ment-that is to say, with the precision of fixed firing. If, for instance, the electric contact during the rotatory movement has the slightest delay, the ball deviates, imperceptibly, it is true, at the starting point, but the deviation becomes comparatively considerable at the arrival point on account of the great distance. The eclipse turrets, moreover, are made of steel cast in a peculiar way, so as to be cheaper, more malleable and consequently quite as resisting as other steel, be ing at the .cupola fifty centimeters thick. The total weight of a steel turret is 120 to 190 tons, and it can fire every minute or every two minu

## Utilizing Niagara.

There have been so many false alarms about utilizing the wasted water power of Niagara Falls that one hesitates to accept rumors of new propositions as likely to be carried out. The latest one which appears to have any backing, though not altogether an original idea, is to tap the Niagara River at some distance above the falls by means of a tunnel driven along the side of the river. The water would be distributed by means of lateral underground conduits to turbines placed on the bank below the falls. These could give power direct to mills, factories, etc., and by electrical transmission, furnish light and power to Buffalo and neighboring towns. It is claimed that by adoptíng this system the scenery will not be disfigured, and that the amount of water drawn off will not appreciably lessen the quantity flowing over the falls. It has always been a source of wonder to those who have studied the ground that some plan has not long ago been adopted which would meet the engineering requirements without impairing the grandeur of Niagara. The first attempts were certainly not in the right line, the small power taken off by the paper mills, etc., being accompanied by a disproportionate injury.
Niagara is not to be measured by hundreds of thousands of horse power and millions of money, it is true; but the visitor's first impression is a vivid realization of the amount of waste perpetually going on, which might be avoided. The State and the country can afford to pay a good deal to keep up the show, but surely there is margin enough, without reducing Niagara to the condition of some of the smaller falls, where the water is turned on from a dam for the gratification of tourists who can afford the luxury.
Electrical transmission of power, which was thought not many years ago to be a mere dream of the cranks, is now shown to be of practical, economical utility. It has been adopted successfully in so many places and under such different conditions that it is reasonable to forecast a great future for it. So far as is known at present, it is the most promising mode of utilizing the
natural forces, such as winds, currents, tides, and terrestrial electricity. - Eng. and Min.Jour.

## Restoration of Faded Photographs.

The family album upon the drawing room table is a never-failing subject of interest to visitors, and among individuals who lack original ideas forms an agreeable subject of conversation in place of that of the weather. Of late years, however, there is more diffidence in placing it in prominent positions for the ready examination of waiting friends, the sad-colored pictures of "the hue of a November fog in Cheapside, or a bad piece of gingerbread spoiled in the baking," being at variance with average ideas of artistic elegance. A more serious aspect of the case is gradual discoloration or fading of the likenesses of members of the family who have passed away by death, raising the question in the minds of survivors what is to be done to preserve those lineaments for inspection, ere it be too late.
When the white parts of an ordinary photograph begin to turn yellow, that photograph is doomed unless immediate efforts be made to preserve it, and those efforts may not al ways be successful. Treatment with a weak solution of bichloride of mercury, under the hands of a skillful photographic practitioner, is one of the best methods of making the attempt. This may arrest decay, but will not restore the likeness to the condition of a first-rate photograph. Bichloride of mercury or corrosive sublimate is highly poisonous, and is best left alone by the uninitiated.
A better way of preserving the memento is to send the photograph to a platinum printing or carbon printing firm of photographers in a sufficiently large way of business to keep upon their premises artists skilled in the use of the brush and pencil. Their usual plan then is to obtain upon glass or paper an enlarged positive copy of the fading photograph. This copy is "retouched," that is to say, worked upon by hand, so
as to remove obvious defects due to decay or to orig-
inal bad work; a negative is taken from the perfected positive, and from this negative any number of copies may be printed by photographic means in permanent carbon pigments or in platinum black. To obtain the positive already mentioned, a primary negative has to be taken, so that two negatives are necessitated by the process, both of which, as well as the positive, are usually worked upon somewhat by the hand of the artist ; the method of getting a good permanent photograph from a bad fading one is, therefore, complicated and requires skill.
In the carbon process, carbon or other suitable per manent pigment is spread upon paper or glass along with solution of gelatine and of bichromate of potash or ammonia. Where the light acts upon this surface through the negative, the decomposition of the salt renders the gelatine insoluble; consequently, when the paper is afterward placed in warm water, the gelatine unacted upon by light dissolves off in company with its pigment, thus leaving the white paper exposed; but where the light has acted, the gelatine and pigment remain to form the shadows of the picture. These are the broad principles of the process, omitting various practical details which it would exceed present limits o particularize.
The other permanent process, in which the dark parts of the picture are formed of platinum black, gives the most durable pictures known, platinum being a metal which has more power than gold of resist ing change under atmospheric and other influences indeed, platinum black is infinitely more permanent than the paper upon which it is printed. In some cases, either from badly prepared sensitized paper or from faults in the photographic manipulations, pla tinum prints have been known to turn yellow in the whites under the influence of sulphureted hydrogen such discoloration has sometimes been subsequently emoved by the application of chemical reagents, with out the dark parts of the paper having been affected all through the operation.
There are methods of taking photographs in silver which have exactly the appearance of platinotypes, so that an expert cannot always tell the difference without the application of chemical tests; these black and engraving-like silver prints are in all probability much more permanent than the ordinary photographs used for.the stocking of albums.-Chambers's Journal.

## Be Inventive.

There are few expressions we hear more frequently han that feeble wail of the cowardly or lazy mind "I can't!" Every day we see people who permit their progress to be stopped by trifles which, instead of retarding them, should spur every faculty up to the resistive, conquering point. "I can't" and "I forgot" are two fatal phrases which should be scratched from the vocabulary of every young man or woman who is ambitious of being or doing anything in this world that shall deserve to be recorded.
Be inventive. Cultivate the creative side of your brain. Don't be stumped. When you seem to be cornered is the very moment to stir yourself and devise some way of making things work.
The Chicago Herald, a little while ago, printed some The Chicago Herald, a little while ago, printed some
remarks of a drummer descriptive of a certain Yankee's ingenuity, which are pertinent to our present theme:
"Talking about ingenuity," said the drummer, "I want to tell you what I saw last winter out West. I was on a train that was snowed in for three days. The company sent us food, but they didn't send any cigars, and the train boy's stock was exhausted the first day. In the express car we found and confiscated a box of smoking tobacco, but there wasn't a pipe on the train. Among the passengers was a Connecticut Yankee who was just dying for a smoke. He got out in the snow and looked around for a weed, or something of that sort, which he might use in making a pipe, but couldn't find a thing. 'I'm going to have a pipe, anyhow,' he said. So he took a lead pencil, opened the wood, took out the lead, and, placing the two strips together again, wound them tightly with two strips together again, wound them tightly with
the tin foil which came off the packages of smoking tobacco, making them air-tight. Then he took an apple, hollowed a bowl out of it, stuck his lead pencil stem into it, and had one of the nicest pipes you ever saw. If you don't believe it, make one for yourself some time and try."
This was a common trick in the army, when we could get neither reeds nor corn cobs, and sweet pipes they made in every sense. When apples were unobtainable, which was not seldom, we fell back upon potatoes.Amer. Art Printer.

## A New and Powerfal Gun.

General Maitland, of the Ordnance Department of the War Office, speaking at the annual dinner of the foremen engineers, held in the Cannon Street Hotel recently, said he had just designed a gun of 22 tons, on Mr. Longridge's wire principle, which had recently been fired at Shoeburyness, the projectile being 380 lb., the range 21,000 yards, or twelve miles, and
the velocity 360 feet per second.
W. L. Wilder imparts to the readers of Science the following, which he states to be a fact not generally known, which we can readily believe, i. e., that, if one holds his breath, wasps, bees, and hornets can be han-

## russian mountains at paris.

The Russian mountains, which were formerly the delight of our fathers in the Beaujon and Delta Gar dens, and in a large number of public places at Paris, disappeared in consequence of some serious accidents
cient affairs, and we reproduce them herewith. Fig. 1 gives a general view of the Russian mountains in the Beaujon Garden. The inclined plane in the center allowed the travelers to ascend to the upper starting pavilion. The vehicles were drawn up this slope by cables. The cables were actuated by a horse whim On reaching the upper pavilion, the travelers descended undulating slides to the right and left, which were about 1,300 feet in length.
The Russian mountains of this garden had imitators, and there soon appeared the Egyptian mountains of the Delta Garden, and the "Niagara Falls" of the Ruggieri Garden (Fig. 2). In this last installation, the starting kiosks were reached by an easy slope, and the passenger got into a small sled that seated but two persons. This sled slid down a very firm wooden in clined plane, and traveled about 160 feet in six seconds We may now just as well say a few words regarding the origin of this sport, which has always succeeded in amusing the public.
Russian mountains are very ancient, and, as their name indicates, were first used in Russia. Precise historical ducuments seem to be rare and little known. In Fig. 3 we reproduce an old colored lithograph, and it is the only picture that we have been able to procure. It was made from an original drawing by Sauerweid It is accompanied with the following text, which per fectly explains the organization and operation of the Russian ruountains on the Neva:
"O On the frozen surface of the Neva there are constructed two frames 40 or 50 feet in height, and 800 or 900 feet distant from each other, and inclined toward each other by a rapid slope of $55^{\circ}$, but not exactly op posite, in order that the descending sleds may not meet. Each descent is soon converted into a mountain of ice by the torrents of water that are poured on to it, or by the blocks of ice that are placed one after another over its entire length. The sled descends with fearful rapidity, and, with the same speed, traverses the level space between the two structures. This exercise is the principal amusement of the Russians dur ing winter."
It will be seen that these Russian mountains were


Fig. 2-THE FALLS OF NIAGARA OF THE RUGGIERI GARDEN (1824).

In a preceding article, we gave a resume of the history of Russian wountains at Paris, and described the great installation at the Beaujon Garden, which was wonderfully successful in 1817 and for many years after. Since the publication of that article, we have been enabled to procure some new and interesting engravings of the time, that give a more complete idea of these an-

* The Algonkin Indian name for a sled.


Fig. 3.-RUSSIAN MOUNTAINS IN RUSSIA.
formed of a simple inclined plane covered with ice Small sleds, seating one person, slid down these, and the speed acquired naturally slackened on the horizontal surface of the frozen river. The Russian mountains of the Beaujon Garden consisted of an undulating slideway in which there were ascents succeeded by rapid descents. The "Niagara Falls" had more resemblance to the genuine Russian mountains, but the vehicles, instead of being sleds, were cars mounted upon wheels that revolved in hollow rails. Such are the characters that distinguish the different systems of Russian mountains formerly constructed. We now come to the new installation of the Boulevard des Capucines, which has permitted us to recall these old souvenirs of the past. The organizer of these Russian mountains has dispensed with the wide spaces used by our fathers in the spacious gardens that existed in the center of Paris, and has had recourse .to a court left free between two houses. A roof 275 feet in length protects the plant, which, at night, is very brilliantly illuminated by the electric light. The cars are provived with five benches, each seating two persons. The entire car therefore holds ten passengers. It runs, through wheels, over metallic rails provided with guard rails that render derailment impossible. The car travels with great speed down the undulating declivity, and rises and descends in succession, as shown in Fig. 4. The space passed over is about 260 feet. On reaching the end of the route, the passengers alight, and a gang of men pulls the car on to a turntable and directs it to the return track. Then the passengers resume their places and return to the starting point. The trip from one end to the other does not take more than twelve seconds, as has been ascertained by a
chronometer. This style of Russian mountain differs secure fastening, is illustrated herewith, and has been from those that have hitherto been operated. It is due patented by Mr. Henry E. Hathawaý, of Merrill, Wis. to an English builder, Mr. Thompson, who has put up One of the bars has a guiding clasp to embrace the numerous specimens in various countries.-La Nature.

## an improved block signal.

A block signal system, so arranged that a train entering a section of track will set a signal at the end of the section toward which it is movtion to ward which it is mov-
ing to "danger," and set to ing to "danger," and set to
"safety" a similar signal, by the same movement, on the section it is leaving, has been patented by Mr. George W. Peterson, of Leonardville, Kan., and is illustrated herewith. In connection with posts arranged at suitable disposts arranged at suitable dis-
tances apart at the side of the track, spring levers are mounted in alignment carrying signal disks, the posts carrying lights, and the tendency of the springs being to throw the signal disks out of line the signal lisks out of the lights toward the with the lights toward the
track. The lower ends of the track. The lower ends of the
levers extend downward into cases, near the foot of the post, whence they are connected by double crank bars, links, other levers, and tripping bars, with wires extending through tubes secured to the ties midway between the tracks, the posts and signal disk levers at each end of a block or section being thus connected together. The engine is provided with an overhanging arm on its left side, mounted in such position that it will strike against and depress the tripping bar connected with this signal disk lever moving mechanism, thus closing or setting to safety the signal for the section of track it is passing from, and setting to danger tion of track it is passing from, and setting to danger
the signal at the farther end of the block the train is just entering, to warn the engineer of a train approach-


## PETERSON'S BLOCK SIGNAL.

ing in the opposite direction. Similar signals are ar ranged on the opposite side of the track for use by trains moving in the opposite direction, the connecting wires passing through the same tubes centrally between the trasks.

## AN IMPROVED CLAMP.

A clamp especially designed for use in foundries, for clamping flasks and moulds, and by carpenters and others, having a quick and easy adjustment, with a

hathaway's clamp.


Fig. 4.-RUSSIAN MOUNTAINS OF THE BOULEVARD DES CAPUCINES (1888).
edges of and slide freely on the other bar, which has at its inner end a slotted offset portion with outwardly projecting lug and inclined bearing face. A stud on an independent clasp embracing the other arm of the clamp passes through the slot, and on this stud is pivoted a cam which operates against the inclined bearing face of the lug at the extremity of the first arm. The cam has a handle for convenience in operating it, and the bars slide freely one upon the other when not set in use, the construction being such that when the jaws are adjusted or closed upon the parts to be clamped, the moving of the handle down will slightly draw the jaws of the clamps inwardly and firmly bind the bars one upon the other, preventing any longitudinal movement.

## Pumping Machinery.

In the course of a paper on this subject lately read at a meeting of the Association of Birmingham Students of the Institution of Civil Engineers, by Mr. F. W. Hewett, he said that one of the first contrivances for raising water by steam pressure-or, as it was stated at the time, for raising water by fire-was Captain Thomas Savey's patent, exhibited before the Royal Society in 1699, when Sir Isaac Newton was president. The valves were all worked by hand. A most important advance was made by Newcomen, who must have been contemporary
with Savey; but little was known of this gentleman except his invention. When James Watt's beam engine was invented, the conception of making the condenser apart from the steam cylinder and keeping the steam cylinder as hot as possible was he basis of its mechanical success. The energy of Bolton, his partner, soon brought this pumping engine into extensive use; and as the demand increased, so
the machine developed. The supremacy of the Cornish the machine developed. The supremacy of the Cornish
pumping engine had remained undisputed from the moment Watt perfected it; and it had scarcely been approached for deep drainage and working against a constant head of water. The velocity of the water through the valves of ordinary pumps should not exceed 4 feet in a second at the most, and the pumps should generally work well at 50 feet per minutebucket speed. The velocity of the water in the delivery pipes should be as consistent as possible.

