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| Vol. XXXII.-No. 23.] |
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| [NEW SERIEs.] | [ NEW YORK, JUNE 5, 1875.

## A NEW SYSTEM OF GAS LIGHTING.

A NEW SYSTEM OF GAS LIGHTING.
A new system of lighting public thorough fares, which for a year past has been in operation in a street in Jersey City, is certainly something novel in the practice of gas illumination, and, if we may judge from a brief examination. aided by the inventor's explanations, is an advance of considerable value considered from an economical point of view. The scheme abolishes gas works, and machines which produce gas by the passage of air through or mingling of air in hydrocarbon vapor. Paradoxical as it may seem at first, there drocarbon vapor. Par8doxical as it may seem at first, there
are no gas pipes-in short, the gas generator is located in the
the burner it is not necessary here to dwell upon, inasmuch as the essential features of the device are those relating to the oil-feeding arrangements.
In lighting a large number of lamps-from 100 to $5,000-$ it would be necessary to have a small steam engine or water power to compress the air and keep it at a uniform pressure, which may be from four to six pounds per square inch. Clock work may be used for any number of lamps under 100. A two inch main pipe, distributing right and left and as near the center as possible, the inventor informs us, would be the center as possible, the inventor informs us, would be
sufficient to supply two or three thousand lamps distributed
when the latter is transmitted through pipes. The air cost ing nothing, if it should escape-except the labor of pump-ing-the actual displacement, we are informed, would be only 64 cubic feet in 2,000 lamps in 10 hours burning, and a half inch pipe could supply this in less than five min-

The cost of operating the system has been determined by the actual working of eight street lamps using a six foot burner each. In 35 days of ten hours each, eight gallons of maburner each. In 35 days of ten hours each, eight gallons of ma-
terial per lamp were consumed, or sixty four gallons in all. This at the present price of the oil-ten cents per gallon-


## De GUINON'S SYSTEM OF GAS LIGHTING.

burner, and the invention reduces itself simply to the means of sending the requisite gas-producing material to that point in each post or fixture. Without further preamble, let us state that the entire apparatus consists of an air compresso at some central locality, several small tanks (one to each lamp post) laid under the side walk, a small air tube connect ng with each from the reservoir filled by the compressor, and another small tube which carries a petroleum product up to the burner. This is the simple plant which it is proposed to substitute for elaborate manufactories, miles of heavy piping, and innumerable meters at special points.
From the large engraving, Fig. 1, given herewith, the gen eral arrangement of the tanks in the street will be under stood; a sectional view of one of these receptacles is present ed in Fig. 2. The tank is made of galvanized iron, with top and bottom of copper, and holds forty-eight gallons, that quantity of oil being somewhat in excess of a six months supply. The hydrocarbon used is a benzine, grade 75, a product of low value and for which there is but little or no in dustrial employment. It is fed into the tank through an aperture in the top, this being accessibie through an iron cover and scuttle arranged in the side walk. The pipe, A, is the main air conduit leading from the central reservoir, and communicating with the tank by the short tube shown. Extending up from the bottom of the receptacle is another pipe, $B$, which leads to the gas burner. It is evident that, an air pressure being produced in the tank by the current from pipe, $A$, the same, acting on the surface of the oil, will force the latter up pipe, B, and so to the point of combustion. The burner employed is provided with a small retort in which the oil circulates. A portion of the oil burning below this retort converts its contents into gas; the latter subsequently passes through various passages in which it becomes mingled with the proper quantity of air, and finally escapes from the orifice, where it is ignited. The exact form and nature of
er a whole city. This may seem extraordinary, but it

than to supply the displacement by combustion of the oil in he tanks and such acci ental leakage as may occur. By such leakage, however, obviously there is no loss of gas, as
would cost $\$ 6.40$. The aggregate number of hours is 2,800 , so that, with the six foot burners, a total of 16,800 cubic feet of gas was consumed. From these data it is clear that the cost per thousand feet is about thirty-eight cents, a mere fraction of the average cost of coal gas.
On visiting lately the locality in Jersey City now lighted by this process, we were enabled to examine the practical operation of the apparatus. The light seemed to be smokeless, and apparently is as powerful as that of ordinary street gas. The street in which the lamps are located is near the river and almost unprotected by buildings, a fact which suggested to us the question of how the intense cold of the past winter had affected the gas. In answer, the inventor informed us that, although the wooden boxes in which the oil tanks were enclosed became filled with water, which froze solid and so continued all winter, the lights remained entirely unimpaired. A large conflagration of a factory in the vicinity gave, besides, an excellent opportunity for noting the effect of great heat. This, though sufficient to melt the lantern frames and burners, showed no influence on the gas, nor produced any explosion in the oil contained in the tanks. The invention would seem to be especially adapted for use in country towns and villages where no gas works exist, as it renders the lighting of the streets a matter of small expense and easily accomplished. It is also well suited for the illumination of gardens and pleasure grounds, as there can be no escape of gas to injure vegetation; and the necessity of tearing up the soil to lay heavy pipes is obviated. It may also be adapted to the lighting of buildings of any description. The tanks may be made to hold enough oil to last a year, so that filling need be done only at long intervals.
The system is protected by two patents, the most recent dated March 9, 1875 . For further particulars address the in. J.

## Srientific Gmericam.

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| Contents. <br> (Illustrated articles are marked with an asterisk.) |  |
| :---: | :---: |
| .. 358 |  |
|  |  |
|  |  |
|  |  |
|  |  |
| loon ascent, the fatal**......... 359 Key fa |  |
|  |  |
| tery for shocks (44). |  |
|  |  |
|  |  |
|  |  |
|  |  |
| 363 Paint, |  |
| ers, foami |  |
| Boilers with water, supplying ( 63 3) 363 Patents, Ifst of cinadian......... 364 |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Cement for glass and cloth (3) $\ldots .363$ Plants for hanging baskets (29) ... 363 |  |
| ar, to mike a. | ${ }_{362}^{35}$ Press, belt-ge |
| n, a tiltering (23).......... 362 Pressure in steam chests, etc., 6 (6i) |  |
|  |  |
|  |  |
|  |  |
| Driling saw p |  |
| Ebonite (10) |  |
|  |  |
| nelin | Shafts at an angle, driving (28) ... 363 |
|  |  |
| lling bodies, force of (64)...... 363 Soldering cast iron (49) $\ldots \ldots \ldots \ldots .{ }^{363}$ |  |
|  |  |
| Files, hardentng (33)..... |  |
|  |  |
|  |  |
| the centeniiai |  |
| Gas cyllinders, compressed (7).... |  |
|  |  |
| ity of. |  |
|  |  |
| Handles, wood for (20)...... ..... ${ }^{362}$ Water, boring for (15)............ ${ }^{362}$ |  |
|  |  |
| Heat (9).......................... 36i Wealth, the distribution of........ ${ }_{353}$ |  |

THE ORGANIC ORIGIN OF THE EARTH'S CRUST.
A popular theological dogma declares that life is the grand object of creation, that the composition as well as the contou of the earth's surface has special reference to its habitabili ty, and that all things show a ruling design to fit the world to be the home of sentient creatures, more especially of man.

Strictly speaking,Science has nothing to do with such dog mas. It has no means of discovering the ultimate pur poses of things, and no time to waste on their discussion Nevertheless it is difficult sometimes not to take an indirec interest in the claims of those who presume to decide such questions, at least so far as to notice how aptly the facts of Nature contradict their assertions. 'Thus in the present case it would be much easier to sustain the contrary thesis, name ly, that so far from having been made what it is that it might be inhabited, the earth became what it is through be ing inhabited; in short, that life has been the means, not the end, of the earth's development.

In the light of recent discoveries, Byron's poetic extrava gance: "The dust we tread on was alive!" becomes a simple statement of observed fact. And the earlier and more paradoxical assertion of Linnæus, that not the superficial dust merely but the very framework of the earth is the product of life, would seem to be equally true. "Fossils are not the children but the parents of rocks," he said; and Huxley declares that the whole effect of the discoveries made since his day has been to complete a larger and larger commentary on his words. The deeper we go into the history of the earth's crust, the greater the part we find to have been played by life in determining its composition and character Even the rocksher $: n$ fore accounted azoic, and of an age anterior to the beginnin, of life, are now shown to be, in all probability, of organic crigin; still more remarkable, as in process of formation to-day
The observations of Dr. Hoolare during Sir James Ross's voyage of antarctic exploration, confirmed by those of Dr. Wyville 'lhompson on the Challenger expedition, leave no doubt that the antarctic sea bottom, from the fiftieth parallel to the eightieth, perhaps to the pole, if the sea extends so far, is being covered with a fine deposit of silicious mud coninosed of the shells of diatomaceor
etons of radiolarian animals (all microscopic and inhabiting the surface water) with the spicula of sponges which live on the bottom. In many parts of the arctic sea beds, a similar deposit is known to be in process of formation. Thus, through the agoncy of minute life, immense beds of silicious rock are forming in the polar regions, similar in character to those of early geological strata. In many cases the soft and friable fine-grained sandstones thus formed in fresh water have been changed by the action of percolating water into a dense, semi transparent,opaline stone; and there is no reason o doubt that the same metamorphic agencies may convert he polar deposits likewise into a form of quartzite, a kin of rock whose organic origin was form rly unsuspected.
Throughout the broad belt of warmer water between il polar caps of silicious mud, the same accumulations are go-
ng on, but they are obscured and overpowered by an iming on, but they are obscured and overpowered by an im mensely greater amount of calcareous sediment, chiefly com-
posed of the skeletons of dead foraminifera, also microsco pic. This forms the globigerina coze, containing a large percentage of carbonate of lime and a small percentage of silica: a chalky deposit capable of conversion into lime tone and even crystalline marble by ordinary metamorphic encies
The formation of coral reefs has long been a favorite il ustration of the gigantic results effected by minute organ sms; but great as these are-and the longest coral reef ex tends, like a huge wall two thousand feet high, as far as from Boston to Chicago-the work of the little reef builders be comes insignificant in comparison with the débris of micros copic life which covers the beds of all the seas to unknown and massive as they are, are immensely overbalanced by the strata which undoubtedly owe their existence to minute plants and animals.
The cretaceous globigerina ooze is the most widely spread material of the sea bottom throughout all the great oceans, at depths from a few hundred to over two thousand fathoms. In shallower waters-and they are extensive-the gray ooze is slowly transformed into a green deposit identical in character with the greensands of the geologists : a formation which Ehrenberg found to be mainly made up of casts in a silicate of lime and alumina of the interior cavities of foraminifira after Professor Baily had discovered that such was the origin of the greenish mud from the sea bottom off the Florida coast. "In these casts, the minutest cavities and finest tubes in the foraminifera were sometimes reproduced in olid counterparts of the glassy mineral, while the calcareous riginal had been entirely dissolved away." In other places, in the Gulf of Mexico, in the South Atlantic, and in the Paific, the same transformation of globigerina ooze to green sand is going on
But the most remarkable change goes on in the extreme depths of the sea, especially below 3,000 fathoms. Profes or Thompson reports that, in crossing from the shallower regions occupied by the ooze into the deeper surroundings, the calcareous formation is found universally to pass gradu ally into an extremely fine, pure clay, which occupies, speak ng generally, all depths below 2,500 fathoms, and consists almost entirely of a silicate of a red oxide of iron and alu mina. "The transition is very slow, and extends over seve ral hundred fathoms of increasing depth; the shells gradu lly lose their sharpness of outline, and assume a kind of rollen 'look and a brownish color, and become more and more mixed with an amorphous red-brown powder, which increases steadily in proportion until the lime has almost ntirely disappeared." The geological importance of this red clay formation is shown by the fact that, in sounding be ween Teneriffe and Sombrero, a distance of about 2,700 wiles, two areas of red clay (aggregating 1,900 miles across) were discovered.
From his studies of the character and distribution of the ed clay, Professor Thompson concludes that it is not a sub tance introduced from without, but that it is produced by he removal, by some means unknown, of the carbonate of me which forms something like 98 per cent of the materi al of globigerina ooze ; that it is, in fact, the ash or insoluble residue of calcareous organisms: a supposition sustained by the reddish mud, consisting of silica, alumina, and red oxide f iron, that remains after treating the ooze with a dilute cid. But one test remains to be tried to give, if successful, the highest probability to Professor Thompson's conclusion and that is the chemical examination of globigerina, diatoms, and the rest, taken in the open sea for the constituents of the red clay. This done, we might rest satisfied that the clay is, ProfessorThompson believes, an essential element of th rganic part of the ooze, and therefore to be classed, with halk, as an organic product, not, as heretofore supposed, as all cases the result of the disintegration of older rocks. The significance of this admission of clay to the list of or anic products can scarcely be over estimated, for it compel us to push back the probable antiquity of life to periods $s$ remote that the Lower Silurian epoch becomes relatively modern. It is, as Professor Thompson observes, impossible to avoid associating the red clays of existing deep seas with the fine, smooth, homogeneous clays and schists of the re motest geological periods, formations which, more or less metamorphosed, obtain such a vast thickness in the so lled azoic strata
Reviewing the results of the Challenger expedition in this de of research, Professor Huxley, assuming the correctness of Professor Thompson's hypothesis, shows how, by the agency of the microscopic plants and animals which are fill ing existing seas with silicious, cretaceous, and clayey sedi ments, the entire crust of the earth might have been devel nto opal or quartzite," he says in conclusion, "and chall
into marble, so known metamorphic agencies may metamor phose clay into schist, clay slate, slate, gneiss, or even gran-
ite. And thus by the agency of the lowest and simplest of organisms, our imaginary globe might be covered with strata of all the chief kinds of rocks of which the known crust of the earth is composed, of indefinite thickness and extent."
The agency of organic acids in precipitating from chaly beate and other mineral waters our beds of iron ore, our veins of copper and other metals, according to Professor T. Sterry Hunt, falls in here as another indication of the vast lmost omnipotent, influence of life in determining the aith's mineral character, and consequently its geology, gegraphy, flora, fauna, and the rest.