## Curious Wants at Druggists' Connters.

The National Druggist gives the following amusing specimens as fair samples of every-day experience:
" Send me some of your essence to put people to sleep with when they cut their fingers off. I want something to take tobacco out of my mouth. Send me a baby's top to a nursing bottle. Something for a sore baby's eye. Enough ipecac to throw up a girl four years old. Enough anise seed to take the twist out of a dose of senna. Something for a woman with a bad cough and cannot cough. Something, I forget the name, but it is for a cure for a swelled woman's foot. For a man with a dry spit on him. For a woman whose appetite is a dry spit on
loose on her."
an Improved car coupling.
The invention illustrated herewith provides a coupling in which the link is held up and guided into the drawhead, while the coupling pin is held in position for automatic engagement therewith, and has been patented by Mr. William O. Rutledge, of Galveston, Texas. A side metallic casing is secured to the drawhead, in recessed portions in the forward part of which are guides for the depending arms of a $U$-shaped frame, having an aperture for the coupling pin in line with the opening in the drawhead, so that when the frame is dropped the pin will extend across the recess receiving the end of a link. The frame is held in elevated position by a spring catch on each casing, having its bent end projecting through a notch in the guide. Through slots in the front of the casing pass the legs of a $U$-shaped piece, whose crossbar extends over the front of the drawhead, the legs being connected to the casing by pins projecting through slots, and adapted to slide thereon, the forward portion of the legs being beveled so that the crossbar is
lowered as it is pushed back by a similar piece on the opposite drawhead, thereby guiding the link into position for engagement by the coupling pin. Upon the drawheads being brought together, the parts being in position as shown in the illustration, the piece with sliding arms, which guides the link into the right hand drawhead, will be pushed back by the similar piece on the other drawhead, when a lip or projection on the casing releases the spring catch, causing the pin-carry-


## RUTLEDGE'S CAR COUPLING.

ing frame to fall, and engagement with the coupling pin is effected. This inventor has also applied for a patent for an uncoupling device.

## AN IMPROVED POWDER AND SHOT CABINET.

An invention providing convenient means for handling powder and shot, in the form of a cabinet, in which a dealer may keep handily and separately the various articles generally called for, is illustrated herewith, and has been patented by Mr. Augustine La Point, of Wessington Springs, Dakota Ter. The cabinet has a lower compartment with a glass door, adapted to receive and display cartridges, gun caps, etc., and the upper compartment is divided by vertical partitions into eight or more lockers, one for each size of shot, which may be poured in through a properly capped opening at the top. The different sizes are indicated by numbers on glass sectionsin the front of each lacker, through which also the sizes may be seen. To withdraw the shot a


LA POINT'S POWDER AND SHOT CABINET.
tube, as shown in Fig. 2, is inserted in the bottom of and projects from the front of each locker, the tube having its outer end sealed and an aperture in its under side, a cylindrical casing being slid over the tube and turning readily thereon, such casing having at its outer end an aperture corresponding with the aperture in the tube. This casing is revolved by a disk with milled periphery, and permits the shot to escape when it is turned so that the apertures are in register. A powder can is pivoted between brackets on the top of the case, the can having an aperture with screw cap for admitting the powder, and a spout from which the powder is poured as the can is tilted.

## AN IMPROVED RAILWAY RAIL PAD.

A device intended to lessen the noise made by railway trains,pprolong the life of the rolling steck, and reduce the wear upon bridges and trestle work, is illustrated herewith, and has been patented by Messrs. H. J. Fackenthall and Lewis Wallace, of No. 761 North Thirty-ninth Street, Philadelphia, Pa. It consists of an elastic pad, A, preferably of rubber, of the width of the rail, B, at its base, and of a length equal to the width of the tie, C . Its upper longitudinal edges, $D$, are beveled, and the portion intervening is concaved in cross section, as shown at $E$, while it has a central rib, $F$, the highest points of which are in alignment with the outer longitudinal edges of the pad. This pad not only forms a


FACKENTHALL \& WALLACE'S RAIL PAD.
cushion to give elasticity to the rail, but serves to keep it in constant close engagement with the spikes, and when the latter become loose, and are again driven the surface of the pad becomes more straightened, be coming perfectly flat by successive readjustments of the spikes.

## AN IMPROVED LIFE-PRESERVING CHAIR

A chair which, when unfolded, can be used on a ves sel or steamer as an ordinary chair, but which, in case of accident, can be folded up and employed as a life preserver, being so constructed that it will support several persons in the water, is illustrated herewith, and has been patented by Mr. James A. Ashworth, of Yonkers, N. Y. The back and seat of the chair are formed of a single piece, preferably of water-proof material, in one or more pockets of which a buoyant substance, usually cork, is confined and secured. This water-proof cover is secured around the top cross bar of the frame of the chair back by a double row of stitches, and buoyant material is secured within this covering to the lower end of the back of the chair frame, where rows of stitches are placed each side of the cross bar and around the hinge portion sufficiently to give great strength with flexibility, the covering be ing carried forward and firmly stitched around the for ward cross bar of the seat, and similar buoyant mate

ashworth's life-preserving chair.
rial being secured in one or more pockets in the body of the seat portion of the covering material. To the outer side of one of the back rails, near its center, is pivotally secured one end of a strap or band, which when not in use is passed loosely over the chair back and hooked by a loop or ring over a button on the other back rail. In case of accident the chair is made
into a life preserver by folding the cork back forward over the cork seat, the hinge spaces at the rear end of the seat permitting this, and the chair is then firmly secured in its folded position by means of the strap attached to one of its back rails, these rails and the legs affording a convenient grasp or hold for persons in the water. These chairs can also be constructed without the back, in the form of a folding stool, as shown in one of the small views.
For further information relative to this invention ddress the inventor, or Mr. George Ash worth, 19 Smith Street, Danbury, Conn

## Progrems of Electrical Science.

Professor Elisha Gray, in a lecture preceding a series interesting electrical experiments given at Evaston, on the 10th of May, said, among other things too good to mit, but which for lack of room must be deferred, that those of us who are just crossing the meridian of life ean well remember the first telegraph wire that was strung in this country. To-day it is difficult to find a corner of the earth so remote as to be out of sight of one. You will find them even in the bottom of the seas and oceans. The last twenty years have seen more advance in the science of electricity than all the 6,000 historic years preceding. More is discovered in one day now than in a thousand years of the middle ages, so that literally, "a day is a thousand years." We put it to all sorts of uses. We make it carry our messages, drive our engine, ring our door bell, and scare the burglar.
We take it as a medicine, light our gas, see by it, hear from it, talk with it, and now we are beginning to teach it to write. If Job lived in this age, and the question were put to him as of old, "Canst thou send lightnings, that they may go and say unto thee, 'Here we are' $q$ " he could eay, "Yes;" and they can be made to say it in the vernacular. A friend of mine says in verse :

> Close to a whispen must hold his ea
> Like deaf men, ning voice to hear-
> But now from town to town her ;
> And puts his nose to town he
> And whispers through a wox
> In olden times along the street
> A glimmering lantern led our feet
> When on a midnight stroll;
> But now we snatch, when night comes nigh, A piece of lightning.from the sky And stick it on a pole.

The question naturally arises in contemplating this subject, " What is it ?" I can imagine the last man on the last day asking this same question, "What is it q" t one time, not long ago, it was supposed to be a fluid, y some two fluids, a positive and a negative. But in his day there are few who do not believe it to be simply a mode of motion; not matter, but a condition of matter ; and not a mechanical, but a molecular motion. By mechanical motion is meant a motion of the mass, and by molecular motion is meant a motion of the ultimate particles of which the mass is made up.

## Fifteen Mile Guns.

Some important experiments have been made at the Shoeburyness school of gunnery in high-angle firing A London correspondent writes: Probably no step of recent years is likely to lead to greater results, for if the experiment should be repeated with the same suc ess, it is undeniable that war ships will have to be a ully protected on their decks as they now are on thei broadsides. The experiments were made with the -inch or 23 -centimeter gun used as a howitzer. An elevation of 37 degrees was given and bat tering charges were used with Palliser shells. Out of four shots three fell within a space of 500 feet by 80 feet, representing the deck of a first-class ironclad, and the range attained was 12 miles! Now, if it be really possible, three times out of four or for that matter once out of four times to throw a 9 -inch shell upon the deck of a ship in midchannel between Dover and Calais, another proof will have been given that in the tedious duel between gun and armor the gun has much the best of it. What is very important, too, is that the heavy charges and the high angle did not strain either gun or carriage in the least, and one of the officers present has said that he believed the gun would stand 45 degrees of elevation without injury, while with 42 degrees a range of 15 miles would be secured. Now, at 15 miles, a ship is "hull down," so it comes to this, that we can throw a 9 -inch shell on to the deck of a ship before. we can see it Surely this is the most marvelous thing yet attempted in gunnery, which of later years ha been so fruitful in surprises. $-A . \& N$. Register.

We are indebted to Professor A. N. Talbot, of Cham paign, Ill., for a copy of the proceedings of the third annual meeting of the Illinois Society of Engineers and Surveyors.
hinge by the use of which a door or shutter or imilar piece of work may be thrown in or out to com pensate for shrinkage or warpage, without inserting wedges, is illustrated herewith, and has been patented by Mr. Charles H. Beer, of No. 317 East 125th Street New York City. The under or engaging faces of the hinge have a longitudinal shoulder, with inclined planes emanating from the center and inclined thererom. Four or more screw apertures are provided in each leaf, and when four are employed, two of them are in the outer inclined plane and two at each side of


BEER'S HINGE.
the center in the other inclined plane, so that by loosening one set of screws, when the hinge is screwed in position, and tightening the other set, either inclined plane may be brought into positive engagement with the door or frame, which may be thus thrown out or carried inward as the occasion may demand.

## IMPROVED RECEIVING-TABLE FOR PRINTING PRESSES.

A receiving-table for cylinder printing presses, designed to facilitate the accurate piling of the sheets without the use of the ordinary form of jogger, is illustrated herewith, and has been patented by Mr. Frank W. Baltes, of Portland, Ore. Upon a table of the usual construction is set at a slight angle a frame in which are mounted strips so placed as to leave slots or openings between them of about three-sixteenths of an inch in width. The strips furthest from the press run entirely across the frame, but those adjacent to the op-


BALTES' RECEIVING-TABLE FOR CYLINDER PRESSES.
osite side of the frame are divided into three sections, being divided by other strips to form slots or openings xtending from the inner edge toward the center of the rame. In these slots are mounted backwardly curved guiding fingers, other sets of differently formed fingers being mounted at the sides and toward the outer edge of the frame, as shown in the illustration, to be ad justed as desired on the frame according to the size of the sheet being printed. The outwardly extending arms of the side fingers may be adjusted, as shown, to serve as stops for the fly, or turned to rest in lines parallel with the fly fingers. As the fly descends, the inner edge of the sheet will strike against the backwardly curved faces of the fingers nearest the press, the sheet then coming to place between these fingers and the other fingers on the frame.

THE LIDGERWOOD mANUFACTURING CO.'s HOISTING engines and boillers-the gorton heater.
In the illustrations on our first page we have endeavored to bring before the mind a correct idea of the plant, and the methods of prosecuting the work, in one of the largest and best equipped modern establishments especially devoted to the manufacture of hoisting engines and boilers.
The works of the Lidgerwood Manufacturing Company, which we take as a type, are near the Atlantic Basin, at the foot of Dikeman Street, Brooklyn. The main machine shop is 75 by 200 feet in size, and, with its gallery and two wings, affords a floor space of 28,750 square feet. The erecting shop covers a ground space of 50 by 228 feet, and with its gallery affords 17,500 square feet of floor room. The boiler shop is 50 by 290 feet, the blacksmith shop 45 by 90 feet, the Gorton heater shop 25 by 100 feet, and the storage shop 45 by 100 feet. Power is supplied by two engines, connected, but which may be readily dis. connected, when either one will afford sufficient power for the entire establishment. All of the departments are completely fitted out with powerful traveling cranes, and the equipment in lathes and boring and turning machines of the latest patterns is designed to more than meet every possible demand. In every branch of the business, attention has been constantly directed to securing uniformity as well as perfection of work through the employment of machinery; and in milling machines there are several of novel construction, especially designed for the work of the company, who have made something of an innovation on ordinary machine practice in the extent to which they carry the work of machine milling.
The engines made by the company present too great a variety for us to mention them all in detail, but their single and double cylinder friction drum portable hoisting engines, with the latest improvements, constitute a representative type of a large part of their business. In the latest patterns of these engines, embodying the results of many years' experience, especial care has been taken to have them simple in design and construction, and well proportioned throughout in accordance with their cylinder power. The cylinders are of extra quality charcoal iron, the steam and exhaust ports being of ample size and designed for high speed, with D slide valve, the valve and valve seat having a scraped fit. The valve and piston rods are of steel, and the crosshead is of the locomotive hanging type, fitted with composition gibs having extra large wearing surfaces and easily adjusted to take up wear. The connecting rod is of best Ulster iron, and the drum and crank shafts are of the best quality of wrought iron, and calculated to be of ample strength for auy possible requirement. The crank wheel is counterbalanced, and is forced on the crank shaft by a special press. The bearings are large,
and fitted with anti-friction metal. A winch head is placed on the outer end of the drum shaft, and a band fly wheel on the crauk shaft, for pumping, sawing, etc.
The friction drums of these engines have many improvements for which patents are held and owned by the company. The frictional hold is effected by the engagement of segments of hard wood, bolted on the inner surface of a spur wheel, to make a hollow inverted double cone, with corresponding coneshaped flanges at one end of the drum. The spur wheel is actuated by a pinion on the crank shaft, and is ordinarily in constant motion. The drum is loose on its shaft, on which it has long bearings, and is free to revolve without sensible resistance, but the coneshaped flange at one end of the drum is thrown into friction contact with the wood-lined spur wheel by a slight lateral motion of the drum, effected by means of a lever, screw, pin, cross key, and collar, and releasfriction surfaces. The great power afforded by this construction is obvious, being such that a very slight pressure will hold the drum against any load the engine can hoist. The end thrust caused by the lateral movement of the drum shaft is taken up by a thrust bearing and screw collar. The friction wood is secured to the inner surface of the spur wheel by bolts and nuts in such way that it can be always kept tight without trouble.
The drums are extremely durable, having been in constant use for years without requiring renewal, and the entire machine leaves nothing to desire in the
quickness of its operation and the ease with which it quickness of its operation and the ease with which it
can be managed. This is particularly exemplified in pile driving, when compared with the work done by any clutch and brake engine. The rope is made fast to the hammer, and passes up over the sheave and down around the drum. When the hammer is raised to the desired height, the drum is released, the rope then overhauling the freely revolving drum as the hainmer falls, it being entirely within the discretion of the operator, without a moment's delay, to give
either short, quick blows, or long and heavy ones, either short, quick blows, or long and heavy ones,
from the entire height of the pile-driving frame. This class of engine has now largely superseded all others for such work, hammers of twice the weight formerly em-
ployed being now commonly used, without damaging the heads or splitting the piles, and enabling the oper ator to give many more equally powerful blows in a minute. The quickness with which piles are driven thereby is generally very surprising to foreign workmen, and the export demand for these engines is large and growing.
In general hoisting work, as the weight is raised to the desired height, the moving of the lever and the operation of the spring loosens the hold of the friction drum, as required for ordinary lowering purposes, but foot brakes are preferably to be used therefor, as saving wear on the friction drum, and allowing the use of the engine for other purposes when a weight is to be held. These foot brakes can at any time be readily applied to an engine not having them, and some of the styles of engines are fitted with ratchets and pawls which may be thrown in and left with a load suspended.
The double cylinder engines are similar to those with single cylinders, except that they have the special feature of having no centers, the engines being conuected at an angle of $90^{\circ}$, thus rendering them much easier to start and handle, single cylinder engines being sometimes caught on centers in handling heavy work. Double friction drum engines, with either single or double cylinders and reversible link motion, are supplied in various patterns specially adapted for quarrying, dock and bridge building, etc., whereby two derricks can be operated, or one drum can hoist a pile in pile driving, while the other handles the hammer. Double drum and double end hoisting engines are made in several varieties calculated to run at different speeds, and a style of portable hoisting and power engine is made to be housed, if desired, when, but for its larger wheels, it somewhat resembles a small dummy engine for street railway use.
Perhaps the most efficient machine ever built for mining operations is the large mining and tail rope hoisting engine made by the company, and specially adapted for double track inclines or double shafts in mines. It motion both drums and brake and independent of each other, so that they may be thrown in and out of gear with the engines in motion, or one drum may be lowering while the other is hoisting, or both may be thrown into gear and the engine used as a regular reversible engine, one load being hoisted while the empty cage is being lowered. This is done with the minimum of friction and wear on the engines, and the great desirability of such independence of drumaction, particu larly on inclines or in mine shafts, will be at once obvious to all engineers and workmen experienced in mining operations.
Space will not admit, however, of such reference as would do justice to the great variety of engines made by the company. Work for which they have a regular demand they keep always in stock, their manufacture being carried on according to the duplicate part system, from complete sets of gauges and templets, which insures absolute accuracy. Instead, therefore, of building each engine separately, they are always ready, on receipt of an order, to send the parts to the erecting
shop and set up the particular engine called for, after which the engine is thoroughly tested, being set up and run with steam on before being shipped. This system not only reduces the cost of production, while necessarily calling for the highest degree of accuracy, but it enables a user of these engines to obtain at any time, without delay, any special part of an engine which may give out, from wear or accident. The standard character of these engines has been recognized by different departments of the United States govern ment, in their specifications for contractors, in which, in many cases, it is stipulated that engines furnished shall be equal to those of the Lidgerwood company. They have been on the market now some eight years, and there are over 4,500 of them in use, being employed in every part of the world.
The manufacture of boilers specially adapted for these various engines constitutes an important portion of the business of the company, as they make also boilers boilers of all kinds, horizontal return tubalar upright tubular boilers, and any kind of work in this class which may be called for. The shells, unless otherwise ordered, are made of CH No. 1 shell iron, of 50,000 lb . tensile strength, and the tube heads of the best flange iron, all of brands tested and known to be reliable, steel being used in place of iron when ordered. All of the boilers are hydraulic riveted, every rivet The bracing and staying is of ample strength to allow a large factor of safety. The edges of sheets are planed off true and smooth, and the seams are thoroughly calked inside and outside. The tube heads are flanged on formers specially made for the purpose, the tube holes being drilled to size and the tubes carefully
fitted, being usually driven in with a maul and then expanded. The fittings are complete, strong, and substantial, of good design, being made by special tools. The tests include a practical steam test to the guaranteed working pressure of 100 pounds, and a
hydrostatic test to a pressure of 160 pounds, and every boiler must be found perfect under such pressure before being sent out.
As relating to a branch house of the Lidgerwood Manufacturing Company, we illustrate in one of our first page views the large Gorton heater shop of the Gorton \& Lidgerwood Company. These heaters have been many years before the public, and have had a large sale, which, with the extensive facilities of the company for their manufacture, afford the best evidence of their high character. These house-heating boilers are for private residences, schools, public buildings, etc., and are unlike any other boiler for such purposes They combine improvements attained through many years' practical experience in satisfying the demands of a large trade. They are side feed boilers, built on the plan of an upright tubular boiler, and are self-feeding as well as surface burning, being adapted for use either way. The coal reservoir is between the lower outside surface of the boiler and the water leg, and the tubes are directly above the fire, the heat passing up through them to the top and thence down on the outside between the boiler and jacket to the smoke pipe in the back. The boiler is designed to generate steam in the mos economical and effective manner, the tubes being placed as thickly as will admit of proper circulation, and its evaporative efficiency is calculated as fully equal to that of the return tubular boiler. The coal reser voir is designed to hold sufficient coal to last from welve to twenty-four hours without refilling, and the grate is low in the center, so that the coal will gradu ally feed down from the outer surface as it is needed and distribute itself at a uniform depth over the surface of the grate, the fire being always directly under the tubes. The grate is of the shaking and dumping type, its outer or main part resting on ball bearings, so that it can be easily shaken, and the center part being independent and arranged to swing to one side for removing elinkers or dumping the fire. This boiler can be used with efficiency and economy for circulating hot water, as well as for making steam.
The general offlices and salesrooms of the company are at No. 96 Liberty Street, New York, and No. 159 Friend Street, Boston.

Water as a Constituent or Organic Substancen.
Water, says Dr. Whitelaw, forms three-fourths of the weight of living animals and plants, and covers about three-fourths of the earth's surface. Professor Chaussier dried the body of a man in an oven, like a brick in a kiln, and after desiccation the body weighed only twelve pounds. Rather more than a pound of water is exhaled daily by the breath, about $13 / 4$ pounds by the skin, and $23 / 4$ pounds by the kidneys, making the daily emissions of water by the body about $51 / 2$ pounds, or water in some well known articles

|  |  |
| :---: | :---: |
| Barley...... ... ................ 15 | Cabbage (leaves).. ............. 82 |
| Oats.................... ....... 16 | Cabbage (stem). |
| Rye........................... 12 | Mushroom. |
| Rice............ ............... 13 | Fungi.................... 86 to |
| Beans (field)...... ............. 15 | Potato........ .... ........... 75 |
| Beans (kidney)................... 23 | Watermelon.................... 94 |
| Peas ......................... 14 | Cucumber. |
| Turnips........ ................ 88 | Vinegar plant............... .. $\mathbf{9}^{\text {\% }}$ |
| Carrots......................... 83 | Wheat flour....... ...... 13 to 19 |
| Rye flour........................ 14 | Cocoa. |
| Barley flour.................... 14 | Ma |
| Maize flour..................... 13 | Figs. |
| Indian corn flour............... 14 | Plums. |
| Oatmeal........................ 14 | Apples. |
| Wheat bread...... ....... 44 to 48 | Gooseberries |
| Rye bread........ . ..... 44 to 49 | Peaches. |
| Cane sugar..................... | Egg, entire..................... 74 |
| Linseed cake................... 10 | Milk ......................... 87 |
| Flesh. ....................... 77 | Blood. ................. 79 to 83 |
| Skin.......................... 58 | Gastric juice..... .............. 97 |
| Bones, variable........... 7 to 20 | Trout.... .... ................. 80 |
| Beef................ ............ 74 | Pigeon. |
| Veal................... ........ 75 | Cheese....................... .. 40 |
| Mutton......................... 71 | Hair, wool, horn........... 9 to 11 |
| Haddock....................... 82 | Brandy..................... ... 56 |
|  | Whisky.... ........... . ...... 47 |
| Tea | Rum...................... ... 30 |
|  |  |

## A New Frictional Machine.

At a recent meeting of the Liverpool Chemists' Asso ciation Dr. Symes exhibited and described Mr. Tudsbury's new double cylinder electric machine for the generation of frictional electricity. It is a modification of the Wimshurst influence machine. Wimshurst's machine, as our readers know, consists of two plates o glass, the surfaces of which are brought near togethor, but do not touch each other. They are caused to re volve rapidly in opposite directions. The modified ma chine of Mr. Tudsbury is made of ebonite, in the form of two cylinders, very much in appearance like two sieves revolving one inside the other, the sectors being placed transversely across the hoop. This machine the smaller patterns of which would prove admirably adapted for medical use, is also fitted with a new dou ble high tension discharge, whereby the length of spark obtainable is considerably increased. Glass machines all give positive electricity. The new ebonite appara tus will yield negative electricity in the same manner.

The following abstract of an account given by Baron Von Richtofen of natural gas wells in China is given in the United States consular reports by Charles Denby, United States consul at Peking. These wells are found in Sz'chwan, near a town called Tsz-lintsing. In an area of twenty-seven li $(9$ miles) diameter salt wells are found. To make a well the Chinese use a long and elastic bamboo pole, supported in the middle by a cross piece, a rope made by coupling the ends of long (not twisted) slices of bamboo, and an iron instrument which weighs 120 catties (catty $=11 / 3 \mathrm{lb}$.) The ment which weighs rope fastened on the thin end of the pole, and the iron on the end of the rope. A slight up and down motion of the thick end of the pole makes the iron hop and bore a vertical hole with its broad, sharpened edge. The ground to be perforated consists chiefly of sandstone and clay. When a portion of the rock is mashed, clear water is poured into the hole, a long bamboo tube with a valve in the bottom is lowered, and the turbid water raised to the top. Pipes of cypress wood are rammed in to protect the sides of the bored hole and to prevent the water contained in the surrounding ground from getting access to the well; the pipes are attached to each other at the ends with nails, hemp, and tung oil.
at least up to the time that Baron Richtofen wrote, a long column of fire rose from that pit, and it is considred nearly impossible to stop the flame.
The gas pits and brine pits are owned separately by corporations. The owners are subjected to the control of the government. The government monopoly is in the hands of the "taotai," who resides at the place. The salt works of Tsz-lin-tsing yield considerable revenue to the government, and have besides enriched numerous proprietors, and give occupation to a numerous population. The number of "fire pits" is twenty-four, and the salt pits are innumerable. Some of them do not enjoy the advantages of gas. The brine is evaporated with grass and wood.

2,500 H. P. CORLISS ENGINE.
As illustrative of the progress of the Corliss system of engines we give an engraving, from Engineering, showing a fine pair of compound Corliss engines lately constructed by Messrs. Douglas \& Grant, of Kirkcaldy, for the Mazayon Spinning and Manufacturing Company. The cylinders are 40 in . and 70 in . in diameter respectively, and have a stroke of 6 ft . The power, which amounts to 2,500 indicated horse power, is transmitted to the various lines of shafting in the mills by
ent proprietors living on the stream, none of the proprietors can use the water for either irrigation or manufacturing, but for domestic purposes and water ing stock, one proprietor will be justified in consuming all the water.
Twenty years' use adverse to the right of another, will give the person so using the stream the right to continue the use, regardless of the other's rights.
And as to the division of water, every farmer who wns land situated upon a stream has the following ights:
1st. To the natural flow of the stream.
2d. That it shall continue to run in its accustomed channels.
3d. That it shall flow upon his land in its usual quantity, natural place, and usual height.
4th. That it shall flow off his land upon the land of his neighbor below, in accustomed place and at its usual level.
These rights he has as an incident to the property in his land, and he cannot be deprived of it by grant or description.
If any farmer shall make any change in the natural flow of a stream to the material injury of any other owner situated upon it, or by any interference shall


IMPROVED CORLISS ENGINE OF 2,500 H. P.

The inner width of the pipes is about 5 inches. As the work proceeds the pipes are rammed deeper, and a new one attached on the top ; the rope, too, is made longer. At a depth varying from 70 to 100 chang ( 700 to 1,000 feet) the brine is struck, and the well is fit for use. The brine is raised to the top through long bamboo tubes and bamboo ropes, as described, by means of a horse whim, and then carried to large pans for evaporation, or led to them through bamboo pipes.
Besides these wells there are others, which are bored to the depth of from 1,800 to 2,000 feet. At that distance below the surface petroleum is struck. Immediately on reaching it an inflammatory gas escapes with great violence. Work is now stopped, and a wooden cap fastened over the mouth of the pit, perforated by several rows of round holes. In each of them a bamboo pipe is inserted, and through these the gas is led under the evaporation pans. The pipes ramify, and on each end a tapering mouthpiece, terminating in a small aperture, is attached. The gas is then used for evaporating the brine.
The enterprising spirit which induced the Chinese to examine the ground at so great a depth is said to have had its origin in the drying up of a brine pit. The proprietor was in hopesoof meeting brine at a greater depth, but found instead the gas.
When the country was infested with rebels during the Taiping rebellion, they removed the cap from one of the gas pits and set fire to it. Since that time, or
ropes running off a fly wheel 30 ft . in diameter by 8 ft . |prevent the stream from flowing as it was wont to flow, 6 in. wide, and grooved for 38 ropes. This wheel weighs about 110 tons, and runs at 60 revolutions per minute, giving a speed to the ropes of considerably over a mile a minute. The crankshaft, made of Whitworth's fluid compressed steel, is 25 in . in diameter in the body and 20 in . in the bearings. The steam pressure will be 100 lb. per square inch.

## Right to the Use of Water.

The Legal Adviser, published at Chicago, gives its readers some information respecting water rights, which has been a source of great trouble and much litigation between neighbor farmers.
It is a general principle, says the writer, that every owner of land upon a natural stream of water has a right to use the water for any reasonable purpose not nconsistent with a similar right in the owners of the and above, below, and opposite to him. He may take the water to supply his dwelling, to irrigate his land, or to quench the thirst of his cattle ; to use it for manufacturing purposes, such as the supplying of steam boilers or the running of water wheels or other hydraulic works, so long as such use does not sensibly and injuriously affect its volume. But this is a mere privilege running with the land, not a property in the water itself.
Where the stream is small and does not supply water more than sufficient to answer the wants of the differ-
he is responsible for the damage he may occasion. These rights are subject to the privilege of each one of the farmers to make a reasonable use of the water upon his own land, while it is passing along the same. It matters not what the source of the water may be, whether it be backwater or the flowage of the same, or the water of another stream. Still, a division of a stream may be made by the farmer, if it be returned to its natural channel before it leaves his premises.