## ROGRESS OF RAPID TRANSIT IN NEW YORK CITY

 The State Legislature has granted authority to the Elevated Railway Company, to extend its line northerly to the Harlem river, and it is said that the new work will soon be commenced. At present there is a single track supported on single iron posts over the sidewalk, commencing at the southerly end of Greenwich street, near the North river, and extending north as far as 30th street on Ninth avenue, a distance of $3 \frac{1}{2}$ miles. It is well patronized, but its capacity is limited. Under the new powers given to the corporation, the work is o be enlarged. The company has lately repaired the present track, put on wooden crossties, changed the gage, etc. A small space is left between each crosstie, and the bed of the road is not, therefore, quite a complete deck. The Railroad Gazeite questions the propriety of using these crossties, believing them to be unnecessary in respect to strength, and likely to result in annoyance to pedestrians, owing to the drip caused by rain and snowWith a view to strengthen the track, the Company has also lately added four braces or struts to each column, exending from the upper part of the column to the under sides f the track girders, with a longitudinal reach of about three feet. The Gazette says: "Whatever may be the object of hese struts, their actual effect is the transmission of unbal. anced longitudinal side thrusts to the columns, which bend, quite perceptibly, from the direction of approaching trains. These columns are ill suited to withstand side thrusts, and the frequent application of such can hardly fail to prove in jurious. As every train bends all the columns over which it passes, more or less, it may be found a wise economy, in proonging the life of the structure, to entirely remove these struts, which have just been attached at no small expense." We are sorry that our cotemporary is not better satisfied ith the improvements that have been made. Its fears as to he effects of the struts on the stability of the columns are in our view unnecessary. The Company appears to have done he best it knew how under the circumstances, and all the patrons of the road are pleased with the improvements.
A portion of the new Underground Railway, on Fourth venue, has just been opened for traffic, namely, from the Grand Central Depot at 42nd street, northerly to 98 th street, ver two miles. All the trains of the Harlem, Hudson River, and New Haven Companies now run underground, and their withdrawal from the surface of Fourth avenue gives great atisfaction to the inhabitants residing on the line. The vibation produced by the passage of trains is scarcely noticea le in the adjoining houses. The avenue surface above the ailway tunnels is now being repaved, and will soon present most beautiful, attractive appearance. A stranger in pass ing through this portion of the avenue would be surprised if old that, directly under his feet, the trains of three grea ailways were flying along at lightning speed. The forty un locomotives are no longer seen or heard.
The underground tunnels are three in number, built side by side, consisting of a central single arch tunnel of 26 feet 8 inches width in the clear, for two tracks, and two singlerack tunnels, 16 feet wide, one on each side of the central The central tunnel is spacious, well aired, and tolerably well ighted, by frequent central openings through the roof. It s a complete success, being much more pleasing to the trav ler, and far better ventilated, than any of the tunnels of the London Underground railways. The single track tunnels, owever, are defective in respect to ventilation; but they could be easily rendered satisfactory by the use of mechan al means for introducing additional air
The value of property along this portion of the line has augmented since the tunnels were authorized. The same may be said of property at the northerly or Harlem portion of the avenue, where the tracks, although not arched, are laced below the street surface, and bridged at the stree rossings. But the contrary is the case along that portion ccupied by the viaduct, from 98th to 116 th $k$ treet. The solid granite walls of this structure occupy the central por ion of the avenue, for a width of 50 feet, and rise from 10 o 30 feet above the street surface. The prospect of a blank tone wall directly in front of one's window is not considered ery inviting by householders, and the price of property ere is comparatively low.
The State Legislature has also passed a general law, unde wich commissioners may be appointed in any city in the State, with power to locate a steam railway, and convey a ranchise for construction, to stock subscribers.

## GREAT GUNS.

It was thought by our government, not long ago, that a 1 ach cast iron gun, able to throw a 500 lbs . ball a distance of mree miles, was about as big a thing in the way of arma rent as would ever be wanted. And so the forts in New York harbo: and other places were supplied with them t great expense. The visitor at Forts Hamilton and Torep kins, down the bay, will see long rows of these grim mon kins, down the bay, will see long rows of these grim mon
against floating enemies. Compared with more recent guns they are now mere pigm'es, of no sort of consequence, and the quicker they are broken up and removed the better. Mr. Menelaus, new President of the Iron and Steel InstiMr. Menelaus, new Presid England, says: "Mr. Longsden informs me that they are making at Essen, at the present time, 14 inch guns of steel, which weigh, when finished, $57 \frac{1}{2}$ tuns, carrying a shot of 9 cwt. 91 English miles, using a charge of 210 lbs . of gunpowder. They are about to make steel guns of the fol lowing capacities and weights: $15 \frac{8}{4}$ inch bore, 30 feet long, weighing 82 tuns, using 300 lbs . of powder, with a shell of $1,500 \mathrm{lbs}$. weight; guns of 18 inches bore, 32 feet 6 inche long, weighing 125 tuns, using 440 lbs . of powder, with shell of $2,270 \mathrm{lbs}$. weight. Mr. Longsden demurely adds 'It is calculated, for the present, that these guns will be heavy enough to destroy any armor a ship can carry.' In gloating over the destructive properties of these weapons, he is leaving out of his calculation, perhaps, the flash of light ning ships which Mr. Reed is about to build, and which may under smart management, be able to get out of the way of such a conspicuous object as a shell weighing over a tun even when fired with about a quarter of a tun of gun powder.'

## THE DISTRIBUTION OF WEALTH.

We cannot hope to give, in the brief space here at our disposal, more than a passing notice to a few of the more salien thoughts in the admirable address recently delivered by Mr David A. Wells, before the American Social Science Associa tion, at Detroit. The subject, "The Accumulation and Dis tribution of Wealth," is one which relates to the much dis cussed relation of capital and labor, regarding which no on topic exists more encumbered with sophisms and popular fallacies. In these times, when the latter underlie a constant succession of agitations, ranging from the French commun boldly spoken and widely published, are doubly welcome We commend them to those who would limit the distribution of wealth, who believe in the subversion of the relation of employee and employed, who denounce the substitution of machines for hands, and indeed all who, while ostensibly laboring for the imaginary rights of a semi-deified idea dubbed the working man, are themselves the main obstacles to the advancement and to the amelioration of the real griev nces of the laboring poor.
Mr. Wells points out that never before has man been able to produce so much with a given amount of personal effort. The productive power of this country since 1860 has inreased 20 per cent, and there is no more curious incident of this continuing progress than the fact that, in staple manu factures, the abandonment of large quantities of costly ma chinery, and its replacement by new, is periodically rendered matter of absolute economical necessity to produce mor perfectly and cheaply, and at the same time to avoid the destruction of a much greater amount of capital by indusqria rivalry. On the other hand, a highly increased consuming power on the part of the masses is evident, showing a corresponding rise in the standard of comfort. Despite this, however the difficulties of earning a living are not lessened, the cry of the poor is as loud, and the discontent with the irregugularities of social condition even more strikingly manifested. The relative position of poor and rich,in other words, remains practically unchanged, although every one knows that the benefits conferred by Science and invention have fallen on all equally. The humblest laborer of the present day possesses luxuries which kings not many years ago could not obtain; but still, if a disparity exists between him and other men, due no matter to what cause, he becomes the propounder of that interminable social problem which,stripped of all dis guises, amounts to the reduction of all men to the level of the weakest in mind or body, and the prevention of any uture inequality by the abolition of every species of reward for superior effort, skill, or attainment.
There is no doubt but that, as Mr. Wells in another por tion of his address remarks, the doctrine of every man for himself is a pernicious one from a social point of view. Society must protect itself; it mustlabor for its own benefit as if it were a body physical, and each member is thus compelled to work for the welfare of his fellows in order to serve his own material interests. The conditions precedent, how ever, to the future progress and well being of society are not merely that shall be increasing abundance, but that it shall be distributed among the masses to the greatest extent consistent with the retention and exercise of individual freedom. To gain this last end, demands have been made extending to the cutting down of the working time to six hoursper day and the actual per capita division of all the ealth of the country or of the world
Mr. Wells shows very clearly the fruitlessness of these propositions, by pointing out that. even with the better mode of living wrought by the introduction of improved machinery, people must labor as much as they do now, in order to main tain themselves in their present condition. There is not enough capital in existence to allow of reduced laboring hours. The maximum value of the annual product of this country is $\$ 7,000,000,000$; and of this, nine tenths must be immediately consumed in order that we may live, and to make good the loss and waste of capital. The result has been that, after 250 years toiling as a nation, we have only managed to get three and a half years ahead in the way of subsistence If now, as a whole people, we should stop working, fou years would be more than sufficient to starve three fourths of us out of existence, and reduce the remaining one fourth to barbarism. If the annual profits of the country could be divided among the inhabitants, it would give each an income of but $\$ 175$ a year. The average annual earnings of com-
mon unskilled laborers is about $\$ 400$; or allowing each man to support three other people, this would average $\$ 100$ to each individual. The wealth of the country, according to Mr. Wells' estimate, is $\$ 25,000,000,000$, which, if divided
among the inhabitants, would be $\$ 6,000$ each. The division, however, would be of short duration, as the money would in vitably find its way back into the hands of the most pru nent. cunning, and skillful.
In conclusion, Mr. Wells said that " it is entirely within the power of society to effect a remedy, by adopting agencies whose simplicity and effectiveness long experience has roven beyond all controversy. But herein lies the difficulty Like Naaman, we are anxious to be cleansed, but, like him, expect to be called upon to do some great thing, and are apt to be disappointed when we are told that the simplest measures will prove the most effectual. In point of natura esources, we have all we can desire. To make these pro ductive of boundless abundance, there must be industry and economy on the part of the individual ; and on that of society guarantee that every man shall have an opportunity to exert his industryand exchange its products with the utmost reedom and the greatest intelligence. When society has done this, we shall have solved the problem involved in the relations of capital and labor so far as the solution is within the control of coöperative human agency; for in giving to each man opportunity, conjoined with freedom and intellience, we invest him as it were with crown and miter, and make him sorereign over himself."

## THE DURABILITY OF GLASS.

It is well known that many kinds of glass, especially when submitted to the influence of moist air, do, in the course of time, undergo certain changes; the polish is tarished, the transparency diminished, while the surface becomes covered with thin iridescent layers, small fragments of which peel off, while threads show themselves in the mass. All kinds of glass are not equally subject to these changes; but certain qualities possess the tendency to un ergo such modifications in the highest degree. They show, ometimes in the course of a few days or weeks, a very slight fflorescence on their surface, which we should be very much nclined to consider to be dust. But in order not to be de ceived, it is well to apply the microscope and chemical ana ysis; and then, in many instances, the supposed dust is proved to be composed of transformed glass. Some kinds o glass soon become covered with an exceedingly thin layer of moisture, which causes the dust to adhere, and the glass ever shows a fresh, clean, or brilliant surface
These changes may be observed in the highest degree, and studied the most easily, in glass which has been buried a ong time. Such glass, when unearthed, is found to be opaque, almost through its whole mass. It has often lost its solidity, and consists of a number of thin and opalescen layers. We have had the good fortune to obtain specimens
of glass recently found in an ancient temple on the Island of Cyprus. It had been buried for 3,000 or 4,000 years, and most of it exhibits an opalescence, surpassing in beauty the finest mother of pearl. For these specimens we are indebted to General Di Cesnola, who made the collection of Cyprian antiquities known by his name, now belonging to the Metropolitan Museum of Art, New York city. General Di Cesnola has returned to Cyprus in order to continue his investigations, and, if possible, secure for our country a series of interesting antiquities forming the intermediate link which ucceeded Egyptian and preceded Grecian art.
Colladon states that he discovered that, if our modern glass is buried for a long time deep in the earth, it becomes lexible. and may be changed in form withoat being broken but that, when again exposed to the air for some time, it beomes hard and brittle as before.
The modifications which glass undergoes in the air are specially due to water and carbonic acid. It is well known hat many of the hardest minerals, such as felspar, become disintegrated and change their nature entirely under the in luence of these two agents. Their destruction is sure, and s only a question of time. All the particles soluble in water are gradually washed away; while, in regard to the oth ers, when they are not carried off by mechanical action, they emain in the place where the disintegration happened. It is the same with glass. The silicic acid, which, in glass, is combined with an alkaline base, is set free by the carbonic acid of the air, which combines with the said alkali. The alkaline carbonate thus formed is dissolved by the water and washed away; and finally there remains, in the place of he glass, nothing but the almost pure silicic acid. Accord ing to Griffith, all very ancient glass proves by analysis to possess this composition. Hausmann has analyzed glass which had been buried for a long time. It possessed an opaescent surface, was opaque, and disintegrated; while only the interior layer was still transparent. He found that the opalescent surface contained almost no alkali, that the lime as well as the sub-oxide of iron, had been carried off, and that the transformed mass contained nearly 20 lbs . of water. We found that the Cyprian specimens also, alluded to above, contained no trace of alkali, consisting as they did of an al ost pure and beautifully opalescent silicic acid.
The first things carried off by the water are the soda and potash. Then follows the lime, which is less soluble. This was especially verified by Bingley, who analyzed specimens of glass which had, for various periods of time, been sub merged in a lake. The action of water on glass was first investigated by Scheele, and is very remarkable. According to the old experiments of Bischof and Fuchs, if a good, hard glass is placed in water, after having been finely pulverized, when placed in contact with it, which reaction can only be
ue to carbonates of the alkalies. Pelouse made recently the same experiment; and not being aware of the older experiments, he announced it as a new discovery.
A glass containing 77 per cent silicic acid, and thus quite ard, when finely pulverized and treated with water, gives to the latter over 10 per cent of its substance. This consists, however, not entirely of alkaline ingredients, as a small por tion of the silicic acid dissolves at the same time. In order to comprehend the latter statement, it must be considered hat insolubility is only relative; there is scarcely a substance which is absolutely insoluble. Water drops constantly falling will at last perforate a stone, so that every drop must carry off some of the substance. Water kept in glass bottles will ultimately dissolve traces of the silicic acid of the glass, and many springs of water contain silicic acid, as the chemical analyses of several kinds of spring and well waters have de monstrated.
The influence of carbonic acid on moistened glass gives ise to many interesting experiments. Pulverized glass moistened with water absorbs carbonic acid from the air, and becomes effervescent. If the glass powder be boiled with the water, it will, after cooling, absorb carbonic acid more rapidly. The researches of Louis ou pulverized felspar show that this mineral, which resists most chemical agents so successfully, is easily disintegrated by simple boiling in water. Experience shows that the various kinds of glass found in commerce behave in various ways when exposed to moist air. And why should it be otherwise? These various kinds of glass differ in their chemical composition, in the ingredients used, and in their proportions. They differ in molecular structure, in thickness, mass, and solidity, all of which details affect the properties. A the same time, whatever be the physical or chemical condition of the glass, that is, its molecular state or composition, it is certain that the destruction is more rapid in proportion as a greater surface is ex posed to the attacking atmospheric agencies. This being the case, it is an interesting problem to find out which kinds of glass are, by their chemical composition, best adapted to resist these atmospheric agencies.

## Government Tests for Metals.

Among the recently passed acts of Congress was a provi sion for the appointment of a Board of Experts to test the Strength and Value of Iron, Steel, and other metals. The President has appointed the following persons to constitute the Board, namely : Lieut. Col. T. T. S. Laidley, President; Commander L. A. Beardslee, Lieut. Col. Q. A. Gillmore, Chief Engineer David Smith, W. Looy Smith, A. L. Holley, R. H. Thurston. Secretary.
This Board of seven persons has organized and divided itself up into fifteen separate committees of three individu als each. W. Looy Smith is chairman of four of the com mittees, R. H. Thurston chairman of three, Lieut. Col. Gil more chairman of two, A. L. Holley chairman of two, and Chief EngineerSmith chairman of one.
Most of our modern scientific discoveries are the results of investigations made under adverse circumstances, in many cases by obscure persons living in penury; in others, by teachers or college professors of limited means, oppressed by laborious professional duties. Of late the idea has begun to prevail that the true way to promote original investi gation is to employ prominent men at the expense of the government, giving them good salaries, comfortable quar ters, and first-rate apparatus for experiments. Relieved of all anxiety in respect to making a living by other duties, it is supposed they thus will be able to devote themselves so exclusively to Science that the boundaries of knowledge will be rapidly extended. The present Board has been created on the above idea. All the members are persons of ability, and if we do not now learn a thing or two that is new about me tals, their strains and qualities, it will probably be because nothing remains to be discovered. But our expectations of the present Board are very exalted, and, as fruits of their labors, we hope to chronicle many early, interesting, and in portant discoveries.

## SCIENTIFIC AND PRACTICAL INFORMATION.

## the propagation of celery.

Celery is a native of Norway and Sweden, where it grows near the edges of swamps. This plant is rarely cultivated as it should be, hence the stunted specimens which appear in our markets. A deep trench should first be dug, at the bot tom of which a layer of sticks of wood, say six inches thick, should be placed, a drain pipe being placed endwise upon one or both ends of the layer. The sticks should be then covered with about a foot of rich mold, wherein the plants should be set, in a row and about five inches apart. The plants should be kept well watered, the water being supplied through the drain pipes, so that, passing through the layer of sticks, which serves as a conduit, the water is supplied to the roots of the plant. In earthing up, care should be exer cised to close the stems of the plant well together with the hand, so that no mold can get between them. The earthing process should be performed sufficiently frequently to keep the mold nearly level with the leaves of the outside stems. If these directions are carefully observed, the plant may be grown at least four feet in length, and this without impair ing the flavor, which deterioration is commonly noticed in overgrown vegetables and fruits.

## hosphoros cristals

M. Blondlot announces that crystals of phosphorus may be $112^{\circ}$ Fah Theng the upper portion of the tube.


This steamer is now about to commence her regular traffic between England and France, and naval authorities will soon have their doubts as to the success of Mr. Bessemer's invention resolved. Whatever be the fate of the ingenious device of the renowned inventor, there can be no doubt but that the vessel is a magnificent experiment. The voyage is about 22 miles in length; and steamers of 400 or 500 tuns tuns burthen, and 300 or 400 horse power, have been hither to found large enough for the traffic. But the Bessemer is 350 feet long and 40 feet broad, as large as many of the Atlantic steamers, although her tunnage is somewhat less than her dimensions would indicate, owing to the low freeboard at each end of the vessel, as shown in our first illustration. Her engines have already indicated 4,600 horse power, which aggregate is divided between two pairs of paddle wheels. aggregate is divided satween toos not answer all expectations, the new ship will be a great benefit to invalids, for she will shorten the time required for the passage to a little more than one hour. Our second illustration shows the general appearance of the deck of the steamer, with the promenade on the top of the oscillating saloon.
At a recent meeting at the Institute of Naval Architects, London, a discussion on this ship took place; and Admiral Sir Spencer Robinson stated that he was on board the Bessemer when she left Hull (where she was built), and the ship proved herself to be remarkably steady in a very heavy sea; and Mr. J. Scott Russell stated that Mr. Reed, the designer (who was present at the meeting), had succeeded in building a vessel of the maximum stability in a cross sea, besides endeavoring to gain an advantage by the use of the Bessemer saloon. All the speakers complimented the designer on the speed and behavior of his vessel, and anticipated very quick travel in her, without regard to wind or weather. It was stated by Mr. Scott Russell that it is in contemplation, by the French Government and the Northern Railway of France, to construct a deep water harbor at Calais, and so avoid the landing of passengers at half and low tides at the long wooden jetties which traverse the great width of sand that fringes the coast. This improvement would make a saving of perhaps 15 or 20 minutes in the journey from Dover to the Calais railway depot

## Mechanical Effects of Light--The Radiometer

At a recent meeting of the Royal Society, at Burlington House, Mr. William Crookes, F.R.S., read a paper detailing his new discoveries on the action of light, and illustrated his remarks by experiments. It had long been supposed that no direct mechanical effects could be produced when luminous rays were allowed to fall upon one end of a most delicately balanced lever arm suspended in vacuo; but the author of the paper proved conclusively, by experiment, that not only heat, but also luminous rays, were capable of producing direct mechanical effects; so that, by the employment of a new instrument (called by him a radiometer), it was as possible to measure the intensity of the rays of light falling on it from either side as it was to measure the rays of heat with a thermometer.
The radiometer consists of four small pith disks, fixed at the extremities of two crossed arms of straw, balanced upon a pivot at the point where the straws cross each other, so that they can spin round on the pivot. The pith disks at the extremities of the four arms are white on one side, and blackened with lampblack on the other. The entire arrangement is inclosed in a glass bulb, from which the air is removed by the aid of a Sprengel's air pump. The disks and arms spun round rapidly when submitted to the action of light, but dark radiant heat had no effect on them. When submitted to the action of light, from which 95 per cent of the heating rays had been cut off, by means of the interposition of a plate of alum, the disks still rotated, though with slightly decreased velocity. Contrary to what might have been expected, it was the blackened surface of the disks which was repelled by light. In order to test Professor Osborne Reynolds' suggestion-that the effect of repulsion might be produced by residual vapor in the bulbs, and not directly by ra-diation-Mr. Crookes exhibited the sameeffects with a lever arm of platinum, suspended by an arm of platinum, the whole of which had been heated to redness again and again, during thirty-six hours of exhaustion by the Sprengel pump, so that it was difficult to suppose that any residual vapor, competent to produce the observed effects, remained in the bulb.
Mr. Crookes further stated that, in some refined experi ments made ly Dr. Balfour Stewart, at Kew Observatory, when rapid motion was obtained in vacuo, radiation was ob tained outside; while in Mr. Crookes' experiments radia tion was produced outside, and motion in the vacuum, so that the experiments appeared to be the converse of one an other. The lever arms used in some of the experiment were suspended upon single fibers of glass, so thin that when one end of the fibers was held in the hand, the othe portion would fioat about like a spider's thread, and usually rise until it took a vertical position. The whole apparatus was of the most delicate description, and was made by Mr . Gimingham.

Petroleum Oil.-Good petroleum should be colorless of light yellow, or with the faintest tinge of violet. It should have no unpleasant odor, and at $59^{\circ}$ Fah.,should have a spe cific gravity not exceeding 0.804 , or not less than 0.795 . When shaken with sulphuric acid diluted with its own bulk of water, it should only color the acid a light yellow, becoming itself lighter in color by the treatment. At $95^{\circ} \mathrm{Fah}$., it should not burn when a light is applied.