The United States Commissioner for Brussels.
The Hon. John Bigelow was recently appointed United States Commissioner to the Brussels exposition, and has sailed for Europe to take charge of the American exhibits at the Belgian capital and see that they are properly placed and classified. The exposition will open on June 2, and close in November. The buildings and grounds cover 100 acres, and are said to exceed in size and grandeur those of any previous exposition. Enormous temporary structures of brick and iron and a large permanent building of stone have been erected. A large portion of the exhibits are now in place. Owing to the delay of Congress in appropriating $\$ 30,000$ to pay for the supervision and care of the exhibits from this country, fewer manufacturers have sent articles than was expected. Every prominent industry will be represented, however.

## GEORGE H. CORLISS.

George H. Corliss, the inventor of the improvements in the steam engine that bears his name, and has won for him an enviable fame the wide world around, was born in Easton, N. Y., on June 2, 1817. His father, a physician, removed to Greenwich, N. Y., in 1825, and the son attended school there until he was fourteen years of age.
He then found employment in a store connected with a cotton factory, as general clerk, remaining in this position for several years. His desire for a liberal education and his thirst for knowledge became so earnest and engrossing that he resigned his situation and entered an academy at Castleton, Vt., where he faithfully pursued his studies for three years.
His academic days being completed, his next move was to establish a country store in Greenwich. The venture was more than successful, but young Corliss, weary of the monotony and limited sphere of his business, developed aspirations for a wider field of labor. During the later years of his residence in Greenwich, there were intimations of the inventive genius and mechanical tastes that were to be the distinguishing features of his brilliant career. He was eighteen years old before he had ever seen the inside of a machine shop.
The hour came, however, for action in the field for which he was especially adapted, and he was not found wanting. Greenwich is divided into two sections by the Battenkill, and the only bridge that united the two parts of the town was carried away by a spring freshet. The result was a serious inconvenience to the town. The prominent citizens decided, at a meeting held for the purpose, that a temporary bridge was im practicable, and adopted a plan for building a scow to ferry passengers and teams over the stream. Young Corliss, in spite of strong opposition, devised a plan for a bridge raised $\$ 55$, the necessary funds, by subscrip tion, and, with the help of volunteer farm ers and workingmen, completed a bridge in ten days that did excellent service for six months.
Another occurrence showed more plainly the special field of Mr . Corliss' inventive power. Boots and shoes were a prominent item of merchandise in his country store He became impressed with the idea that machinery might be properly used in their manufacture. The result was the construc tion of a machine for stitching leather; this invention antedated that of the Howe sew ing machine. While improving and developing this machine, he commenced the manufacture of the tools required in its construction, and he was thus introduced into the machine shop, and the steam en gine business was the result.
An important epoch in Mr. Corliss' life occurred in 1844. He removed to Providence, R. I., and became identified with, and finally the head of, the firm of Corliss, Nightingale \& Co., and in 1848 he completed and started a steam engine, embodying the essential features of the improve ment he had designed. In the Corliss, engine the gov ernor is connected with the cut-off, instead of the throttle valve. The governor does no work, but simply indicates to the valves the work to be done, thus by one feat of engineering skill obtaining two results-uniformity of motion and economy of fuel. The improvement was so great and so practical that the Corliss engine has obtained a unique position of its own.
The Corliss Steam Engine Company wasincorporated in 1856, with Mr. Corliss for president. He was his own architect and engineer in designing and constructing the buildings for the.factory. The grounds extend over more than nine acres, the buildings covering half the space, and the rest being devoted to lawns, drives, and ornamental shade trees.
In 1872, Mr. Corliss was appointed commissioner for Rhode Island to the international exposition at Philadelphia, and was chosen as one of the executive committee of seven, to whom the preliminary work was in trusted. In 1875, he submitted plans for the construc tion of a grand central steam engine of 1,400 horse power, proposing not only to utilize it as the motive power for all the machinery to be exhibited, but also to make it an ornament to this department of the ex position. . After much delay and vexatious opposition, the plan was adopted. Every visitor to the Centennial bore witness to the success of the experiment in the perfect adaptation to the requirements demanded, and also to the artistic elegance of its construction. The result was produced by the untiring energy and de termination as well as the engineering skill of Mr. Cor liss in devoting his personal attention to the construc tion of the engine, and also to the fact that he con tributed $\$ 100,000$ to the work from his own privat funds over and above the aid furnished by the commis sion. Many wonderful and beautiful sights and scene at the exposition will be forgotten, but long as life en
dures will memory bring back the thrilling moment when the Corliss Centennial engine, like a being endowed with life and touched by a magic wand, commenced its movement for the day, and did its work with an almost human intelligence.
Mr. Corliss gave his busy brain no rest. Some of his later iuventions are a machine for cutting the cogs of bevel wheels, an improved boiler with condensing apparatus for marine engines and pumping engines for water works.
The last three years of Mr. Corliss' life were occupied with the invention and construction of special machinery to be used in the manufacture of steam engines, with the firm conviction that he would thus be enabled to lessen the cost to the purchaser. In this plan seve ral of the mechanical operations on each piece of machinery are carried on and completed with one adjust ment and one set of tools. In order to make the plan successful, a number of pieces of the same shape must be manufactured. The inventor's purpose was to extend his business sufficiently to be able to keep special machines busy all the time on every detail, and to accomplish this aim he perfected an organization by which three large engines can be turned out every ten hours, complete in all their intricate parts.
His plans were at length completed to his entire satisfaction, the reorganization of his working force was adapted to the new methods of handling material from the time it entered the works until it was finished, and the special tools were ready to commence their task at the master's call. But he was not destined to behold

The sunny side of Mr. Corliss' character found its highest expression in his home, the beautiful home in whose structure, convenience, and ornamentation every esource of his inventive genius found expression. Here in the society of his wife and daughter, he passed his happiest hours. This man of strong will and stately mien was tender, chivalrous, loving, and beloved.
Mr. Corliss spared neither pains nor expense in carry ing out his plans, cost scarcely entered into the calcu ation, if it insured success. He also contributed generously to religious and charitable institutions.
Mr. Corliss was of a modest and retiring nature, and rather a voided than sought after the public prominence he might have attained. He was, however, in the State Senate in 1868-70, and was a presidential electo in 1876. He refused the nomination of mayor and

In a handsome tribute to his memory, the London Engineering says as follows: "By the death of George Henry Corliss, America has lost the best known engineer she has ever produced. In all the countries of the world where steam engines are employed the name of Corliss has been heard, and ranks next in familiarity to that of Watt. Indeed, it has become so much a part of our technical vocabulary that many engineers will learn with surprise that little more than a month ago he owner of it was not only alive, but was the active head of the Corliss Steam Engine Company, of Provi dence, R. I. Many men verging on middle age found the Corliss engine an established fact when they entered apprenticeship, and hence they have been
disposed to class its invention with the events of ancient history, and its inventor with those who are either dead or superannuated. There could, however, be no greater mistake. Mr. Corliss has, it is true, passed away full of years and honors, but he was busy up to the last week of his life with a new Pawtucket pumping engine, and with the reorganization of the factory with which he was connected.'

## Fabulous Astronomy.

The stars have always had a great influence upon the imagination; so the progress of astronomy through the ages gives us a faithful image of the conquests of the human mind. We propose now to study the beginnings of astronomy, which are, as it were, the alphabet of that science.

## DIVISION OF TIME.

We have watches, clocks, and calendars in profusion; but our primitive ancestors had nothing that permitted them to measure time--nothing at least but the sun and moon, which still serve our rustics to some extent, but so slightly that the bell is called upon to make known the principal divisions of the day to laborers in the fields. The course of the sun gave the succession of the days, and the lunations indicated the months. As for the seasons, at the renewal of the year, there was at first no rule that permitted of forming a calendar. Primitive man was therefore his own astronomer, and
the active operation of his latest invention-the triumph of his art. In the midst of his honorable career, in his golden prime, he passed away on February 21, 1888, in his 71st year, having lived a little beyond the hreescore and ten years allotted to man.
Mr. Corliss received many proofs of the high appreciation in which his important inventions were held. He won the highest competitive prize at the Paris Exposition of 1867. The Rumford medals were awarded to him in 1870 by the American Academy of Arts and Sciences. He received the Grand Diploma of Honor from the Vienna Exposition of 1873, although not an exhibitor. In 1878 the Institute of France gave him the Montyon prize, the highest honor for mechanical achievement. In 1886 the King of Belgium made him an officer of the Order of Leopold.
On the other hand, he had the usual experience of inventors. Obstacles beset his path. There were conflicting interests, competition, deeply rooted prejudices to overcome ; vexatious lawsuits were forced upon him, continuing for fifteen years, and costing him $\$ 100,000$, but ending in a full.vindication of his claims.
Strength and tenderness were the distinguishing features of Mr. Corliss' character. The strength was apparent to all, the tenderness found its fullest ex pression in domestic life. He sought with conscientious purpose to find out what was right, and, when his mind was made up, held to the courage of his convictions, swerving neither to the right nor left. As a matter of principle, he threatened to stop the running of the Centennial engine, if the exposition were open on Sunday, and he carried his point. He refused to countenance corruption and bribery in accomplishing his purposes. He made large contracts to build engines for the government during the civil war, and waited seven years for his pay, with a heavy loss of interest, rather than condescend to give retainers for the influence of Wash ington lobbyists.

## the various systems proposed in ancient times vividly

 reflected the temperament of their authors.The darkness of night exerted a sort of terror on the mind of our ancestors. Just as material existence succeeds nothingness (which it is also followed by), just so does day succeed night, which is the origin of time, as winter is that of the year. The Ostiaks of the Yenisei reckon their years by snows, and the Iroquois of North America by winters. The Numidians, the Gauls of Cæsar, and the Germans of Tacitus reckoned the diurnal periods by nights. In the north principally, night had considerable importance, and the Scandinavians possessed the best connected and most poetical ideas. Day was the son of Nott, " night." The latter proceeds first, says a passage of the Edda, mounted upon his horse Rinfoxe, "ice mane." Every morning, on finishing his career, the courser sprinkles the earth with the drops of foam that fall from his bridle, and that is dew. Day follows, mounted upon Sinfoxe, "luminous mane," and his mane illuminates the air and earth. These peoples believed also that the longest night, that of the winter solstice, was the progenitor of all the others, and that the world was created during such a night. That is why it was called the "mother night." It was the greatest holiday of the year, and, at the same time, the origin of the new year. It was styled also Juul,* the present name of Christmas, which has replaced it.
The Chaldeans said that the world began at the autumnal equinox, when the night becamelonger than the day.
In the seventeenth century, the French tribunals were still giving orders to "put in an appearance within fourteen nights." The Englisit say "fortnight," an abbreviation of "fourteen nights," to designate the two weeks' interval which is improperly called in French quinze jours.

The curious ideas about the moon.
and phases of the moon have been much remarked, and the cycle of these various appearances is short enough to favor that convenient division of time which was the ancient month, and which still serves the Israelites and Mussulmans for their calendar. When the Indians of several tribes united for some enterprise, the signal for the rendezvous was usually a full moon designated a long time in advance.
The beautiful moonlight of countries that have a usually pure atmosphere offered an invitation to games and festivities. The new moon interrupted the merrymakings, which were resumed with greater spirit when the thin silver crescent was observed after sunset. The ancient Peruvians said that the moon was dead during the three days of its invisibility. The Khasias of the northwest of India think that the sun burns it up. Several savage peoples believe that they see in the lunation a quarrel between the sun and the moon (which to them are husband and wife), passing monthly through the same phases. The moon grows from new moon to the full, then wanes; the same is the case with its domination; finally, the sun triumphs and swallows its adversary, whose head it spits into the heavens. The ancient Slavonians believed that the
moon, having been untrue to her husband, with the moon, having been untrue to her husband, with the beautiful Venus, was condemned to wander in the heavens. The Dakota Indians think that the moon at its waning is eaten by little mice. The Polynesians believe that it is devoured by the spirits of the dead. The Hottentots say that it wanes when, suffering from a headache, it puts its hand to its forehead and hides the latter from our view. The Eskimos imagine that the moon, harassed by fatigue and hunger after fipishing its journey, retires for a moment to take rest and food. Its apparent corpulence after its reappearance shows with what avidity it has fed.
shows with what avidity it has fed.
The spots on the moon have attracted attention and The spots on the moon have attracted attention and
stirred the imagination in all ages. There is probably no country in which an imaginary picture has not been seen in the disk of our satellite; and yet, among the various figures that are thought to be seen in the moon, two principal types seem to prevail, according to a certain geographical distribution. In Eastern Asia, the common vision is that of a hare or rabbit. The Chinese common vision is that of a hare or rabbit. That they see a rabbit seated upon its haunches before a mortar and pounding rice, after the manner of the country. The Hindoos see a hare or a squirrel,
and they call the moon the hare or squirrel carrier. and they call the moon the hare or squirrel carrier.
The Siamese see the figure of a hare in the moon; although some distinguish therein a man and woman cultivating their field.
[Albertus Magnus thought that the form of the spots represented a lion with his tail toward the east and represented a lion with his tail toward the east and
his head to the west; others have thought it to be much more like a fox.]
Among many of the Indian tribes of North America, the hare is the symbol of the moon, as the jaguar is that of the sun. The Mexicans maintained that there was a rabbit in the moon's disk, and this was connected with one of their myths. In Central America, the moon is figured upon certain structures as a pitcher, or as a spiral shell whence a hare is emerging.
[According to Iroquois tradition, an old woman gifted with the power of divination was unhappy because she could not also foretell when the world would come to an end. For this, she was transported to the moon, where to this day she is seen weaving a forehead strap. As once a month she stirs a kettle of hominy, an ever-present ca
never be finished.]
When we pass from North to South America, the image placed by popular belief on the globe of our satellite undergoes an entire change, and the hare and rabbit give way to a human figure. The Incas relate that a courtesan, promenading on a moonlight night, was taken with the beauty of the star, and, wishing to own it, rushed toward it in order to embrace it. The moon clasped her with a vigorous movement, and still holds her.
In the Samoan Archipelago they distinguish a woman and her child, who have been transported to the moon. On the Book Islands, men are seen in the
moon, and at Timor, an old woman spinning. The principal African nations, especially those of the south distinguish a human face.
The ancient Scandinavians connected the spots on the moon with a legend: "Mane," says the Edda, "regulates the course of the moon and its different quarters. One day he carried off two children, Bil and Hiuke, as they were coming from a fountain carrying a pitcher suspended from a stick. These two children have not left the moon, as every one may see."
[To the poets, the spots represent the boy Endymion whom Diana loves so well that she carries him with her.]
In the explanation of the Eskimos of Greenland, Anninga, the moon, brother of the beautiful Malina, the sun, was one day chasing his sister, and was about reaching her, when she turned, and, with her fingers all black from the soot of a lamp, besmeared the face and clothes of Anninga, who has always carried the marks thereof.

The Khasias, who think that the moon is burned very month by the sun, see in the spots on its disk the shes resulting from such combustion.
[The Jews have some Talmudical story that Jacob is in the moon, and they believe that his face is visible.]
The Greek vision of a maiden's face has been transmitted to the Latin nations. Peoples of German origin incline more to the image of a little man bent under the weight of a burden. Shakespeare speaks several times of a man near whom is observed a dog and a ash.
In France, according to locality, the peasants think they see in the moon the figure of the traitor Judas;
Judas hanging from an elder tree branch; Jean de Navets, wheeling his barrow full of stolen turnips; the fratricide Cain resting upon his spade and looking at the innocent Abel lying at his feet; $\dagger$ a peasant guilty of having cut wood on the domains of his lord, and snapped up by the moon; a peasant who went to fence his field in on Sunday, and who was condemned to reeze in the moon, loaded down with a fagot of thorns; hunter and his dog ; a she goat and her keeper, who is milking her near a bush, and always with the everlasting fagot.
[Another and very ancient superstition is that the ines and spots on the moon's disk are the figure of a man leaning on a fork, on which he carries a bundle of thorns or brushwood, for stealing which, on a Sunday, he was confined in the moon-a belief probably based on the account given in Numbers xv. 32 of a man who was stoned to death for gathering sticks upon the Sabbath.]
It is unnecessary to say that with a good telescope we perceive simply luminous and dark areas, and detect mountainous regions and craters of extinct volcanoes. Some astronomers find a great resemblance to the tail of a peacock, or to the appearance exhibited by powdered plaster, irregularly arranged and horoughly wet, upon which the sunlight is falling.
During eclipses of the moon, men of ancient times experienced the greatest fear. Total eclipses of the sun are very rare. There occurs but one at the most per century, in a given place, and it lasts hardly five minutes. The partial eclipses of this star produce no more effect than an interposition of the clouds, so that such phenomena occurred without exciting attention. The same was not the case with lunar eclipses, which take place at the moment of the full moon. As our satellite is then visible all night if the heavens are clea we easily follow the changes that occur on its disk.
When the moon was eclipsed, the Incas believed it to be sick. As soon as it began to be observed, a feeling of inquietude prevailed. If it entirely disappeared, it
was the sign of certain death. It could no longer sustain the heavens, it would fall upon the earth and crush poor mortals, and the earth would end. So, as soon as one of these eclipses was seen, the dates of which were unknown, every one grabbed whatever instrument he could puit his hands upon-drums, trumpets, kettles-and made a frightful noise. Dogs were tied up and whipped in order to make them howl dolefully, under the belief that the moon loves theseanimals, and that, touched by their groans, it would make an effort to revive. It is probably for this reason that we say of a dog barking at night that he is baying at the moon. Did the Greeks of classical antiquity speak otherwise of Diana, the huntress?
In Peru, during lunar eclipses, the men, women, and children cry in deafening unison, "Mama quilla, mama quilla!" i. e., " mamma moon," supplicating the celestial powers not to let them die. When the light returns, they praise the great god Pachacamac, the upholder of the universe, who has cured the moon, and, through this, has prepented it from putting an end to the existence of men.
The Huron and Carib Indians had about the same ideas. The terrible Carib demon Maboya, who is the author of frightful apparitions, sickness, thunder, and tempests, tries to devour the star of night. In order to put the monster to flight, a great racket was made by
striking pieces of bark, drums, and kettles, and esstriking pieces of bark, drums, and kettles, and es-
pecially by shaking the maracas (gourds containing pebbles). The Caribs, young and old, men and women, then danced all night, jumping with the feet joined, one hand upon the head and the other upon the buttock, without singing, but uttering mournful and terrible cries. Those who had begun to dance were obliged to continue until daybreak, without daring to quit, no matter what the necessity. Meanwhile, a girl shook a gourd containing some pebbles, and tried to attune her coarse voice to this tiresome racket.
The Eskimos hide their provisions and close their dwellings, for fear that the sun or moon may enter The men utter cries and strike resounding blows, anc the women pull the dogs' ears. If these animals howl, the end of the world is not yet near, since they existec?
before man and have a much more certain presentiment of the future.
*See Midsummer Night's Dream, act iii., scene i., and.Tempest, act ii., scene ii.

+ This i
+This is the Italian idea, too. Dante, in the Inferno, describes the
moon by the periphravio, "Caino \&
[Whenever there is a lunar eclipse, the Odjibway ndians say gisiss nibo, " the moon is dying."] Some South American tribes think that, during clipses, the moon is devoured by a gigantic dog. The Guaranis think that the animal is a jaguar, and the ichthyophagous Makahs of the strait of Fuca think it is a shark that does it. On such occasions many tribes shoot arrows into the air in order to drive away the pretended enemies of the sun and moon. This recalls an exploit of Alphonso VI., King of Portugal (1664), who, learning that a comet, the precursor of the death of a sovereign, had been observed in the heavens, ran out to
look at it, and, after insulting it, shot at it with a pistol look at it, and,
The Scandinavians had pretty much the same ideas. The moon and the sun, Mane and Sunna, which are brother and sister, are walking fast, pursued by two terrible wolves ready to devour them. The most dreaded one is Managarmer, a monster who fattens upon the substance of moribund men, and sometimes eats the moon and spills blood in the heavens and air. Despite the relatively advanced state of astronomy among the Hindoos, this people preserves in the heavens the head and tail of a dragon that tries to devour the sun and moon during eclipses. These are the two nodes of the lunar orbit upon the ecliptic. The duration of the revolution of the line of the nodes is still called the draconic period.
We find an analogous tradition among the Hebrews. The author of the Apocalypse represents to us a draped woman in the sun who has the moon under her feet, and. who wears a diadem surmounted with twelve stars. A seven-headed dragon, capable of carrying along with its tail a third of the stars of the heavens, is waiting to devour the fruit that this woman is going to put into the world.
In the popular beliefs of Sumatra and Malacca, the darkening of the star is caused by a great serpent, which encircles it in its coils. The Alfourous of Ceram believe that the moon is asleep during eclipses, and they beat a drum in order to awaken it. The Siamese still think that eclipses are caused by the malignity of a dragon that devours the sun or moon. They therefore make a great din with stoves and kettles in order to drive this pernicious animal away. The learned understand these phenomena, and know that they can be foretold and their return be calculated. The same is the case in China; but in this eminently conservative country, the very court and authorities of the empire have indefinitely perpetuated the traditions of primitive times. An eclipse of the sun was a warning to the emperor to examine his faults and make amends for them. If the phenomenon was announced by the official astronomer, news of it was given throughout the empire, and the court prepared for it by fasting and seclusion. On the day fixed, the phenomenon was every where awaited with anxiety. As soon as the star began to be observed, or, to use the Chinese expression, as soon as it began to be eaten, the emperor himself gave the alarm by beating " the roll of wonder" on the thunder drum. The mandarins, who had come with their bows and arrows "to assist" the eclipsed star, shot into the air uninterruptedly. The educated Chinese know that these are but forms, but the superstition still prevails among the masses, who fall on their knees at the beginning of an eclipse, strike the earth with their foreheads, and make a great noise with drums and gongs in order to deliver the star from the dragon that threatens to devour it.
The Greek and Latin authors (Plato, Pliny, Livy) tell us that a great noise was made during eclipses. The early Christians rang bells, not only during storms, but during eclipses also, in order to war against the action of malevolentspirits, and to repulse, according to the consecration of the priest, the darkness caused by phantoms (umbra phantasmata), a relic of the dark genii that devour the moon.
(To be continued.)


## Trained Mechanics.

It is a notable fact, and one, too, not generally known, says the Industrial World, that some of the "best all-around" mechanics, i. e., those who can turn their hands to all kinds of general machine work, are men who learned their business in small shops, where all sorts and all classes of work are done. An ingenious, thinking man placed in such a shop has the best possible chance to develop all the talent there is in him. The hundred and one odd jobs required to be done will cause him to devise ways and means, and "to think," and in these ways he will grow to be a man fertile in resources, dexterous in touch, and ready for nearly any kind of work which may come along. Now mark the difference: A man trained in a large shop, with its score or more of departments, learns or works through as a rule one, two, or three different departments, of course becoming an expert in the several branches; but should occasion arise for him to do some particular work of which he has but a slight knowledge, he is out of his latitude, and makes poor progress, simply because he has not done all kinds of adapt his hand to almost anything which turns up.

## EXPERIMENT IN CAPILLARY ATTRACTION

## O'CONOR SLOANE PH,

Few subjects are so fertile in simple experiments, requiring little or no special apparatus, as capillary attraction. Faraday, who was unrivaled as a popular lecturer, continually employed the simplest possible methods of illustrating the action of this subtile force. One of the most striking he performed thus: A pile of salt was placed upon a plate. The lecturer then poured into the plate a saturated solution of


EXPERIMENT IN CAPILLARY ATTRACTION.
salt in water. The solution was colored to make it easily visible. As it was poured about the base of the salt, it was drawn up through the pores existing between the grains. By the operation of capillary force the colored solution gradually rose upward, coloring the salt as it ascended.
The clew to the success of this experiment is in the use of the salt solution instead of plain water. Were the latter used, it would rapidly disintegrate the pile of salt, by dissolving it. With the saturated solution the solid salt is quite unaffected.
In the illustration is shown a modification or development of this experiment. The apparatus required is a little more extensive, as, in addition to the plate, a glass funnel and an India rubber balloon are needed.

The balloon should be inflated to its largest size and kept so for some time, so as to stretch the rubber well. This is to enable it to fill at low pressure. The glass funnel should be as large as possible, as the demonstration is more satisfactory when executed on a large scale.
The funnel is filled with perfectly dry salt, well pulverized, which is pressed in as hard as possible. The funnel is completely filled with it, when supported mouth upward. The filling may be carried a little above the rim. The plate is then placed over its mouth so as to bear against the salt, and the whole is inverted. The object is to so conduct the operation that the salt shall not settle down or change its position, but shall remain in close contact with the walls of the funnel. All these precautions are quite esfunnel. All these
The mouth of the balloon, whence the air has been expelled, is now sprung over the open end of the funnel as shown in the cut. It is not necessary to tie it on. The balloon must, of course, be perfectly empty.

The plate, funnel, and balloon are now ready for the experiment. A saturated solution of salt should have been prepared. This is made by shaking in a bottle an excess of salt with water. As salt is more soluble in cold than in hot water, this operation must be done at ordinary temperatures. As coloring matter, a little ferric salt with sulphocyanide of ammonium may be added, or any ink that is soluble in water may be used.

The solution is now poured into the plate so as to rise above the edge of the funnel and keep it immersed. It at once rises through the salt, coloring it as it ascends. As fast as it rises, it of course leaves the plate. Hence the experimenter must make repeated additions of solution. As the fluid rises, it drives out the air before it. This would escape from the mouth of the funnel. But the balloon which has been placed there intercepts its escape. The air enters and rapidly inflates it. The ${ }^{\text {successive bolts can be thus employed for the separ }}$ pressure thus produced is slight. It cannot do more tion of material into different degrees of fineness than just fill the balloon. It cannot distend it But by having the balloon well stretched, its inflation can be made quite conspicuous.
If, by settling, the salt has left any space between itself and the walls of the funnel, the possible pressure,


MURDOCH'S BOLT FOR CLEANING DRY PULVERIZED OR POWDERED SUBSTANCES.

## AN IMPROVED NIGHT LAMP.

An invention providing means for regulating the flame of a lamp, so that when not in use the flame may be lowered and raised as required, has been patented by Mr. Theodor Bergmann, of Gaggenau, Baden, Germany, and is illustrated herewith, Figs. 1 and 2 being sectional views, and Fig. 4 showing its application as a cigar lighter. The invention consists of a regulating sleeve applied to the wick tube, which is secured to a top plate over the burning fluid by a thimble screwing into a bushing. Upon the wick tube is a sliding sleeve,


BERGMANN'S "ALADDIN" LAMP.
A, to which is secured a downwardly extending rod, $B$, passing through a tube in the fount, and carrying at its lower end a weighted block, D , adjustable on the roll by a screw thread. Near the angle of the bent part of the rod is a stop device, C , adjustable by means of a set screw, whereby the vertical movement of the rod is limited, and this may also be effected by adjusting the weighted block' when the stop device may be dispensed with. When the lamp is raised by the hand the weighted block drops so as to depend partly below the base, drawing down the sleeve to bring it even with the top of the wick tube, thus causing the flame to enlarge and rise up through the opening in the top of the hood. Upon placing the lamp on any suitable resting place, the depending block strikes thereon and rises, pushing up the sleeve by means of the connecting rod past the flame, so as to lower the flame without extinguishing it. The degree to which the flame is to be enlarged or lowered may be regulated by adjusting either the block or the stop device. It is said that large quantities of these lamps have been sold in the European markets.
For further particulars with reference thereto, address the owners, Gaggenau Iron Works, Baden, Germany.

The Great Yellowstone Geyser Now Active.
A dispatch to the Chicago Tribune sais the Excelsior geyser in the Yellowstone Park is in operation. This geyser is in the great middle geyser basin, close to Fire Hole River. It is in the form of an immense pit 320 feet in length and 200 feet wide, and the aperture through which it discharges its volume of water is nearly 200 feet in diameter. Its general appearance is that of a huge boiling spring, and for many years its true character was not suspected. Its first eruption occurred in 1880, when it revealed itself as a stupendous geyser. The power of its eruptions was almost incredible, sending an immense column of water to heights of from 100 to 300 feet, and hurling with it rocks and bowlders of from 1 to 100 pounds in weight. Its present eruption is said to be a repetition of that of 1880 . It s throwing its volumes of water 300 feet into the air, and Fire Hole River is reported to have risen two feet from its rushing floods. This is now conceded to be the most powerful geyser in existence.

## The Edison Photophone.

The editor of the Western Electrician thinks the Edison photophone possesses such vast possibilities and its achievement has awakened an enthusiasm which has not been manifest since the introduction of the telephone. It may, he thinks, serve a thousand different purposes. It may aid the business man throughout the working hours and charm him in his leisure moments. Employed as it can be for both pleasure and business, it may revolutionize life in both pleasure and b
these aspects.

## ENGINEERING INVENTIONS.

An indicator for boiler feeds has been patented by Mr. William H. Rodgers, of Whitestone,
N. $\mathbf{Y}$. It has an alarm mechanism normally held set by a fusible play, two signal disks being arrunged in con-
nection therewith, so mounted that when the pump or Lection therewith, so mounted that when the pump and
injector is working, the safety disk will be exposed and the danger disk covered, and vice versa.
A fire extinguisher for railroad cars has been patented by Mr. George. W. Oborn, of Columbus, Ohio. The invention consists in connecting the
stoves and lamps with a tank of fire extinguishing stoves and lamps with a tank of fre extinguishing
liquid, and the tank with the air brake drum or liquid, and the tank with the air brake drum or
cylinder by a valved pipe, so that in case of accident compre
the fire.
A car heating and ventilating apparatus has been patented by Mr. Jacob T. Earnest, of Jacksonvile, Fia. In combination with an air bewer
and closed water tank with spray pipes, the invention and closed water tank with spray pipes, the invention
covers various other novel features of an apparatus for covers various other novel features of af apparatus for
supplying railroad trains with pure air, either heated or cooled, and suitably moistened, while also removing the vitiated atmosphere.
A draw gear for railway cars has been patented by Mr. Chas. H. Starr, of Logansport, Ind. It consists essentially of a pair of ilanged channel gains or slots to receive the bolts by which the draw spring cage and the bolster bearing are bolted to posi-
tion, the channel irons being arranged for connection tion, the channel iron
with the draught sill.