Fig. 2.-THE NEW SWINGING SALOON STEAMER BESSEMER.-THE DECK AND UPPER PART OF THE SWINGING SALOON

The International Exhibition of 1876.
English manufacturers have scarcely done with the Vienna Exhibition of 1873 before they are officially invited to take part in a similar international demonstration in 1876. This time, huwever, the scene shifts from the old world to the new-from Vienna to Philadelphia-the actual raison d'être of the exhibition being to celebrate the hundredth anniversary of American independence. For this purpose, a lar $_{5} \mathrm{e}$ part of Fairmount Park, one of the boasts of Philadelphia, has been allotted, and since many months engineers and contractors have been pushing on the work with untiring energy; for although a year has yet to pass before the exhibition opens, unceasing labor will be necessary to complete the task.
We shall in due time publish full drawings of the designs and construction of the various buildings, but we may take this opportunity of giving some idea of the scale of the exhibition. There will be five main structures-the Indus trial Hall, the Machinery Hall, the Art Gallery, the Horticultural Pavilion, and the Agricultural Hall. Besides these, there will of course be the numberless smaller buildings in
the park, which will spring up of necessity in all directions. The main building is constructed chiefly of iron and glass, and in its general design bears a marked resemblance to the Great Exhibition of 1851. It lies about due east and west, and covers a rectangular area 1,880 feet by 464 feet in width. The greater part of this large building is only of one story, the hight being 70 feet. At the corners are four towers 75 feet high, and in the center of the building the roof, for the space of 184 feet square, is raised, and at each corner is placed a tower 120 feet high. The total areas of this build ing are as follow :

| Ground floor. | Acres. $.20 \cdot 02$ |
| :---: | :---: |
| In galleries. | $0 \cdot 85$ |
| In towers. | $0 \cdot 60$ |

In the direction of its length, the building is divided into seven parts. In the center is a main'avenue 120 feet wide and 1,832 feet long; on either side is an aisle 48 feet in width, then two more avenues each of 100 feet, and between them and the wall of the building on each side are two other aisles of 24 feet. Three transepts of the same width, and divided in the same way, break up this enormous hall, and destroy the monotony of a long, unbroken roof line.
The Machinery Hall is also on a grand scale, but neither its design nor construction call for special remark here. It is 1,402 feet long and 360 feet wide, with an annexe 208 feet by 210 feet, and the area covered is 12.82 acres, the available floor space being 14 acres, including the galleries. This building is divided into two main avenues, each 90 feet wide with a central aisle, and one on each side, all 60 feet wide. In the center is a transept 90 feet wide. The annexe already mentioned is to be devoted to the exhibition of hydraulic machinery.
The Art Gallery resembles somewhat in general design the corresponding building at Vienna. It is built of granite,
iron, and glass, so as to be practically fireproof. It is 365 feet long, 210 feet wide, and 71 feet in hight.
The Horticultural Building is a large and elegant structure of glass and iron, 383 feet long, 193 feet wide, and 72 feet high. The Agricultural Hall is also of great dimensions, and of some little architectural pretensions. The materials employed are wood and glass. The general plan consists of a long nave crossed by three transepts, and the leading architectural feature is a Gothic Howe truss. The nave is 820 feet long and 125 feet wide. The central transept is 100 feet in width, and the outside ones 80 feet, the hight being about 75 feet.
Such is a very general outline of the exhibition buildings, which, covering an area of about 50 acres, will be opened in Philadelphia in May, 1876, and to which English manufacturers are invited to come with their exhibits. It should be mentioned that it is not a government undertaking, but simply a public enterprise, to which, however, the government has lent its support by a payment of some $\$ 200,000$. The esponsibility of failure or success rests, therefore, with the promoters; but we bolieve we may say with certainty that
American public spirit will carry through the exhibition to a triumphant conclusion, even if a pecuniary loss should be sustained. With this matter, however, we have little to do, but it is a question of paramount importance whether there exist sufficient inducements to English manufacturers to encourage them to come forward as they have done at previous foreign international exhibitions, or whether the probable disadvantages are too certain to justify their incurring the arge expense and great trouble which must inevitably attend the representation of British industry.
It must be evident at once that the disadvantages, if not many, are at least serious. The distance to be traversed, and the cost attendant upon the transport of goods, are of themselves sufficient reasons to discourage many, and we think it is to be regretted that the English Commission can offer no facilities for free transport under government aid, such as will doubtless be afforded by some foreign governments But the most serious objection is found in the existence of the prohibitive import duties, which rule in the United States, and which effectually check competition of foreign with native manufactures in many branches of industry Again, the English manufacturer fears, and doubtless his ears have some good foundation, that any special merits possessed by the objects he exhibits will, unless protected by patent right, or by secret of production, be copied or im proved upon by some appreciative American competitor. These objections must weigh most powerfully with a large
number of manufacturers, and especially with those who would, under more favorable conditions, crowd the space allotted to the British section in the Macbinery Hall.
On the other hand, the Philadelphia Exhibition offers strong inducements to exhibitors, above all to some of a certain class. The facilities afforded by the United States patent law have been taken advantage of by a large number of inventors, who, having thus secured their inventions, have every reason for gaining as much publicity as possible, and may do so, not only without fear that they will be grossly pirated, as was the case in the Paris and Vienna Exhibitions, ure as to create a demand in the United States, they will be able to make advantageous arrangements during the period of the exhibition, either for the sale of their American patents, or for the granting of licenses under them. British exhibitors will also be dealing with an English-speaking, ap preciative nation, always eager to adopt anything of promise.
Another powerful inducement is found in the fact that English manufacturers will not contribute their exhibits only for the inspection of United States visitors. For a long while past American manufacturers have been pushing their rade with great success in the various countries of South merica, and these countries will look with interest to the hiladelphia Exhibition as a means for making them better acquainted with the United States market. If English exhibitors ref rain from contributing, they will lose the oppor unity thus afforded of entering into direct and profitable competition, as the objection of prohibitive tariffs does not pply in this connection, and English makers can far outstrip those of the United States in point of price.
In all branches of the industrial arts, English exhibitors have strong reasons for being present, because not only can the producer in this country compete even in the face of the high duties, but the people of the United States, while they possess keen appreciation of the beauty of form and material,
are not able either to originate, or even to imitate, high class productions of this nature. That this fact is well known mongst manufacturers is evidenced by the numerous and extensive applications for space in the Industrial Hall made to the English commission. The area originally allotted to Great Britain and her colonies in the building was 46,000 square feet, and already the applications have exceeded a space of 60,000 square feet for the United Kingdom alone, while Canada demands 30,000 feet, and all the remainder of ur colonies have yet to be provided for. These applications, moreover, do not include those for hanging exhibits, and for hese 27,000 square feet for carpets alone have been applied or. These facts indicate that in the Industrial Hall, at all vents, this country will be powerfully represented.
Regarded from a higher point of view than that of immediate trade benefit, it may be urged that a powerful and concerted action on the part of British manufacturers may do much towards breaking down the barriers existing in the channels of free trade with the United States. No better ar of appealing to the people of that country in favor of this object could be found than by thus convincing them of
the cheap producing power of England: but we think that the cheap producing power of England: but we think that
the chances of success are too remote to encourage our manuthe chances of success are too remo
Fortunately English exhibitors will have facilities for bringing forcibly under the notice of the American public the difference in cost between free goods and those subjected o existing duty, by marking on each exhibit the actual price, and that made necessary through protective policy.
Judging from present appearances, we believe that the pace in the Industrial Building allotted to this country will be crowded to excess, while that in the Machinsry Hall will be but scantily filled. The Agricultural Building will, as we gather from (in our opinion) the somewhat premature nnouncement of the English agricultural engineers, be left without any exhibits of machines and implements belonging to this class,and we fear that but little space will be required in the picture galleries for English paintings or statuary.
Upon one all important point English exhibitors have good reason to congratulate themselves. The government has isely placed at the head of the British commission the man whom those who had to do with the Vienna Exhibition have earned to place perfect confidence. Mr. Philip C. Owen will find, we feel sure, a far less onerous and ungrateful task before him than that of 1873, and the liberal grant made by or Government will enable him to render more assistance to exhibitors, and to carry through his work in such a way as to reflect credit upon the country and himself.-Engineering.

Purification of Metals by Filtration.
If the substance of which a filter is composed has no attraction for the particles of the liquid to be filtered-that is, not wetted by it-the interstices of the filter do not act like capillary tubes, and the liquid will not pass through. Mercury will not run through a very fine sieve of iron or copper wire unless the wire be amalgamated; and if this be done, although the meshes be very fine, the mercury will pass through easily, while any pieces of iron, copper, or amalgam will be retained on the filter.
Lampadius, formerly Professor of Metallurgy at Freiberg, Germany, has attempted to make use of this principle in purifying the easily fusible metals, and with what success the following will show: Tinned sheet iron,as thin as paper,
was cut into strips six inches long and four inches wide. Five hundred of these were placed face to face and fastened in an iron frame, with wedges driven in to bring them closely together. This frame was luted into the bottom of a graphite
crucible. Some impure Bohemian tin was melted in another crucible, and allowed to cool until crysta's began to form on the surface, when it was dipped into the filtering crucible The tin, which was still fluid, ran through almost chemically pure,while a pasty magma remained on the filter, which contained iron, arsenic, and copper chemically combined with iron.

## ASTRONOMICAL NOTES

Observatory of Vassar College.
For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students.

Mercury
Manets
On the 1st of June, Mercury rises at 5 h . 53 m . in the morning, and sets at 9 h .15 m . in the evening. It is at its greatest elongation, east, on the 9th, and should be looked for after sunset, north of the point at which the sun disappears. On the 30 th, Mercury rises at 5 h .32 m . A. M., and sets at 7 h . 51m. P. M.

Venus.
Venus is seen in the morning, rising on the 1st at 3 h .8 m ., and setting in the afternoon at 4 h .46 m . On the 30 th Venus rises at 2 h .47 m . A. M., and sets at 5 h .48 m . P. M.

## Mars.

Mars rises on the 1 st at 9 h .17 m . P. M., and sets the next morning near 6 o'clock. On the 30th Mars rises near 7 P.M., and sets at 3 h .11 m . the next morning.
According to the Nautical Almanac, Mars occults or hides from our view the star $\Sigma$ Sagitarii on the 30th, at 1 in the morning. As Mars passes the meridian at 11 P . M.,it will be in the southwest, when the occultation occurs, and, as its greatest hight above the horizon is but $20 \frac{1}{3}^{\circ}$ (in this latitude), it will not be very conspicuous; but the star is of the fifth magnitude and a telescope of small power will show the phenomenon.

## Jupiter.

Jupiter rises on the 1st at 3 h .11 m . P. M., and sets at 2 h . 17 m . the next morning. On the 30 th , Jupiter rises at 1 h . 15 m . P. M., and sets at 0 h .22 m . the next morning. On the 19th of June two of Jupiter's satellites will disappear by coming in front of the planet, and one by going behind the planet; so that for two hours a telescope (unless it be a powerful one) will show but one of the moons, and that the fourth, or the satellite farthest from the planet.

## Saturn.

Saturn rises on the 1st just after midnight, and sets at 10 h . 26 m .A.M. the next day. On the 30 th , Saturn rises at 10 h .9 m ., P.M., and sets at 8 h . 24 m . the next morning. The best time to look at Saturn is between 3 A. M. and 4 A . M., when it is about $34^{\circ}$ in altitude and near the meridian.

## Uranus.

Uranus rises on the 1 st at 9 h .12 m. A. M., and sets at 11 h . 25 m . P. M. On the 30th, Uranus rises at 7 h .25 m . A. M., and sets at 9 h .35 m . P. M.

## Neptune

Neptune can be seen to be a planet only by the use of the best telescopes, and at present is above the horizon almost wholly in daylight, so that it is useless to attempt observations.