A rail joint has been patented by Mr John V. Koss, of North Yakima, Washington Ter. It sections, with intervening spring joints, and other novel features, to provide for the expansion and contraction of the rails, and has especial reference to keeping switch rails in order, and pre
becoming jammed and out of order
A railway signal has been patented by Mr. Charles D. Tisdale, of Boston, Mass. It is a semaphore, to be operated by a weight under control of an
electro-magnet, a hollow post being adapted to contain electro-magnet, a hollow post being adapted to contain being supported by the post to throw light through windows of the semaphore arm, while there is a removable handle for turning the shaft and winding the weight cord.

## miscellaneous inventions

A cough mixture has been patented by Mr. George Wood, of Crawford, Col. . Itconsists of
extract of extract of blood root, essence of anise, essence of sassa-
fras, essence of lobelia, and other ingredients, comfras, essence of lobeiia, and other ingredienis, com-
pounded and administered in a special manner set forth.
A clasp has been patented by Mr. William Bloomberg, of New York City. The inven-
tion consists in a peculiar form of blank employed in constructing the main jaw of the clasp, for holding suspender ends without stitching, and uniting them to the suspender buckle
A ship's $\log$ has been patented by Mr. oscar Kustel, of San Francisco, Cal. This invention in a device wherein the distance sailed or steamed by a vessel in a given time will be recorded in knots, and the ecord will be open to inspection at all times.
A handkerchief holder has been patented by Mr. Stephen M. Griswold, of Brooklyn, N. Y.
This invention provides an article in the form of a brooch, with a pin, to hold a handkerchief as in a clasp, while the device may be made in gold or f
material to make an attractive ornament.
A collar and cuff drier and dampener has been patented by Mr. John G. Dixon, of New York City. This invention provides means whereby collars
and cuffs may be carried in quantities through a suitable heated chamber, and sabject to exposure equally on both sides, and afterwara be automaticall
A thill coupling has been patented by Mr. Joel S. Pardee, of New Troy, Mich. It is a simple and inexpensive coupling which may be quickly engaged with or disengaged from a stud on a vehicle thil or pole, to allow either, thills or a pole to be used for
harnessing one or more horses, while also arranged to be an effective anti-rattler
An automatic weighing scale for liquids has been patented by Mr. Paul Witteck, of Butler, N. J. It has a reversible measure, with means the measure and automatically emptying the measure when filled, the invention covering various nove features of construction and the combination of parts.
A cork holder for bottles has been paented by Mr. William Beardsley, of Beacon, Iowa. It to form a cap or hood over the cork, and with opposite to form a cap or hood over the cork, and with opposite
side arms or extensions adapted to engage a compensating neck band, which may be arranged around bottle necks of different sizes.
A method of manufacture of felt hats, caps, etc., has been patented by Mr. Frederick
W. Cheetham, of Hyde, Chester County, England. It consists in frst forming the complete body or form according to whether it is to be soft or stiff, then working
or felting a covering of fine short staple wool upon the or felting a covering of fine short
coarser body, finally finishing it.
A sweat pad has been patented by Mr. Charles J. Gustaveson, of Salt Lake City, Utah Ter. It has one or more openings or slots extending through it, combined with a hook having both ends made alike,
and adapted to have either end seated in the slot, to and adapted to have either end seated in the slot, to
constitute a roversible pad for protecting the neck and constitute a roversible pad for proter a
shoulders of a draught animal.
A sewing machine has been patented
by Mr. Charles P. Bostian, of Milton, Pa. Two needles
are carried by the needle bar at an angle to the width of
and both entering the same race, with mechanism for bringing the points of the needles into position withi he race for the single shuttle to take both loops,
making simultaneously a double row of stitches.

A wall covering composition has bee patented by Mr. Carl Straub, of Syracuse, N. Y. It is made of wood fiber, cement, and a hardening acid, compounded in proportions and manuer describe to make a composition only about half as heavy as
mortar, but more elastic, and of uniform density or rdness.
A button machine has been patented by Mr. Albert Wittig, of New York City. It consist of a press with revolving bed carrying dies and having cuting block for supporting cloth for covering enable them to provide buttons covered with the ma terial of which the garment is made.
A suspender attachment has been patented by Mr. Charles H. Scales, of Torouto, Ontario ing the continuous doubled straps forming the ends of self-adjusting suspenders to the webs, while allowin the straps to run freely, securing the ends from displacement when not attached to a garment.
A gate roller and hinge has been patented by Mr. James G. Swarthout, of Stone's Prairie the roller may turn and swith in opening and closing gate supported on the roller, forming a gate roller and hinge supported in and connected with two hinge posts,
so that the gate may be moved endwise or swung so that
around.

SCIENTIFIC AMERICAN
buildina EDITION

## MAY NUMBER.-(NO. 31.)

## table of contents.

1. Elegant plate in colors of a double house for two housand five hundred dollars, with floor plana, sheet of details, etc
2. Plate in colors of a cottage costing five thousand dollars, with fioor plans and sheet of details, etc.
Page of engravings giving a general view of the successful operations of moving
Perspective elevation and filoor plans of a house costing six thousand dollars.
3. Design for a house to stand on a knoll or high ground. Perspective and floor plans.
Perspective view and ground plan for the Orange
Heights Hotel, now erecting on Orange MountainsHeights Hotel, now erecting on Orange MountainsArthur D. Pickering, architect.
4. Half page engraving of the new United States Post Office at Springfield, Mass., and new United States
Post Office and Court House at Los Angeles, Cal. Post Office and Court House at Los Angeles, Cal. Drawing in perspective of the elegant r
Dr. S. F. Hanse at Minneapolis, Minn.
Sketch of a dwelling in Rochester, N. Y., cost about six thousand five hundred dollars.
5. Perspective and floor plans for a country house of moderate cost.
6. Elevations and floor plans for a frame dwelling. Cost about flve thousand dollars.
Illustrations giving a perspective view and fio
plans of a cottage for fifteen hundred dollars.
Repairing the foundations of a large grain mill and elevator at Providence; R. I.-Half page engrav-
ing.
Floor plans and perspective view of a substantial
dwelling. Cost eight thousand dollars. A dwelling for two thonsand five hundred dollars. Perspective and floor plans.
7. Perspective and fioor plans of two modern dwellings, costing eight thousand dollars and two thousand eight hundred dollars respectively.
Plans and perspective elevation for a two thousand two hundred dollar house.
8. Illustration showing the beautiful dwelling and
grounds of Timothy Merrick, Esq., Elmwood, grounds of Tim
Holyoke, Mass.
9. Elegant residence of Dr. J. S. Hurlbut, Esq , School Street, Springfield, Mass.
Miscellaneous contents: Relative strength of
stones and bricks.-Echoes and reverberations in stones and bricks.-Echoes and reverberations in
rooms.-Dimensions of the most important of the rooms.-Dimensions of the most important of the
great cathedrals.- Boston hot water distribution. great cathedrals.- Boston hot water distribution.

- Roofs for mills.-Combined rain water cut-off and filter, illustrated.-The genesis of a tornado. -A millstone recipe.-Lumber trade notes.parming and ventilating.-Grant memoriait for
petition.- The Arkansas dry kiln.--Paint for fresh cement.-Foreign made joinery.-Floor paints.-Large dams.-Preservation of timber.-
How to ornament a vase.-Enemies to varnish.Filling for floors.-Wooden water pipes.-Ready mixed paints.-The Ridgway refrigerator system, illustrated.-A sanitary heating appäratus, illus-
trated.-The Prentice patent metallic hip shingle. The Scientific American Architects and Builders Edition is issued monthly. $\$ 2.50$ a year. Single copies, 25 cents. Forty large quarto pages, equal to about
two hundred ordinary book pages; forming, practically, a large and splendid Magazine of Architrcruse, richly adorned with elegant plates in colors and Tith fine engravings, illustrating the most interesting
examples of Modern Architectural Construction and examples of Mo
The Fullness, Richness, Cheapness, and Convenience of his work have won for it the Laraest Circulation of any Architectural publication in the world. Sold by all newsdealers.

MUNN \& CO., Publishers,
361 Broadway, New York
ßusiness and 2ersonal.
The charge for Insertion under this head is one Dollar a linejor each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

To any one who will start a match factory we will reess a good site and one year's supply of timber. Ad ress Bay City Manufacturing Co., Bay City, Mich. Box
Double and single and steam driven punche
hears. Over 300 sizes. See ills. adv., page 333 .
Safety water columns. Cheaper than explosions or urned boilers. For illustrated price list, Reliance Gauge 'Wanted-Pate
Wanted-Patents-Manufacturing.-It is desired by patended article or a new line of manufacturing to es tablish, the merits of which can be proved, to address
with reference thereto, M. C. W. Wheeler, Peoria, Il. Steam Pipe Covering, Sectional and Plastic. Write or Pamphlet. Jno. A. McConnell \& Co., 119 Water St. thsourgh, Pa
For Sale-Important patent for printing in fast colors on all textile fabrics and in any number of colors at one
mpression. Being successfully worked in Fngland. For urther particulars apply to Worthington, 34 Leadenhall treet, London, England.
Steel name stamps, 15 cts . per letter. Steel figures, $\$$ per set. F. A. Sackmann, Cleveland, $\mathbf{O}$
The Diamond Prospecting Co., 74 and 76 W . Lake St. Chicako. Ill., gene
prospecting drills
For the specific purpose for which they are designed, Partz Electric Batter
723 Chestnut Street, Philadelphia, Pa
For the latest improved diamond prospecting drills, ddress the M. C. Bullock Mfg. Co., 138 Jackson St hicago, ill.
Burnham's turbine wheel is sold at net.price to mill Nickel Plating.-Manufacturers of pure nickel an des, pure nickel salts, polishing compositions, etc. 810
"Little Wonder." A perfect Electro Plating Machine. Agents of the new Dip Lacquer Kristaline. Complete autit for plating, etc. Hanson, Van Winkle \& Cor

Perforated metals of all kinds for all parposes. Th Robert Aitchison Perforated Metal Co., Chicago, Ill. The Railroad Gazette, handsomely illustrated, pubished weekly, at 73 Broadway, New York. Spec
copies free. Send for catalogue of railroad books.
The Knowles Steam Pump Works, 113 Federal 3t.. Boston, and 93 Liberty St., New York, have just is-
sued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single an duplex, steam and power type. This
mailed free of charge on application.
Link Belting and Wheels. Link Belt M. Co., Chicago, Iron Planer, Lathe, Drill, and other machine tools of Presses \& Die Frat

The Holly Manufacturing Co., of Lockport, N. Y. will send their pamphlet, describing water works ma

Supplement Catalogue.-Persons in pursuit of infor mation of any special engineering, mechanical, or scien-
tiffc subject, can have catalogue of contents of the Scientific Amirican Supplement sent to them free The SUPPLEment contains lengthy articles embracing the whole range of engineering, mechanics, and physica Improved fine tools for mechanics-Manufactured by tt, Athol, Mass. Send stamp for full list.
Lockwood's Dictionary of Terms used in the practice
of Mechanical Engineering, embracing those current in the drawing office, pattern shop, foundry, fitting, turn ing, smith's and boiler shop, etc., comprising over 6,00 Price. $\$ 3.00$. For sale by Munn \& Co., 361 Broadway, Ne

Planing and Matching Machines. All kinds Wood Working Machinery. C. B. Rogers \& Co.. Norwich, Conn. For best forges, blowers, exhausters, hand and power drills address Buffalo Forge Co., Buffalo, N. Y.
We are sole manufacturers of the Fibrous Asbestos
Removable Pipe and Boiler Covering. Wes Removable Pipe and Boiler Coverings. We make pure
asbestos zoods of all kinds. The Chalmers-Spence Co., asbestos goods of all kinds. The Chal
19 and 425 East 8th Street. New York.
The Improved Hydraulic Jacks, Punches, and Tub Hoisting Engines Friction Clutch Pulleys, CutHoisting Engines, Friction Clutch Pulleys, Cut-o
Couplings.
D. Frisbie \& Co.. 112 Liberty St., New York. Tight and Slack Barrel Machinery a specialty. John
reeenwood \& Co., Rochester, N.Y. See illus. adv., p. 2 . For best quality, order your steel castings from the falo Steel Foundry, Buffalo, N. Y.
Wardwell's patent saw benches. All sizes in stock Dintone Machine Co., Fitchburg. Mass.
Duplex
Dalo, N. $\mathbf{Y}$.

- Send for new and complete catalogue of Scientific and other Books for sale by Munn \& Co., 361 Broadway


## NEW BOOKS aNd PUBLICATIONs.

La Galvanoplastie, le Nickelage, LA DORURE, L'ARGENTURE, ET ile Bouant, Professeur au Lycee Char-
lemagne. Small 8vo, pp. 303. With 34 figures inserted in the text. Paris
Librairie J. B. Bailliere et Fils. 1887. In this little volume. Professor Bouant, after a brief
expase of the history and present state of the electrolytic arts, proceeds to a description of the varions pro cesses employed in electrotypy, electro-chemistry, and electro-metallurgy. The directions and formulas for
markable clearness, and any one who follows them to
the letter will undoubtedly obtain successful results, the letter will undoubtedly obtain successful results,
and that too with the simplest of appointments. The and that too with the simplest of appointments. The
electrolytic arts, in fact, are peculiar in that they need no very extensive establishments for their development, but may be practiced in the humblest of shops or in the applications of electrotypy and the other branches of electrolysis are daily becoming more numerous, this lit tle work will prove a valuable and welcome addition to
the library of the practical metallurgist, as well as to the library of the practical metallurgist, as well as to that of the amateur.
Old South Leaflets. This is the title of heir titles sumpiciets on varioussubjects of impor No. 1. Constitution:of the United States. 2. Articles of Confederation. 3. Declaration of Independence. Washington's Farewell Address. 5. Magna Charta. 6. Vane's "Healing Question." 7. Charter of Massa chusetts Bay, 1629. 8. Fundamental Orders of Connec
ticut, 1638. 9. Franklin's Plan of Union, Washington's Inaugurals. 11. Lincoln's Inaugurals and Emancipation Proclamation. 12. The Federalist, Nos. 1 and 2. 13. The Ordinance of 1787.-etc. Price, five cents per copy, one hundred copies, three dollars. Pubshed by D. C. Heath \& Co.
\% Send for new and complete catalogue of Scien fic and other Books for sale by Munn \& Co., 361 Broadway, New York. Free on application.