Sun Spots.
The report is from April 20 to May 18 inclusive. The picture of April 20 shows, near the western limb, the pair of spotsmentioned in the last report, one still distinct, the other divided intotwo smaller ones. On April 4 this group was seen on the very edge, while a small spot appeared, coming on. In the photographs of April 23 and 24, no spot is seen. On April 29 a large group, consisting of penumbra containing several spots and closely followed by two small ones, appeared coming on, while near the center of the disk was another small pair. The pictures of April 30, May 2, and May 3 show a change of motion and position of spots in the penumbra, independent of the motion across the disk.
Photographing was interrupted from May 3 to May 11 by clouds; and since that time till to-day, May 18, no spots have been visible with a glass of $2 \frac{1}{2}$ inches aperture

## Paint.

At a recent meeting of the Society of Engineers, a paper by Mr. Ernest Spon on "The Use of Paint as an Engineer ing Material" was read. The author, in the first place, considered the necessity for the use of paint, and then noticed the composition and characteristics of the pigments usually employed by engineers. White lead, he observed, should be of good quality, and unmixed with substances which may impair its brightness. It is usually adulterated with chalk, sulphate of lead, and sulpbate of baryta, the latter being the least objectionable. Zinc white is not so objectionable as white lead, but is dry under the brush and takes longer in completely drying. Red lead is durable and dries well; but should chemical action commence, it blisters and is reduced to the metallic condition. Antimony vermilion was sug gested by the author as a substitute for red lead, and its qualities enlarged upon. Black paints from the residua products of coal and shale oil manufacture, and oxide of iron paints, are generally used for iron work, for which purpose they are peculiarly suited. Allusion was alsu made to anti corrosive paints, and to those containing silica. Referring to the oils used in painting, the author stated that linseed oil was by far the most important, and that its characteristics deserved careful study. It improves greatly by age, and ought to be kept at least six months after it has been ex pressed before being used. It may he made a dryer by sim
ply boiling, or by the addition of certain foreign substances. Nut oil and poppy oil are far inferior in strength, tenacity, and drying qualities to linseed oil, and are used to adulterate and drying qualities to inseed oil, and are used to adulterate
the latter. The author noticed the dryers employed, and the latter. The author noticed the dryers employed, and
alluded to the properties and means of testing the purity of alluded to the propertics and means of testing the purity of
spirits of turpentine. IIe then dwelt at length upon the spirits of turpentine. le then dwelt at length upon the
mixing and practical application of paint to new and old woodwork, the preservation of cast iron by means of Dr. Smith's pitch bath, and the cleansing, painting, and care of wrought iron structures. He stated that, when used under proper supervision, no better protection could be found for iron structures than oxide of iron paints. He concluded by observing that the real value of any paint depended entirely upon the quality of the oil, the quality and composition of upon the quality of the oil, the quality and composacture; the pigment, and the care bestowed on the manufacture;
and that the superiority of most esteemed paints was due to and that the superiority of most esteemed paints was due to
these causes rather than to any unknown process or material these causes rather than to any
employed in their preparation.

PRACTICAL MECHANISM.
by joshua rose.
$\overline{\text { NUMBER XIIV. }}$
hand tidning-rinishing tools.
The tool shown in fig. 73 is an excellent one for finish Fig. 73.
ing wrought iron or steel ; it must, however, always be used with water, and should be hardened right out at and near with water, and shou
the cutting edge, A.
he cutting edge, A.
For cutting out a
For cutting out a round corner, a round-nosed tool, such as shown in Fig. 74, is the most effective; it will either rough out Fig. 74.


TOP VIEW


## SIDE VIFU'

or finish, and may be used with or without water, but it is always preferable to use water for finishing wrought iron and steel. A is the cutting edge, and B, the heel of the tool. This is a sample of a large class, applicable to steel and wrought iron, the metal behind the cutting edge being ground away so as to give to the latter the keenness or rake necessary to enable it to cut freely, and the metal behind the heel being ground away to enable it to grip the rest firmly.
cutting a thread.
Our next operation will be to cuta thread upon an iron bolt, supposing it to be roughed out according to the in structions already given. The tools necessary for this pur pose are a graver or V tool, with which to start the thread and a chaser, with which to cut the thread after it is once started. Fig. 75 presents a V tool, A being the cutting point.


## TOP VIEN'

and B , the heel. To start the thread, the lathe should be run at a fast speed: and the heel of the tool being press ${ }^{\circ} \mathrm{d}$ firmly to the face of the lathe rest, the handle of the too must be twisted from right to left at the same time as it is moved bodily from the left to the right, the movement being similar to that already described for the graver, save that it must be performed more rapidly. It is in fact the relative quickness with which these combined movements are performed which will determine the pitch of the thread. The appearance of the work after striking the hread will be as shown in Fig. 76, A being the work, and


B, a fine groove cut upon it by the $V$ tool from which it will be observed that the judgment alone must be depended upon to gage the speed of the movement of the tool necessary to cut the fine groove, $B$, which must be the same width from one groove to the next as is the chaser from the point of one tooth to the point of the next.
The reason for running the lathe at a comparatively fast speed is that the tool is then less likely to be checked in its movement by a seam or hard place in the metal of the bolt, and that,even if the metal is soft and uniform in its texture, it is easier to move the tool at a regular speed than it would be if the lathe ran comparatively slowly.

If the tool is moved irregularly or becomes checked in its forward movement, the thread will become "drunken," that is, it will not move forward at a uniform speed; and if the thread is drunken when it is started, the chaser will not
only fail to rectify it, but, if the drunken part occurs in a
part of the iron either harder or softer than the rest of the metal, the thread will berome more drunken as the chase proceeds. It is preferable, therefore if the thread is no started truly to try again, and if there is not sufficio metal to permit of the starting groove first struck being turned out, to make anotherfurther along the bolt. It takes much time and patience to learn to strike the requisite pitch at the first trial ; and it is therefore requisite for a beginner to leave the end of the work larger in diameter than the re quired finished size, as shown in Fig. 76, so as to have meta sufficient to turn out the first few starting grooves, should they not be true or of the correct pitch. If, however, a correct starting groove is struck at the first attempt, the chaser may be applied sufficiently to cut the thread down to and along the body of the bolt; then the projection may be turned along the body of the bolt; then the projection may be tharned
down with the graver to the required size, and the chasing down with the $g$
proceeded with.

After the thread is struck, and before the chaser is applied to it, the top face of the rest should be lightly filed to remove any burrs which may have been made by the heel of the V tool or graver; or such burrs, by checking the even movement of the chaser, will cause it to make the thread drunken. Where the length of the thread terminates, a hollow curved groove should be cut, its depth being even with the hottom of the thread; the object of this groove is to give the chaser clearance, anit to enable you to cut the thread parallel from end $t s$ end and not to leave the last thread or two larger in diameter than the rest. Another object is to pre vent the front tooth of the claser from ripping in and breaking off, as it would be very apt to do in the absence of the groove.

TO Make $A$ Chasel
Chasers are cut from a hub, that is to say, a cutter formed by cutting a thread upon a piece of round steel, and then forming a cutting edge by cutting a series of grooves along forming a cutting edge by cutting a series of grooves along
the length of the hub. These grooves should be V-shaped, the cutting side of the groovehaving its face pointing towards the center of the hub, as shown in Fig. 78. Hubs should be tempered to a brown color. A chaser is made from a piece of flat steel whose width and thickness increases with the pitch of the thread; the following proportions will, however, be found correct:

| Number of threads ner inch | Number of tecth in the chaser | Thickness of |
| :---: | :---: | :---: |
| 24 to 20 | 12 to 14 | 1.4 inch |
| 18 " 14 | 10 | 5-16 " |
| 12 " 8 | 9 to 6 | 5-16 " |
| 6 " 4 | $7 \times 6$ | 3-8 " |

The end face of the chaser should be filed level and at an angle with both the top face and the front edge of the steel,

Fly.77.

as shown in Fig. 77, the edge, A, being rounded off so that it shall not strike against any burr upon the face of the rest, and thus be retarded in its forward movement while being cut. The hub is then driven in the lathe between the cen ters, the chaser being held in a handle sufficiently long to enable the operator to hold it with one hand, and press the shoulder against the end so as to force the end of the chaser against the hub, which will of itself carry the chaser along the rest. The position in which the chaser should be held is shown in Fig. 78, A being the hub, and B, the chaser, from

which it will be seen that the chaser is held upside down while it is being cut, the cutting face resting upon the lathe rest. After the chaser has passed once down the hub, special attention should be paid as to whether the front, tooth will become a full one; if not, the marks cut by the hub should be filed out again, and a new trial essayed. It must be borne

in mind that, the chaser being held upside down, the back tooth, while cutting the chaser, becomes the front one when
be run at a comparatively slow speed, and kept freely sup plied with oil, it being an expensive tool to make, and this method of using preserves it. In Fig. 79, A is a chaser whose frent tooth is not a full one; B is a chaser with a full front tooth; and C is of the same form as $A$, when it is, as far as possible, corrected.
The cutting operation of the hub upon the chaser is continued until the thread upon the latter is cut full, when it is taken to the vise and filed as shown in Fig. 80, A being the

chaser as it leaves the hub, and $B$, as it appears after having he edge, C , and corner, D , roundedoff.
The angles of the end face of the chaser to the top and edge aces of the body of the stcel, and the uses thereof, are made apparent in Fig. 81, in which A is a top, and B, a side view of chaser when in operation, C being, in each case, the work. From this it will be observed that the angle in the direction of the thickness gives rake to the teeth, while the angle in the direction of the breadth serves to keep the front side of the chaser from coming into contact with the head, shoulder, or other projection of the work. In the absence of a hub, a chaser may be made by cutting a slot in a blank nut, fastening the end of the chaser in the slot, and tapping the hole. The difference in shape between a chaser for use on wrought iron, as shown in Fig. 81, and steel, and one for use on cast

iron, brass, or other soft metal, is shown in Fig. 82.
The difference consists in making the teeth less keen, by beveling off the top face and cutting the teeth less hollow in their length. The latter object is obtained by moving the handle, in which the chaser is fixed, up and down while the hub is cutting it.
The lathe rest should be so adjusted that the chaser teeth cut above the horizontal center of the work. The teeth of the chaser should fit the thread on the bolt along all their length when the body of the chaser is horizontal, and then the least raising of the handle end of the chaser will present the teeth to the work in position to cut, while the teeth behind the cutting edge will fit the thread, being cut suffi: ciently close to form a guide to steady the chaser. This method of using will not only keep the thread true, but will preserve the cutting edge of the chaser. If a chaser has top rake, as shown in Fig. 81, and the handle end is held too high and so that the back of the teeth are clear of the thread, it will cut a thread deeper than are its own teeth; if, on the other hand, the top face is beveled off, as shown in Fic. 82, and the handle is held too high, it will cut a thread

## Ry

shallower than are the chaser teeth.
The proper temper for the teeth is a deep brown, or, for unusually hard metal, a straw color. For chasing wrought iron, the lathe may be run so that the teeth will perform about 40 feet, for steel about $3 C$ feet, for cast iron 50 feet, and for brass about 80 feet, of cutting per minute.

## France and the Centennial Exposition.

We printed last week an extract from The Engineer's recent editorial on the Philadelphia Centennial, in which the general disinclination of English manufacturers of agricultural and other machinery was especially mentioned, and ascribed to the high duty which is charged in this country on the entry of such products. The same objection is now being urged in France to the contributions of French manufacturers. M. Herman La Chapelle, one of the largest engine builders of Paris, publishes a long letter in the Moniteur Industricl Belge, in which he strongly condemns the prohibitory nature of American duties, and points out that, with the exception of wines, silks, and works of art, of which France has almost a monopoly, it is useless to exhilit the principal industrial products of that country.

Signatures made with a lead pencil are good in law

IMPROVED BELT-GEARED COTTON PRESS. The improved cotton press herewith illustrated is driven by a belt in the same manner as a gin stand or mill. It is not necessary either to stop or slacken the speed of the driving shaft to reverse the motion of the screw, while the belt always runs in the same direction. The general construction of the apparatus is strong and durable, and it has withstood the strain of making bales ranging as high as 610 lbs . without breakage. The machine has now been in use for three seasons, giving, as we are informed, uniform satisfaction. The simple arrangement of the working parts will be understood from the details shown in Fig. 2, in connection with the perspective view of the same $n$ Fig. 1.
The driving pulley, A, Fig. 1, always runs to the right, and at the opposite end of its shaft is secured a wooden friction pulley, B. The latter works in the space between the two rims, C and D, of a larger pulley, Fig. 2, which is attached to the end of a shaft or pinion, on which rotates the bevel gear, E , and so turns the screw, thus raising or lowering the follower, F, Fig. 1. G, Fig. 2, is a lever which moves the sliding journal box, in which the end of the shaft-carrying pulley, $B$, is supported either to the right or left, so that the friction pulley is thus brought into contact with either rim, C or D, and, engaging with either, gives motion in one or the other direction to the double rim wheel. There is sufficient space between the rims to allow pulley, B, to run idle, by not engaging with either rim, when the operator so desires.
When pressing the bale, the friction pulley is caused to work against the rim, C, turning the latter in the same direction as its own motion, and thus running the screw up slowly and with the full pow er. To carry the screw down, the friction pulley is moved over to engage with the rim, $D$, through which it obviously imparts a quick lowering motion to the screw.
The press is guaranteed by the manufacturer to make a bale weighing 500 lbs . The screw is of solid wrought iron, having a pitch of 2 inches. The driving pulley, traveling at 250 revolutions, will run up the screw at the rate of 20 inches per minute. The total weight of the machine is from 3,500 to $4,000 \mathrm{lbs}$.
Patented April 29, 1873. For further particulars address

the manufacturer, Mr. H. Dudley Coleman, 12 Union street, New Orleans, La.

NEW SHARPENING INSTRUMENT.
The utility of this invention, shown in our illustration, is so Fig. 1.

self-evident that any description is hardly necessary. Those who have struggled over a piece of tough beef with a dull
knife, until worked into a state of actual ferocity doubly in tensified by the pangs of hunger and a large number to carve for, know that a good steel, which will stay in respectable condition and not wear smooth in a fortnight, is something very akin to a treasure. Therefore, when we introduce an ornamental implement which will sharpen knives at a mere


SIMMONS' BELT GEARED COTTON PRESS.
touch, which pulls out skewers, cuts cork wires, and whic has a convenient corkscrew hidden away in its handle, al ways at hand at the right time and in the right place, we feel we are doing a large portion of the community a service.
The device shown herewith does all this. The implement consists of six blades of a very hard and tough steel, one of which is shown in No. 4, Fig. 2, which are grouped together radially, as represented in Fig 1, around a central rod, No. 5 , Fig. 2. The ends of these blades are secured in a socket, No. 3 Fig. 2, and by a suitable screw they are held tightly in place The handle, No. 1, Fig. 2, is hollow, and is made of polished corrugated metal. It incloses a corkscrew, No. 2, Fig. 2, and holds the same by screwing upon a thread formed on the bolster. At the end of the steel portion is a short knife for cutting cork wires; and just inside the blade a notch is made which affords a ready means for grasping and extracting skewers.
The arrangement of radia blades is entirely novel and is very effective in use. Though especially designed for fami ly use, the device is suited for sharpening the largest knives It is the subject of several patents obtained in this country and in Europe through the Scientific American Paten Agency. For further particulars address the manufacturers, the Radial Steel Company, 221 Pearl street, New York city. [See advertisement on another page.]

IMPROVED BUCKET EAR.
Mr. James D. Field, of Blue Rapids, Marshall county, Kan

sas, is the inventor of an improved bucket ear, herewith il lustrated, which was patented March 16, 1875, through the Scientific American Patent Agency. The advantages claimed
for the device are that it is out of the way of cover and bail
and not liable to catch in clothes; that it is strong, and cannot be readily broken off, and that it is cheap and easily made, It consists of a continuous pieca of sheet metal, as shown in Fig. 1, which is folded as indicated by the dotted lines, so that a central rib is formed upon it. The rib is then perforated to receive the bail, and the side plate is similarly pierced for the admission of the screws which attach the appliance to the bucket. The completed ear in position is represented in Fig. 2. Further particulars may be obtained by addressing the inventor as above.

## IMPROVED HYDRANT.

The advantage offered by the improved hydrant or street washer illustrated herewith is that the valve may be reached for repairs or clearing without necessitating the digging-up of the ground. To this end the entire interior mechanism may be lifted bodily out of the hydrant, so that the outer casing, when once placed, remains a fixture. The invention is re,resented in perspective in Fig. 1, and in section in Fig. 2. In the latter engraving, $A$ is the outer casing which is set in the ground; $B$ is on inner tube ng which in said casing by screw threaded enlarge cur $C$. Through this tube runs a rod wich portion at C. Through this tube runs a rod which erminates below in a valve carrier, D , which is arranged to slide in a cylinder, which projests into the valve chamber, forming the seat of the valve, $E$, attached to said carrier. The inlet pipe screws into a branch of the valve chamber. The upper exremity of the rod is surrounded by a spiral spring, F, which raises it upward, and so keeps the valve pressed firmly against its seat, a packing ring located on the valve rendering the joint tight. Just bove the end of the rod, the handle, $G$, is pivoted so that, by pressing down thereon, the rod is depressed against the action of the spring, the valve opened, and the water allowed egress up to the exit faucet. The valve cylinder has a vent, $H$, through which the waste water can pass into the exterior casing, the screwed bottom piece, I, having an opening which permits leakage into the ground. The screw ring, C , is the sole means of confining the valve cylinder to its place on the chest; so that when access is to be had to the valve, it is only necessary to detach the nozzle, remove the cap and operating shaft, and then, by unscrewing the ring, ift out the interior apparatus.
Patented November 3, 1874, by Mr. B. E. Lehman, of Bethlehem, Pa., to whom inquiries for further information

may be addressed ; also to the McNab and Harlin Manufactur ing Company, 56 John street New York, sole agents for New York and the Eastern States.
which two of the most daring
Spinelli and Sivel, lost their Spinelli and Sivel, lost their
lives through suffocation in the lives through suffocation in the
highly rarefied air of the upper atmospheric regions, is told in detail by the survivor of the party, M. Gaston Tissandier, in La Nature, the journal edited by him. We have already given the main facts of this disastrous affair, but the following in addition thereto will also be found of interest. We extract from the periodical above named the engravings given herewith, one of which represents the aero nauts and their apparatus as dis posed in the car of the balloon. Tissandier is shown noting the barometer indications, Croce is seated on the right, and is in haling oxygen, and Sivel is about cutting loose the bags of ballast. The time chosen is after the bal loon had mounted to a hight of over 23,000 feet, and a sense of faintness and oppression was already stealing over the occupants of the car. The temperature was about $14^{\circ}$ above zero Fah. Sivel, who had relapsed into a kind of stupor, suddenly awoke, and turning to Tissandier asked the altitude; the bal loon had nearly reached 24,000 feet. Then he cut loose the bags of ballast, and this action is the last remembrance which M. Tissandier possesses of the course of events until he awoke and found his companions dead.
The small balloons shown just above the car contained a mixture of air and oxygen ( 70 per cent of the latter gas) which the aeronauts inhaled until suddenly overcome. The reservoir hanging outside of the car is an aspirator for forcing air through tubes filled with caustic potash, which air was subsequently tested for carbonic acid.
The temperature of the air, as the balloon ascended, wes carefully measured, up to the time when the observers succumbed.
At the surface of the earth it was $57^{\circ} \mathrm{Fah}$. By the time an altitude of 20,000 feet was reached, about 50 minutes intervening, the mercury had fallen to $32^{\circ}$; the last indication noted, two hours after starting, and when the balloon was 23,680 feet high, showed $13 \cdot 8^{\circ}$ above zero, Fah. During this period the temperature of the gas within the aerostat was constantly noted; this reached $73 \cdot 4^{\circ}$, when the mercury outside marked but $23^{\circ}$, and remained at that point. This fact accounts for the rapid ascension of the balloon in the upper regions, and its precipitous descent after sinking into the denser atmosphere.

We remarked in our previous article that the registering barometers, which were to be opened by the French Society, and which fortunately remained intact during the fall of the car, would show how high the balloon ascended after the aeronauts became insensible and before it began its downward course. These have been examined, and show that the lowest pressure corresponded to about 10.3 inches of mercuy, which indicates a hight of a little over 27,500 feet. From this point the balloon began to descend, falling swiftly to 20,500 feet. Here the aeronauts revived, and then cut way the aspirator and threw overboard more ballast, caus ing the balloon to rise once more to the same high altitude and insensibility again to supervene. The track of the air ship forms a gigantic $M$, the ends about 150 miles apart
In the smaller illustration, Fig. 2, are represented Sivel' sounding balloons, by means of which he recognized the presence of currents of air above or below. A rod, thirty eet long, was projected from the car and held in equili brium by the upper bailoon, which was 19 feet in diameter and which was filled with gas. This was attached to a rope 3,000 feet long and allowed to ascend that distance above the car. The other small balloon was filled with air, and, being attached to a line of similar length, fell that far below. Mr Donaldson uses an arrangement similar to this, kites being Donaldson uses an arrangement similar
substituted, however, for the balloons.

## Piracy on a Railroad

Presence of mind at the right time averted the possibility of a serious disaster on the Hudson River railroad, recently Five convicts managed to break a way from the working gang at Sing Sing prison, and, reaching the railroad track, suddenly jumped into the cab of a freight engine which, at the time, was slowly dragging a heavily loaded train. Present ing revolvers at the heads of the engineer and fireman, they ordered both men to alight. The engineer, unable to reach any heavy tools to fight the intruders, resorted to strategy


Fig. 2.-SIVEL'S SOUNDING BALLOONS.

As soon as the pumps began to operate, the water worked into the cylinders, and, in a few se conds, the head of one blew off, thus, of course, greatly re tarding the speed of the ma chine.
Meanwhile a telegram had been sent to Superintendent Toucey, at the New York office, announcing the capture. Promp action was necessary, as a loco motive, tearing over the line in utter defiance of time tables and trains ahead, was a danger ous intruder and liable to work considerable damage at station and crossings. Recollecting that near Tarrytown there is a switch which runs parallel with the main track for a long dis tance and then abruptly ends in the river, Mr. Toucey, without an instant's hesitation, sent to the Tarrytown station maste an order "to open the west switch and throw No. 89 into the river." The astonished of ficial, although hardly crediting his senses, nevertheless pre pared to obey the command He threw cpen the switch and locked it, and then stood calm ly by, watching the cloud of steam up the track get bigger, and waiting for $\$ 20,000$ worth of engine to go plunging, with whatever train might be behind it, down to the bottom of the Hudson.

Another explosion occurred, ho wever, which saved the lives of the convicts and the destruction of the engine. The locomotive was within a mile of the switch when the other cylinder head was blown out. The machinery stopped, and the convicts, leaping out, took to the woods. The engineer, who had been running after his locomotive, well knowing that she could not travel very far, she could not travel reached her, and, jumping into the cab, in a few seconds had the fire out, and the steam down.
While the prison officials should be held to a strict account for the fact of the escape of the convicts and of their being possessed of arms, the railroad people are entitled to much credit for their part in the affair. And this is equally due to the engineer for his presence of mind, to Superintendent Toucey for his prempt application of an heroic remedy, and to the station master at Tarrytown for his implicit obeand to the station master at Tarrytown for his implicit obe-
dience to an order which the majority of men would have hesitated over or have refused to obey without explanation.

Steam Launches for Yachts.
A miniature steam launch, only 14 feet long by 4 feet 3 inches beam, has just been built by Messrs. Edwards and Symes, of Cubitt Town, Eng., as a tender to a sailing yacht for use on the fiords of Norway. The boat is to be carried at the ordinary davits, and it has, therefore, been made as light as possible, the total weight, including the machinery, being only 800 lbs . The hull is built entirely of mahogany, and it contains a vertical boiler with engine attached, the arrangement being such that the machinery can be detached from the hull in a few minutes, and hoisted out complete, and the launch then used as an ordinary boat, it being provided with oars and rowlocks. The boiler, which is worked at a pressure of 75 lbs . to 80 lbs . per square inch, is welded up throughout, there being no riveted seams. The boat will carry four persons and a good supply of coal; and during a trial trip made at Greenwich last week, it attained a mean speed of $6 \frac{1}{2}$ miles per hour.