## 

## Hints to coriespondents.


(1) J. E. W. asks how to splice a belt in order to make it run as near like an endless belt as of splicing. A. Use hile hot, stirring in thoroughly about 20 per cent of its weight of tannic acid, or extract of tan bark. Apply to the splice and quickly clamp together. The splice shonld be made of scarfed edges extending 3 to inches back. according to thickness of belt. The sur-
face to be perfectly clean and free from oil.
(2) E. V. H. desires a recipe of some preparation that will make leather waterproof. A.
There is no way of making leather absolutely waterroof. Good tanning and currying, with the grain or air side out, and the frequent use of stuffing makes
(3) M. M.-The word lye is used to inicate the solution of a caustic or carbonated alkali, such
(4) H. J. M.-For Babbitting small oxes, use a spindle of iron turned smooth, for the journal. Set the box and spindle in proper position in moulding sand as dry as will stick together. Ram the and gently to close the opening between box and spin ay be very alightly taper, ad by gently rapping it may be very slightly taper, and
idewise, it will easily drive out.
(5) J. W. T.-The following combined ning and fixing bath is recommended:
Chloride of gold..
Sulpho cyanide of ammonium.
Hyposulphite of soda..


Dissolve the gold first in a small quantity of water, then add as above. See our book catalogue. The book by
(6) J. L. V. asks a receipt for making compressed yeast. A. This yeast is obtained by straining the common yeast in breweries and distilleries, until a moist mass is obtained, which is then placed in hair
bags, and the rest of the water pressed out until the bags, and the rest of the water pressed out until the
mass is nearly dry. It is then sewed up in strong linen mass is nearly dry. It is
bags for transportation.
(7) W. W. McV. desires a receipt for making good dark mahogauy stain for elm wood. A Boil $1 / 2$ pound of madder and 2 ounces logwood chips in a gallon of water, and brush well over while hot. When
dry, go over them with a pearlash solution having ry, go oth 2 drachms to a gallon.
(8) D. F. W. asks how vaseline is puried for barbers' use: A. The residuum from which vase ine is made is placed in settling tanks heated by After the complete separation of the fine colve it is withAfter the complete separation of the fine coke it is with black cylinders, during which process the color is nearly all removed, as well as its empyreumatic odor. See can send you, post paid, for $\$ 4.50$. See also Scien tific American Supplement, No. 153.
(9) A. E. S. asks the best preparation or waxing eilk thread for binding gut snells on to very
mall fish hooks. A. Yellow beeswax is ordinarily used. Shoemaker's wax is very good also. The following mixture will render it waterproof. Take 2 parts boiled oil, 1 part gold size, put into a bottle, shake well and
it is ready for use. Apply with a flannel, expose to the
(10) A. A. asks (1) the proper proportion or compounding sulphur and molasses, to be used as a
blood purifier, and how it is to be taken? A. Take easpoonfuls of sulphur, and 1 of cream tartar, and mix with sufficient molasses, so that it will not be too stiff It is taken in doses of a teaspoonful once or twice a day. ha purifying th $t$ is best for you to consult a physician.
(11) J. B. desires a receipt for making a good ink used for shading, with three different sized on "Inks") in Scientipic American Supplevint o. 157
(12) O. R. asks for a book from which he can learn how to stuff birds. See Brown's Practica Taxidermy, which we mail for $\$ 2.50$, or Bat
(13) C. H. D. asks how to make an arti cle called razor paste. A. Emery reduced to an im palpable powder 2 parts, spermaceti ointment 1 part, mix together and rub in over the strop. See Spon" 2, for several similar recipe
(14) C. L. L. desires a receipt for makng the biack cement or paste that is used for filling um, brown japan, and lampblack into a putty like ass, fill in the spaces, and finally clean a putty like turpentine.
(15) T. M.-The paste mostly used in mounting photographs is nothing more than pure hinned down to proper consistency with boiling water f there are lumps, it should be strained through a fine cloth. Some add a little camphor to preserve it.
(16) C. A. R. asks if a thermo-electric pile can generate enough current to run a motor, and if so, how large one should be. A. A thermo-electric bat
tery can be so used, but with very low efficiency. It size would depend on the energy absorbed by the mo
(17) S. L. S. asks: 1. About how long can a man live, without serious inconvenience, if placed inside a tight iron casing containing 100 cubic feet of air? A. A very few minutes would practically exhaus the air, for though it, would take some time to breathe
all of it, it would rapidly become so contaminated as to all of it, it would rapidly become so contaminated as to
exercise a toxic and weakening effect. 2 . Is there any exercise a toxic and weakening effect. 2. Is there any
simple means by which the air in such a casing can be kept pure enough, so that a man can live in it a longer time? A. Caustic soda or potash would absorb car bonic acid gas, and a well exposed solution of permanmove the ortaic impurities. Then a man could endure the confinement much longer. 3. What pressure per square inch is necessary to compress air to half its bulk? A. Double the atmospheric pressure, or fifteen pounds per square inch, by a pressure gauge set to zero in the atmosphere. 4. What pressure per square inch Three atmospheres, or thirty pounds to the square inch plus the natural pressure is pretty severe It depends on the constitution.

## TO INVENTORS

An experience of forty years, and the preparation of more than one hundred thousand applications for palaws and practice on both continents, and to possess unqualed facilities for procuring patents everywhere. A
ynopsis of the patent laws of the United States and all oreign countries may be had on application, and persons broad, are invited to write to this office for prices wich are low. in aosordance with the times and our ex tensive facilities far sonducting the business. Address
MUNN \& CO., office ScIENTIFIC AMERICAN, 861 Broadway, New York.

## INDEX OF INVENTIONS

 For Whith Leters Pa United States were GrantedMay 15, 1888
AND EACH BEARING THAT DATE [See note at end of list about copies of these patents.]

$33,783 \mid$
ook cover, C. F. Morgan....

Boot or shoe soles, machine for buffing, G. A. Ful
lerton..............................................
Bots or shoes, heating apparatus for, F. Batter.
Boots or shoes manufacture of, Bots or shoes, manufacture of, J. C. Iv
Wilson, for grooving the mouths of. w. I Box. See Fare box. Journal box. Music box. $\begin{aligned} & \text { Brake. } \\ & \text { brake. } \\ & \text { Brick, ma }\end{aligned}$.

## Brick, manufacturing, J. F. Clark Burglar alarm, Goulden \& Clarke. <br> burner. See Gas burner. Vapor burner.

Button machine, A. Wittig

Cable conduit and truck, w. Heckert..
able splices, locking device for, W. R. Patterson 382 ,
Can. See Mucilage can.
Can cover, milk, F. Stork.
Car brake, autJmatic. E. W. Luce.................
Car brake, electro-ma
Car coupling, . Eby.
ar coupling, W. L. Uhlen
Car door, J. .C. Wands.
Car, freight, P. Brown.
Car, freight, P. Brown.................
Car heaters, safety casing for, A. Bell
Car heating and ventilating apparatus, J .
Car mover, G. S. Currier........
Car, railway, G. M. Pull
Car, stock, H. Arms..
Car, stock, L. R. Stiles
ar vestibules, equalizer for, H. H. Sessions,
Cars, folding step for, A. J. Barber

rying, C. H. Little
ars, street indicator
Cars, street indicator for, G. A. Pidduck..
Carburetor, L. Marks.. ...........................
Carriage curtain cord holder, J. G. English
Carrier. See Trace carrier.
Cart, road, C. W. \& G. H. Jewett
artridge loading apparatus, J. H. Read........... 382, 382,984
ase. See Filing case. Folding case.
Cash and parcel carrying apparatus, H. L. Love

Casting metal mould for, S. D. Locke.............. entrifugal machine, A. Freitag. hair. See Life preserving chair. Reccining.... ${ }^{2}$ ai Check and pad protector, G. A. Meyer...
Check slips, etc.. receptacle for, H. W. Royce
Churn, T. J. Smith
Churns, washing machines, etc., device for opera
ing, J. Restein..............
Cistern cleaner, J. H. Breese
Clamp, H. E. Hathaway.
Clasp, W. Bloomberg...........
Cleaner. See Cistern cleaner.
lipser. hair, Phipps \& Bu
Cloe Water closet.
Coal hod, E. Barrath.
ock, J. A. Prout..........
Coffee mill, J. M. Waddel
oiffins, manufacture of artiflcial stone, I . Mundt. receptacles for, P. Everitt.
Collar and cuff drier
Collar and cuff drier and dampener, J. G. Dix........ Coloring matter, prodactio
dolph............................
Colter roling w. Sit Composition of matter, J. A. Kiesele. $\underset{\text { Hartman.......................... }}{\text { Confectioner's mould, s. E. Ball }}$ Confectioners, shifting gate for, D. W. Marmo......
Copal, manufacture of artiflial, E. Bchaul.. Corn husking implement, P. Kaufman. Cotton batting, making, Walker \& williams.
Cough mixture, G. Wood............................

## upling. See Ca Thill coupling.

Crank pin, lubricating, G. R. Parker Crossing, acute curve, A.
Cuffholder, J. H. Carder.
Cultivator, Blue \& Halter ...................... Curbing of artifcial stone, constructing street, C.
C. J. Everett.... C. J. Everett........... ......
Curtain flxture, z. F. Bryant..
Cushion. See Billard cushion.

Cutter. See Band cutter. Cutter bar, W. F. Kendrick. Die. See Screw cutting die.
Directory indicat.............. Directory indicator for buildings, etc., T. J.
McTikhe.............................. 382,997
Dow Doweling machine, Howell......... Williams
Draught regulator, c. E. Gras Draught regulator. C. E. Gray...
Drier. See Collar and cuff drier.
Drill. See Rock drill.
Drin stock, A. Allgoever......
Dyeing apparatus, A. Harmel.
Dyeing apparatus, U. Wind
Dyeing apparatus, C . Weldon.
Electric cables, manufacturin
Electric cables, manufacturing,
Electric indicator, J. Tregoning
Electric machines, commutator for
Testa.........................
Electric motor switch, R. H. Mather
Electric motors, switching device for, R. .
Mather... .....................................
Smith.......
Electrical agricultural syste........................
Electricul apparatus, coin operated,
Elevator. See Water elevator.
Elevator. See Water elevato
Elevator, boot, M. F. Seeley
Elevator lock, E. J. Herma
Embossing machine. M. T. Durkin
Engine. See Motor engine. Traction engine.
Eyeglasses, A. Kahn...
Eyeglasses, nose guard for, w. .... Wells.
Fabrics, implement. for turn
Eschner.....................
rexes, automatic locking attachment for

## H. Claspy Fare box w.

Fare box, W. A. Crowdus.
Fare register, W. Pigott
Fare register, W. Pigott........
Farm हate, Johnson \& Oppelt
Farm gate, L. Shepard........

|  |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |
| r, H |  |
| er, automatic stationary mater |  |
|  | Nose rings, machine for making barbs for hog, |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Flat iron heater, Modery \& Leukhardt........... 3 |  |
|  |  |
|  |  |
| Folding table, E. Babcock.......... .............. 3 | Paper fastener, xummed, J. M. Jones............. 322,813 |
|  |  |
|  |  |
| Fur animals, machine for pulling hair f |  |
|  |  |
|  |  |
| nace blocks, apparatus for deteecting le |  |
|  |  |
| anic battery, G. H |  |
| A. J. English.............................. 382,695 | Pipe wrench, R. Copland........................ 82799 |
|  |  |
|  |  |
| Gate roller and hinge, J. J. Swarthout............. 32,84 |  |
|  | Plow, sulky, E. C. Westervelt......................... 382,919 |
|  | Plowing |
|  | tbook F |
| for steam engines, flywheel, L. D. C | 53 |
|  |  |
| Governor, steam engine | Po |
| Grain binder, W. R. Raker........... ....... ...... 883 |  |
| inder. H. . . Primmore........... ............. 38.2838 | Press. See Baling press. Hay press. ${ }^{\text {Premen }}$ |
| ain binders, knot tying mechanism | Printing fim, Pi.g. |
|  | Printing machines, ini |
| Grain heater, J. Warrington | Hawkins.............. ........................ ... 882,976 |
| Grate, A. C. Morton .................. ........... 382720 | e, w |
| powd |  |
| Iter, J. | Pul |
| Hame link, M. E. Lasher.............. ......... 882.883 | Pun |
| link |  |
| Hanger. See Door hi |  |
| rness rosette attachment, R. W. Jones........... 382,880 | Punch, compound lever, C. M. Brown............... 382.447 |
| rrow. disk, L. A. Richards............ ............. 382,731 | Punching machines, blank holder for, R. J. Ship- |
| ester, J. Shickle. $\qquad$ 382 |  |
| rvester and binder | Rail |
|  | Rail, grooved girder, A. J. Moxham............. 838.001 |
| vesters, bundle | Rail joint, J. V. Koss. 388,815 |
| hams, etc., manu | Railway |
| $\qquad$ 382,798 | Railway grip, cable, S. Gibson........................ 382.950 |
| press | Railway rail |
|  | Railway signal, C. D. Ti |
| ater. See Grain heater. Flat | Railway tie, metallic, F. |
| el mould, E. J. LeGay............................. 382,888 | Ratchet movement, W. S. |
| plate, C. Doney | Reclining chair, H. C. Kree |
| eling machine, C. W. Glidden..................... 382,762 | Refrigerator, Hot |
| c. | Register. See Cash register. |
| isting Jack, W. N. B | Regulator. See Draught remer |
| lder. See Carriage holder. Handkerch |  |
| pple, O. B. Fales. | Rice |
| s. |  |
|  | Road, apm |
| Horseshoe nails, machine for making, H. A. wills.......................... 382,988 | ${ }_{\text {grack }}^{\text {gradient }}$ |
|  | ${ }_{\text {Rock drill }}^{\text {Rock }}$ |
| en........................................ 382766 | drilling |
|  | Rodents, impl |
| ant, fire, D | Koontz. |
| ators, tem <br> t... | Rods and tubes, machine |
| tor. See Boilier fear | Rods, machine for f |
| $\underbrace{\text { Direetory in }}_{\substack{\text { cator. } \\ \text { cator. }}}$ |  |
|  | Rolling mills, |
| and, M. | Rolls, applia |
| and, | Rolls, hous |
| lated wire, J. | Rovings, machine for makin |
| k. See Hoisting Jack. Lifting jack. | Saddle trees, press for fo Fink |
| nt. See Rail joint. | Safe lock |
| rnal box, J. C. Miller......................... 828.983 |  |
| y fastener, Barrett \& Baker........................ 382,680 |  |
| ys, manufacture of door, H. B. Sargent. ......... 383,012 |  |
| ader.extension, J. C. | ${ }^{\text {m }}$ m |
| mp , Babbitt \& B | cafrold |
| attachment, inc | Scale for liquids, automatic weighing, P. Whitteck. $\qquad$ |
| p, co | Scissors, buttonhole, L. C. McNeal ................ 882,988 |
| mps, manufa | Scraper, road, ${ }^{\text {d }}$ |
| P. Tho |  |
| rn, f. Rhind | Separator. See Rice separator. |
|  | Sewing machine, C. P. Bostian............ ......... 392,794 |
| the, p | Sewing machine, buttonhole, T. F. Hagerty....... 382,763 |
| eto | $50$ |
| ns | 4 |
| e-preserving chai | Stade, window, A. Hufrer........................ ${ }^{383,063}$ |
| ter. See Wazon | Shaft coupling, A. H. Mackay................... 3887765 |
| Lifting jack, R. M. Frales........................ 382.984 | Sheet metal, die for shaping, o. w. swift.......... 383,081 |
| fting jack, J. Weat | Ship's log, 0 O. Kus |
| te collecting and compa shell $\ldots \ldots \ldots \ldots \ldots . .$. | shoe. |
| Sek. see Alarm lock. Elevator lock. | sixnal |
| tock | Sleigh, bob, M. D. williams..................... ${ }^{382} \mathbf{3}, 286$ |
|  |  |
|  | roducing record |
| m shuttle relief mechanism, Z . T. McKinney.. 382 ,955 | arrester, H. Bruce |
| ricator, G. W. Brown....................... 382752 | Spinning spindle support, |
| ricator, | Spinning spindle support, A. Wood |
| pricator, E. Verny | Spring tooth, P.F. Wells ..................... - 388,887 |
| dneto generators, automatic shunt for, C. E. Seribner............................... | A. |
| suring utensil, T. B. Farrington.................. 822,0 | Finigan .............. ..... .................. 382,961 |
| Meechanleal movement, J. Witt.i. ......... ...... 3827885 | Stamps, device for holding and moistening post- |
| ical apparatus, elect | घRe, J. H. Breese.................... ....... 88.037 |
| tal articles, machine for heating and hardening, H. White. |  |
| rods, machine for reducing, H. A |  |
| 10,932 | pparatus for vessels, J. H. Snelling...... 322888 |
|  | Stirrup, T. Coady |
|  | tool, H |
| See orree milit Gupowder mili. | Stove, heating, E. A. Wiman ........................... 382 ,380 |
| ing machine, F. Lowry,...................... 88,061 | Stove or range, E. W. . Anthong................... 382,851 |
|  |  |
| Iinger, G. B. Free |  |
| M ${ }^{\text {Motor, J M. M. Brosius............................ } 3828,865}$ |  |
| rit enfine worked bs combustible gas, | Switch. See Electric motor switch. |
|  |  |