## Glycerin as an Illuminating Material

M. Schering states that glycerin may be burned in any lamp so long as the flame is kept on a level with the liquid. The latter, on account of its consistence, will not ascend an elevated wick. As the flame, like that of alcohol, is almost colorless, and as the material is especially adapted for absorbing a large proportion of saline substances, M. Schering has recently mode experiments in coloring the flame with various bodies, and with satisfactory results. By introducing substances rich in carbon, it appears that the flame may be rendered suitable for illuminating purposes. The low price of glycerin, and its property of not volatilizing at high tem peratures, add to its advantages in this direction.

The new British arctic expedition, which will shortly start for the north pole, is to go up through Smith Sound, on the west coast of Greenland, following the route of the last American expedition-Hall's.

HOOD'S ADJUSTABLE BRUSH HANDLE.
Here is an invention which is just in time for spring house cleaning, for which reason, together with that of its handiness, we have no doubt but that it will meet with general approval, especially from our lady readers, who are looking forward with no cheerful anticipations to that serious yearly
titor in this country; and it should have none, for it entire y fills the field of scientific information and research. Its pages contain information of interest to the most though less reader; and it is difficult for the most unscientific min to lay down a copy without scanning its excellent illustr ions and explanations.

## Dissolution of Hydrogen in Metals.

In previous researches on the metallic alloys formed by hydrogen, MM. L. Troost and P. Hautefeuille indicated the characters which distinguish these definite combinations from the solutions of hydrogen in metals. Potassium, sodi um, and palladium combine with hydrogen, while a consid erable number of other metals merely dissolve this gas. Iron, nickel, cobalt, and manganese offer striking analogies in the manner in which they behave with hydrogen at different temperatures. The facility with which they absorb or give off hydrogen gas depends greatly on their physical condition. An ingot of pure nickel gave out, in a vacuum, at a red heat, one sixth of its volume of hydrogen. Laminæ of nickel, obtained electrolytically, gave out forty times their volume. Pulverulent nickel gave up one hundred times its volume, and remained pyrophoric after the escape of the hydrogen. An ingot of cobalt gave up one tenth of its volume, electrolytic laminæ of cobalt thirty-five times their volume, and pyrophoric cobalt powder one hundred times. It alse remained pyrophoric after the loss of the hydrogen. Soft iron in ingots gives off one sixth of its volume, and gray cast iron more than the half. Electrolytic laminæ of iron gave off 260 volumes. In fine, it may be said that iron nickel, and cobalt absorb directly hydrogen gas, but it cannot be said that combination ensues, just as has been already shown in the case of lithium and thallium. Finely divided iron has a property which is not shared by nickel or cobalt it decomposes water slowly at common temperatures, and rapidly at $100^{\circ}$. In this respect iron approximates to man ganese.

## CAR WHEELS

It has been estimated by good authority that there are no fewer than $1,250,000$ car wheels in daily use on the railroads of the United States. Each wheel travels 88.75 miles per Fig. 1.


Car-mieck.
day of 320 days per annum, and its average load is $3 \frac{1}{8}$ tuns. With this stress, the life of the wheel is about 45,000 miles, or 1.58 years On trains running at express speeds, the average life does not exceed 10 months' service, while wheels under tender trucks have a life of 18 months. A freight wheel, it is stated, often lasts over 3 years. Assuming the average life of car wheels under all kinds of service to be 5 years, the total number of wheels worn out annually in the United States may be placed at not less than 250,000 . Allowing an average cost of $\$ 18$ per wheel, and calculating about one half for the value of the old wheel, the annual loss may be stated at two and a quarter millions of dollars.
We present, in Figs. 1 and 2, a few examples of the numerous inventions of this class. $a a^{\prime}$ represent the well known Washburn wheel; $b b^{\prime}$ are perspective and sectional views of a spoked wheel of rather antiquated form; $c$ is a Woodbury wheel, which has a compressed annular elastic packing between the cylindrical faces of the body and rim. The body is sectional, having two webs bolted together. Each portion has a flanged rim, the combination of the two forming an annular seat for the tyre. $d$ is a wheel cast in three separate pieces, consisting of a rim and two portions, each of which latter has a hub and a web, between which the inner flange of the rim is gripped and bolted. The wheel, $e$, has side plates cast in one piece with the hub and cross pieces, which connect the peripheries of the side plates. The encircling tyre is secured by rivets. In the wheel, $f$, the tyre has pins upon its inner side, which enter slocsin the rim of the wheel to hold the tyre from shifting. The flange piece has a shoulder projecting on the inside, that fits in a circular groove in the body of the wheel, to which it is bolted. The wheel, $g$,
which is bolted a covering annular disk. This device is to allow the revolution of one of the wheels upon the axle on ares of the track. $h$ is a car wheel constructed in two parts : first, a rim with two flanges forming an inner recess Fig 2.

and second, a hub with a web, and a flange upon the same, flaring slightly outward. Slots in this flange permit it to spring past the flange of the rim into the inner recess. $i$ and $j$ are two forms of wheel, in each of which the cast hub and rim are connected by corrugated wrought metal disks. $k$ is the Raddin wheel, in which the entire web and rim are cas in one piece. The hub has binding rings which are bolted together through holes in the web, with interposed packing rings of india rubber to lessen tremor and jar. $l l^{\prime}$ are two views of the Watson wheel, in which the space between the hub and the rim is occupied by a skeleton metallic frame having openings filled with compressed panels of wood.
In the wheel, $m$, Fig. 2, the wedges of wood are driven between the rim and the tyre, in order to absorb the jarring motion. $n n^{\prime}$ are views of a compound wheel in which seg ments of wood form a web between the hab and the rim, and are secured by metal plates. $0 o^{\prime}$ are views of a wheel in which the hub and rim are of cast iron united by wrought ron spokes, each alternate spoke leaning at an angle from the opposite side of the central circumference of the hub to the central line of the rim. $q$ is a wheel somewhat similar to $k$ in which the web of the wheel is enclosed between binding plates, and has a packing between itself and the plates, and plates, and has a packi
also on its inner edge.
Paper, when entering into the composition of car wheels Paper, when entering into the composition of car wheels,
is tightly pressed in as a packing between the steel tyres and the cast iron hubs, so as to form a compact, strong, and yet somewhat resilient material, which deadens sound and diminishes the force of concussion.
The illustrations are selected from the pages of Mr. E. H. Knight's " Mechanical Dictionary." *

## HAND SUPPORT FOR SHEEP SHEARS

As the sheep-shearing season is now close at hand, a novel arrangement of a support for the hand while holding the shears, which we illustrate herewith, will doubtless

prove of timely interest. The object of the device is to en able the operator to have free use of his hand while the muscles of the same are firmly braced, and thus assisted during the fatiguing labor. He is thus enabled to exert greater strength, and may, at the same time, rest the hand withou laying down the implement. The attachment consists of straps, of leather, rubber, or other suitable material, which are secured to one of the shears handles. Rings or loops are fastened to the other handle, and through these the straps are passed so as to form a cross over the back of the hand, the ends being secured and the length adjusted by suitable button holes and hooks. As illustrated in the engraving, elas tic bands are employed, in which case the straps are riveted or otherwise permanently attached to the handles of the shears.
A caveat for the invention has been prepared by the Scientific American Patent Agency. Further information may be obtained by addressing the inventor, Mr. James L. Smith, P. O. box 290, Tuscola, Ill.

The Newly Elected Honorarv Members of the Ironand
The annual general meeting of the Iron and Steel Institute of Great Britain recently took place:in London. Acting
upon the authority vested in them at the last general meeting, the Council have elected the following gentlemen as honorary members Professor Peter Tunner, Leoben, Austria; Professor R. Akerman, Sweden; Professor Grüner; Dr. Percy, London; Mr. Peter Cooper, New York; Mr. H. Schneider, Creusot; Mr. F. Krupp, Essen. The total number of honorary members, including the King of the Belgians, who was elected last year, is now eight.
The president, I. Lowthian Bell, Esq. said : " Most of you, I dare say, are familiar with the names and possibly also with the achievements of those gentlemen who have gained for themselves this distinction; but in the event of there being
any here present to whom the names of those gentlemen are not familiar, perhaps it would be acceptable that I should mention the ground upon which we have accepted them. The first name on the list is that of my friend, Professor Peter Tunner, of Leoben, Austria. I have had the honor of personal acquaintance and, I may say, of personal friendship with this distinguished foreign metallurgist during the last five-and-thirty years, and can safely say, in practical acquaintance with every portion of the metallurgy of iron, it is mpossible to imagine any one more proficient, or any one who takes a greater interest in the development and progress of our science.
The next name is that of Professor R. Akerman, of Swed en. Sweden, as you all know, is a classic country in the assertion, that the great repute of that very ancient country in the manufacture of iron is very well sustained by the ex ertions, by the knowledge, and by the learning of Professor Akerman, and the same may be said of Professor Grüner, of the Ecole des Mines in Paris. There is no subject connect ed with the progress of our art which does not receive the immediate attention of my friend Professor Grüner; but, in addition to that, I may say he has distinguished himself in the archives of scientific research in France, by his original investigations, many of which are of great value in connec ion with the smelting and subsequent treatment of iron.
Then comes the name of a gentleman, familiar, I am certain, to every one who has ever read a word upon the subject of the manufacture of iron in this country; I mean that of my friend Dr. Percy, of the School of Mines in Jermyn Street If he had rendered no other assistanceto iron manufacture than simply to have collated and extracted, from works writ ten in almost every foreign language, an account of that which had been done in other countries as well as that which had been done in our own, I am quite sure that Dr Percy would have entitled himself to this distinction at our hands; but in addition to that, the doctor has also distinguished himself by several very important investigations in nnection with this chair
The next name is that of my venerable friend Mr. Pete Cooper, of New York. I cannot pretend that, in the pro esses or the practice of making iron, he has done much to distinguish himself in America, but he has been connect ed for many years in the manufacture of iron with his son Mr. Cooper, and with his distinguished son-in-law, the Hon Mr . Hewett; but in addition to these recommendations, Mr Peter Cooper has, with a singleness of purpose which cannot be too much admired, devoted a sum which would have been considered enormous even in this country, ior the advance ment of Science, by founding the Cooper Institute in New York, in which young persons are instructed in every branch of art and science; and if it were only to evince the apprecia tion which we have for efforts in that direction, I am of opinon that the Institute, in conferring this honor upon Mr Cooper, honors itself by so doing
The next name is that of Mr. H. Schneider, of Creusot Most of you are aware that the social position of Mr. Schnei ler was sufficiently great some few years ago to cause his selection to fill the very responsible office of President of the Legislative Council of the Government in a neighboring country; but with this, of course, we have nothing to do What recommends Mr. Schneider to ournotice is nothis socia position, but the manner in which he has identified himself o my own certain knowledge, for the last forty years with the advancement of the art of making iron in a neighboring country. The works with which Mr. Schneider is connected were founded by Messrs. Wilkinson and Manby. I forget
the circumstances which led to the transference of those the circumstances which led to the transference of those works to my friend Mr. Schneider; but suffice it to say that have grown to be, as many members here can testify, one of he most important establishments of that country
The last name on the list is that of Mr. Krupp, of Essen If we measure a man's merit by the extent of the operations he directs, and the rapidity with which those operations ar carried into effect, I do not know that we could find a mor signal instance of progression than that of Mr. Krupp, and we have thought it proper to recommend that Mr. Krupp, be added to the list of our honorary members.

An interesting report, by Mr. Richard H. Buel, on the Eagle Wing propeller will be found in our inside advertis ing columns. The results of that engineer's calculations are somewhat approximate, but they serve to show a high degree of efficiency in favor of the screw, inasmuch as he con and $22 \sharp$ per cent in speed, as compared with a "true" screw tested under like circumstances. Further and more elabo-
rate investigations into these facts, especially in the light
of fuller data, will soon be made, we are in formed, by Judge Patterson, the inventor.
a Self-Lighting Gas Burner.-We have recently been shown a gas burner, which does away with the use of matches, and the dangerous practice of carrying lighted paper. Attached to the burner is a tube containing a slip of paper, on which are dots of fulminating composition. A hammer falls on one of these dots, igniting the fulminate. The hammer is operated by a spring and is controlled by the cock by which the gas is turned. An engraving of this con venient arrang

## Zecent gamerican and foreign zatents.

## Improved Steam Trap.

James M. Meharge, Montreal, Canada, assignor to Richard Patton or same place.-- he invention consists or a hollow vessel balanced ollecting receiver. A weighted steam valve of the vessel, with cross head at upper end of spindle, produces, by the rising and the falling of the vessel, the closing and opening of the valve, in connection with the stationary fork, so as to admit the steam and fo
the condensed wa:er through the discharge pipe to the boiler.