## HENRY CAREY BAIRD \& CO. Industrial Pablishers, Booksellers, and Importer $\mathbf{8 1 0}$ Walnut Sto, Philadelphia, Pa., U. S. A  and Circulars, the whole covering every branch of Sci- once applied to the Ars, sent free and freot postare on any one in any part of the world who will furnish his

##  <br> 

THE COPYING PAD.-HOW TO MAKE


The Boston Hydraulic Motor Co.
 25 Motors

CHURCH ORGANS,
all complete,
Together with all its Pat
ents, Patterns, good will
of Business, etc. efstablished 13 Years Address,
NAVAL ARCHITECTURE-AN IN teresting review, by Mr. Rh. Duncal, of the progress
that has been mead in this branch of science during
the last fifty vear. Contained in ScrENTFIC AMERI-


## 

 ARCHIPCHORLL BOLSS.

## Useful, Beautiful, and Cheap.

## To any person about to erect a dwelling house or sta- ble, eitherin the country or city, or any builder wishing

 to examine the latest and best plans for a church, schoolhouse, club house, or any other public building of high or low cost, should procure a complete set of the Architrats' and Butiders' Edition of the scientific american.
The information these volumes contain renders the and to persons about to build for themselves they will and the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail draw ngs of almost every class of building, with spec fica ion and approximate cost.
Four bound volumes are now ready and may be ob-
tained, by mail, direct from the publishers or from any newsdealer. Price, 82.00 a volume. Stitched in paper
covers. Subscript on price, per annum, 82.50 . Address overs. Subscript on price, per annum, \$2.50. Addres MUNN \& CO., Publishers, 361 Broadway, New York.

## 1ERFECT sonngPAPER NENG

The Koch Patent File, for preserving newspapers, Mag
asines, and pamphlets, has been recently moprove and

 MUNN \& CO., Publishers Sotentifio Amerioan.


TEI BUILDING OF A RAILWAF. By Thomas Curtis Clarke, Engineer of th Poughkeepsie Bridge, of parts of the New York Elevated Road, etc., with 40 illustra
tions by A. B. Frost, Walter Shirlaw, A. M. Turner, I. D. Woodward, and others. A NOVELETME, by HENRY JAMES.-"A London Life," begins in this number. SOME GENTLEMEN IN FICTION. By Robert Louis Stevenson. CORYDON-A PASTORAL. By Thomas Bailey Aldrich.
HOSPITAL LIFE. By A. B. Ward. With illustrations from drawings by J. Alden Weir W. L. Taylor, Francis Jones, and Charles Broughton.
the story of A sand Pile. By g. Stanley Ha

OARDINAL NEWMAN. By Augustine Birrell. With two portraits.
dil ine by Augusive Birrell. With two portraits.
known dramatist SiNGF. A Striking Short Story. By George H. Jessop, the well Send 2c. stamp for " 20 Questions About Railways," a compendium of valuable information
*** Among the handsomely illustrated articles in the Railway series which will immediately follow are
FEATS OF RAILWAY ENGINEERING. By John Bogart, State Engineer of New
 Horace Porter, who writes of the comforts and luxuries of modern travel. illustrated. THE RAILROAD MAN'S LIFE. By B. B. ADAMS, Jr., who was formerly in active railway service, and will tell, in a popular way, of the duties, dangers, and pleasures of the employe's life.

25 CENTS A NUMBER. \$3.00 A YEAR. For sale by all deabors. CHARLES SCRIBNER'S SONS,

NEV YORK
 or carpenter, or Round Smooth Holes. BALL ERIE, PANE CO.

 ing, and all purposes wher-
a colose orverning engine is
indispensable.





NATURAL GAS INDUSTRY AT PITTSS




## IRIP FDRGINGG.

RallWAY AND STEAM FITTERS SUPPLIES Rue's Little Giant.Injector. SCREW JACKS, STURTEVANT BLOWERS, \&c. JOHN s. URQUHART, 46 Cortlandt St., N. Y. GAS ENGINEERING, RECENT PRO

 COUNTERSINK and DRILL COMBINED.


The Countersink following the Drill, the job is finish-
ed at one operation. stving the adjusting of tools and
work twice. Made by ed at one operation. suving the adjusting of tools and
Wirt wice. Made by
WIIey $\mathbb{E}$. Kussell Mfg. Co., Greenfield, Mass.
PRANCE, IOUUIS KKAPAFERERR, 12 rue Orleans buys American electrical and mechanical goods. Inven.
tions. New York references. Correspondence solicited.
ENERY USER OF MACHINERY


 Sent free to any address.
VAN DUZEN \& TIFT, Cincinnati, 0


WFITMFPR PATPNT FURINCP IDE Automatic Engines, Traction and Portable Engines - BTrPAMM EROAD IROTOTOFRE; Foundry and Machine D
Hamisburg, Pa, U. S. A.
THE "FISHKILL" CORLISS ENCINE, Fishkill Landing Machine Co., Fishkilloon=Hudson, i. Y. ROCK BREAKERS AND ORE CRUSHERS




Proponif ro Siteel for uee in the coinarac




























## 

 E. o. mectornick, Gein: Pases Azent. Cohicngo.



## INVENTION WANTED


 Veran Appiation ot troprongen ohank
 THE MIND CURE.-BY MARY J. FIN-


## SCIENTIFIC BOOK CATALOCUE,

 MUNN \& CO., Publishers Scientific American, $\begin{gathered}\mathbf{3 6 1} \text { Broadway, New York }\end{gathered}$

## The Scienificic $\mathrm{A} \underline{\underline{\text { merican }}}$

 PUBLICATIONS FOR 1888.$\qquad$


GOING IN＇TO THE POUILTRY BUSI－

Hyatt Pure Water Co．




 Recommended．by Engineer
Corps，U．S．War Department， and the Hiphest Anthoritied
on Santation and Hydraulic
Enkineering
 Address Estmates HYATT PURE WATER COMPANY
THE HALL Shoot Line Telephone
The Ame of Eificiency and Emonomy． No dangerous electricity．Especially applicable for
Short Distance Lines between Offles and Factories， Warehouses，Stores，Mills，Hotels，etc．，or wherever in－ stant and reliable inter－communicatlon between inter mediate points is desired．

THE HaLL TELEPHONE CO． Broadway and Astor Place，New York City．
 PATENTS．
 amine improve
for Inventors．



 tain pamphlet sent free of onare，on application，con－

 patents in ail the principal countries of the
MUNN \＆Corid．
CO．，Solilitiors of Patents，



THE BACKUS MOTOR THE BACKUS


THE BACKUS EXHAUSTER


HOME－MADE INCUBATOR．－PRACTI－STFFIETBATIE．

 or Business，for Fun
RIDE WHEELS！ The best is the cheapest，and
we are prepared to show you
that THE VICTTRS Bicycles，Tricycles， Safety Bicycles Overman Wheel Co． Makers of Victor Cycles， BOSTON，MASS．
 THE BRIDGEPORT WOOD FINISHING CO NewMilford，Conn
Wheelers Patent Wood Fluler
Breing 5 Lithogen siligate paint SLLEX FLINT AN FELDSPAR．
PAMPHLET GIVING DIRECIIONS FOR FINISHNG HARD WOOD FREE TO ANY ADDRESS．


## CAS GNCINTS．



Send for Inustrated cataliogue．
fince and solesrooms ENGINE COMPANY，


Steam！Steam！
We build Automatic Engines from 2 to 200 H．P．． A Large Lot of $\mathbf{2}, 3$ and 4－H．Engines With or without boilers，low for cash
Box 15，

95 MILK ST．BOSTON MASS，
This Company owns the Letters Patent granted to Alexander Graham Bell，March 7th，1876，No．174，465，and January 30th， 1877，No．186，787．
The transmission of Speech by all known forms of Electric Speaking Telephones in－ fringes the right secured to this Company by the above patents，and renders each individual user of telephones not furnish－ ed by it or its licensees responsible for such unlawful use，and all the consequences thereof，and liable to suit therefor．

Patent Riveiod Nondich Rndiboin Bolting
Brest IN TPEIE VOOFIOD．
Specially adapted for PAPER MILLS，SAW MILLS，and wherever a BELT of UNUSUAL STRENGTH is required．
THE GUTTA PERCHA AND RUBBER MFE．CO．


The Original Unrulcanized Packing． CALLED THE STANDARD－As it is the Packing py which


ICE \＆REFRIGERATING

 CHALLENGE EMERGGGRINDNG



 THE FLORIDA STEAM HEATER． Will Never Rust Out or Explodo．
Sectional．
Portable，
Automatic． Sectional．Portable，Automatic．
Magazine or Surface Feed． 16 sizes． Send for Illus．Book and Estimates．
Pieree，Butler．\＆Pleree Mfg．Co．， Want Agent．SYRACUSE，N．Y．

## 『王曰 <br> ฐcientific gmerican <br> ESTABLISHED 1846.

The Most Popalar Scientific Paper in the World． Onls 83.00 a Yenr，incluclinn Poastage．Weekis．
This widely cir culn ited and splendidly Mlustrated paper is pubisished weekly．Every number contains six－ original engravings of new inventions and discoveries， representing Engineering Works，steam Machinery， New Inventions，Novelties in Mechanics，Manufictures， Chemistry，ELlectricity，Telegraphy，Photography，Archi－ tecture，A griculture．Horticuture，N．Natal histr，etc．
Complete List of Patents each week． Terms of Subscription－－One copy of the SCIEN－
 postage prepald，to any subscriber in the United etate
or Canada，on reeelpt of three dollins by
 Clabs．－－special rates for several
Manters．Wequa lear pextoulurs．：
Thie satest way to remit fisby．Postal Order．Draft，or Express Money Order．Money carefully placed inside
of envelopes，securely sealed，and correctly addressed or envelopes，securely bealed，and correctiy addressed，
seldom goes astray，but is at the sender＇s risk．Ad－
disel dress all letters and make all orders，drafts，etc．，pay：

MIUNIN \＆CO．
361 Broadway，New York． TPET3
Scientific American Supplement．
This is a separate and distinct publication from In size，every number contaiaing sixteen large pages full of engravings，many of which are taken from foreign papers，and accompanied with translated descriptions
THe Scientific American Supplement is published weekiv，and includea a very wide range of contents．It presents the most recent papers by eminent writers in
il the principal departments of sience and the Useful Arts，embracing Biology，Geclogy，Mineralogy Natural History，Geography，A rchæology，Astronomy，
Chemistry，Electricity，Light．Heat，Mechanical Engi－ neering．Steam and Railway ngineering，Mining， Ship Building，Marine Engineering，Photography，
＇echnology，Manufacturing Industries，Sar．itary En－ Bineering，Agriculture，Horticulture，Domestic Econo ny，Biography，Medicine，etc．A vast amcunt of fresh
and valiable information obtainable in no other pob－ lication．
The most important Ennineering Works，Mechanisms， and Manufactures at home and abrosd are illustrated and described in the Suppiement
Price for the SUPPIEMENT for the United States and
Canada．$\$ 5.00$ a year，or one copy of the ScIENTIFIC AM． ERICAN and one copy of the SUPPLEM ENT，both mailed for one year for 87.00 ．Single copies 10 cents．Address and remit by postal order，express money order，or check，
MUNN \＆Co．， 361 Broadway，N．Y．，

## Builders Edition．

The SCirntific American Archirectis And BUILDERS＇EDITIoN is Issued monthly．$\$ 2.50$ a year． Single copies， 25 cents．Forty large quarto pages，equa
to about two hundred ordinary book pages；forming a large and splendid Magazine of Architecture，rich－ Iy adorned with elegant plates in colors，and with other tine engravings；illustrating the most interesting ex amples of moderth Architectural Construction and A special feat
of a variety of the latest and best plans for private resi－ dences，city and country，including those of very mod－
crate cost as well as the more expensive． erate cost as well as the more expensive．Drawings in
perspective and in color are given，together with fall Plans，Specifications，Sheets of Details，Estimates，etc． The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any
Architectural publication in the world．Sold by all MUSers． 82.50 e year Remit to

MUNN \＆CO．，Publishers，
361 Broadway，New York．
PRINTINTG INKS．
HE＇＂Scientific American＂is printed with CHAS
Esard Sts．，Phila．，and 47 Rose St．，opp，Duane St．，N．Y．