## Improved Umbrella Support.

Richard J. Welles, St. Joseph, Mo.-At the upper end of the stand
a socket which receives a head. The head is made in two parts is a socket which receives a head. The head is made in two parts,
one of which is serrated, and is made to engage with the socket by screwing up a nut. A clamp clasps and holds the handle of the mbrella. By lowering the tightening nut the head will be loos-
ned, and may be turned in any direction, and the staff of the umbella will be released.

## Improved Emery Grinding Machine.

E. William Gunn, New Woodstock, and George D. Wells and Harso constructed that the emery wheel may be turned into any posiion that the form of the work being ground may require without stopping the wheel or checking its speed. It expands and contracts
as the band is twisted and straightened, and allows the bands to be as the band is twisted and straightened, and allows th

## Improved Saw Set.

Robert J. Granville, Astoria, Oregon.-By thisimproved saw setthe eeth may be alternately set in oppositedirection, so that the operain may be fin in paith adjustable clamps and ives each tooth the exact degria of

## Improved Fastening for Tool Handles.

William M. Fisk, Lancaster, Pa.-This consists in a fastening bar plied and turned about one fourth of a revolution, and thereby fas ened. It also consists of a spring in combination with the fastening bar to hold the cap in place.

## Improved Lantern Handle.

Theodore James, North Adams, Mass.-A small block turns and nostreely upon a wire ring. Through a hole in thc block is passed prevent the block from sliding upon it. The block turns upon wire bail, so as to enable the lantern to swing or oscillate without changing the position of the first ring. Upon the ends of the wit

Improved Sash Fastener.
John Singer Wallace, Philadelphia, Pa.-This is an improved deice by which the upper sash may be readily pulled down, and both closing, or cleaning of the window. The invention consists in sus pending from a metal bracket, at the upper cross piece of the window, a stiff rod, which extends below the double cross piece of the ashes sufficiently far down to be used as a handle for lowering and closing the upper sash. This pendent rod is provided with a spring in the shape of an inverted umbrella spring, which locks over the ower sash. The rod swings like a pendulum in a metallic oblong be taken out of the same through an open front recess, for being emoved, while the unobstructed opening and closing of either sash are permitted by a side recess in the rear part of the socket, along which the spring is allowed to slide out.

Improved Device tor Felling Trecs.
Charles C. Curtis, Coos, N. H.-The object of this invention is to esired direction by which the falling of sawn or cut trees in any revented. The invention consists of a spiked pole of suitable ength, that is applied to the tree and seated on an adjustable in clined piece that is hinged to a base frame, and raised to upset the
tree by a suitable braced supporting collar and elevating mechtree by
anism.

Improved Lamp Extinguisher.
Milan Waterbury, Mason City, Iowa, assignor to himself and Wil am H. Betts, of same place.-Shous the lamp be upset, a ball will veight will draw a chain tight, and thereby pull a lever downward which in its turn will cause the extinguisher to overlap the top of umproved Hitching levinguish the lamp.
Christian H. Bausch, Holyoke, Mass.-This invention relates to traps for hitching horses: and consists in a metalione the lock being adjusted to any desired position on the strap.

## Improved Ash Sifter.

William Montgomery, Chicago, Ill.-To one side of the sifter are attached the edges of a semi-cylindrical plate, which passes through hole in the screen, to form a spout, through which stones, slate,
inders, and other rubbish may be dropped into the ash box without raising the sifter

Improved Cover for Beds, etc
John Foster and William A. Weant, Salisbury, N. C.-The object of this invention is to furnish a convenient screen or enver for
beds, cribs, tables, etc., for the purpose of excluding flies, mosquibeds, cribs, tables, etc., for the purpose of excluding flies, mosquinetting having a pivoted movable section in combination with hinges which attach the same to the bed frame, and brackets which support the cover when raised integrally from the bed.

Improved Barrel Croze.
J. H. Morrison, Portsmouth, N. H.-The invention relates to the oints by which heads are secured in barrels intended to hold
iquids, but especially beer. It consists in forming this joint of an arc form, so as to strengthen the edge of head and stave, thus pre venting fracture or leakage from internal pressure or external per
ussion. venssion.

Inclined Guide Wheel for Locomotives and Railway
Turner H. Lane, Holly Springs, Miss.--The object of this invenition is to increase the security and durability of the rolling stock of railways, by providing a means whereby the car wheels are pre-
vented from leaving the track. It consists in the combination with the car wheel of an inclined guide wheel having a flange that rests against the under side of the top of the rail, the said guide whee with an elastic seat or cushion. The guide wheels may be located either between the wheels of the truck or upon one side, and may be either inside the track or outside.

## Improved Railroad Crosstie.

Henry Reese, Baltimore, Md.-The object of this invention is to furnish at a minimum cost a practically indestructible and permanent crosstie for railroads, in place of those made of timber, which
last but a few months, and whose removal is a source of great and never ending expense to the railroad corporations; and the invention consists in a T-iron crosstie, provided near each end with oppo-
sitely facing clips, between and beneath which the rails are placed sitely facing clips, between and beneath which the rails are placed

Improved Motive Power.
Henry Bolton, Brantford, Canada.-This invention relates to certainimprovements in motors for driving sewing machines, etc., and it consists in a means for utilizing the power of a magazine spring
through a secondary driving spring, the tension of which driving spring is relatively constant, and which said secondary spring is intermittingly wound up by the magazine spring asfast as it spends its force, and while it is in operation; the two springs being so rela-
tively constracted and arranged that the constant tension of the tively constracted and arranged that the constant tension of the
secondary spring is less than the weakest tension of the magazine spring at any stage of its operation, so that the magazine spring spring at any stage of its operation, so
can always wind up the driving spring.

Improved Permutation Lock.
Mott B. Brooks, Brockville, Canada.-This invention relates to certain improvements in permutation locks. It consists in a semi-
circular link having one end extended and pivoted in bearings in circular link having one end extended and pivoted in bearings in
the case lock, and so arranged as to be drawn out and turned upon its pivots. The extended straight portion of the link is provided with a recess with which a transverse spring bolt is made to engage for the purpose of locking the link, and the transverse bolt is also provided with a recess with which a longitudinal bolt is made to engage for the purpose of locking the spring bolt. Upon said longitudinal bolt the permutating devices are arranged, which consist of three numbered rings, a clutch collar, and a disk, whereby
an almost unlimited number of combinations may be had, and the an almost unlimited number of combinations may be had, and the
device locked or unlocked by both an absolute and a relative key.

Improved Scaftold Clamp.
William C. Fellows, Toledo, O., assignor to himself and Charles Whittingham, of same place.-The bracket consists of a band which
slips over the uprights, with a key fastened therein by a pin. The upper inner edge of the band is serrated to prevent the band from slipping on the upright. Confined by the bolt is an eccentric arm, in a recess of the key. Teeth penetrate the upright and secure the brackets. As the weight of crosstree and scaffold bears on the key, the wood, and the arm, as the load is put upon the scaffold, works the wood, and the arm, as the load is put upon the sc
eccentrically on the pin, and increases the resistance.

Improved Process of Manufacturing cider. William H. Gilmore, Shiloh, Ohio.-This invention relates to the
manufacture of artificial cider, and it consists in combining, with water, sugar, and tartaric or citric acid, a concentrated cider essence, which is obtained by freezing cider and drawing off the uncongealed alcoholic portions from the center. The said uncongealed alcoholic portions contain in solution all of the essential oils and flavoring essences which, being more volatile than water,

Improved Tank for Retailing Coal Oil.
John H. Boardman, Baltimore, Md. -The object of this invention is to provide a case for coal oil barrels for retailing purposes; and it consists in a closed barrel case having one side of the lower part of it extended so as to form, with a portion of the drip tray, a closed
dispensing tray with independent movable entrance thereto. The barrel is provided with a siphon and a bar for holding the same in place, and the drip tray has a trough which receives the leakage.

## Improved Bill File.

Maurice Langhorne, Maysville, Ky.-This invention relates to certain improvements in bill fles, and it consists in a sheet metal box having its sides cut away obliquely from the front to the rear for a the from ance, an the with the tor the balance, so as to leave the files, when pushed back against a spring, to be placed in such a position as to be readily inspected the box being provided with a flange cover to protect the files from the damaging influences of flange cover to prot.
weather and dust.

## Improved Scroll Sawing Machine.

Charles N. Trump and Samuel N. Trump, Wilmington, Del.-A by means of a sitted to the show is driven by power applied by friction whecl. The boring device is driven by the same friction wheel. A lever is connected with the arm piece, to which an eccen tric is attached, which eccentric bears on the pin and throws the friction pulley in contact with the friction wheel. When the lever is thrown back, the pulley is drawn back from the wheel by the driving band of the boring bit. The saw restsagainst straight faces,
so that, when the clamp is drawn up, its whole inner surface bears so that, when the clamp is drawn up, its whole inner surface bears
on and clamps the saw. The boring mandrel is supported on the arm of the saw by means of a bracket.

Improved Let-off Mechanism for Looms.
John Turner, of Lonsdale, R. I.-This consists of the yarn beam, geared by a system of reducing gears, and a pair of long cone pul-
levs and belt, with the cam shaft of the loom, with which there is a long, slowly revolving screw. The last gradually shifts the belt
lese a long, slowly revolving scrcw. The last gradually shifts the belt
to increase the speed of the yarn beam in the proportion of the reduction of the size of the yarn roll, thus constituting a positive graduated let-off. For varying the delivery, to make the cloth more or less close, wheels of different sizes may be put in the reducing train; for instance, the wheel on the yarn beam, and the one gearing with it, may be removed and others put in their places.

## Improved Car Brake.

Solon G. Howe, Detroit, Mich., assignor to himself and James W Cheney, of same place.-This invention consists of double friction cones, which are placed on the axles and carried, by the action of a wedge bail on friction rollers, against corresponding double shells
keyed fast to the axles. The friction cones are applied by the wedge bail, and released by spring braces, both being operated by the ends of the car. The axle is lnbricated through perforations in the ends of the car. The axle is labricated through perforations in
the center pins of the friction rollers, and the cones are secured in their regular position and motion on the axle by a stationary projecting pin of the axle entering annulargrooves of the cone hubs. The spring braces are attached to the upper and lower part of each cone, and secured to their lever connecting rods by wedge shaped blocks with binding side ridges, by which the constant strain ex-
$\mid$ strips, called furring. This should be done on all $\mid$ outside ealls, and, ,ff not now
likely be a remedy in this case.
(2) J. B. Jr. says: It is proposed to put up a block of buildings one story high in front, two with separate chimneys to each section. Will the two story building, being higher, interfere with the
draft in the flues of the one story building, and draft in the flues of the one story building, and
the three story building with that of the flues of the two story building? If so, what is the reme dy? A. The probabilities are that the flues will not draw well three quarters of the time. The depth as the second, to draw the flues of the first story extension over to the rearwall of the second story, and carry the chimney shaft up against the said rear wall, topping out above the main roof of
the building at the usual hight above said roof.
(3) J. B. S. asks: What steel is used and ow is it tempered, for making steel magnets? A very h
centage.
(4) T. C. N. asks: 1. What ingredients are used in the white glazing of cast iron pans? A.
For enameling cast and wrought iron vessels, two For enameling cast and wrought iron vessels, two
compositions are in use; one has for its base silicompositions are in use; one has for its base sili-
cate of lead, and the other boro-silicate of soda. One of these enamels is applied to the scoured surface of the metal in the form of a powder, which is fixed by heating to a sufficiently high temperature to fuse; it then spreads over and covers the metal with a vitreous varnish. The boro-silicate of soda possesses great superiority over the sili-
cate of lead, for it is not attacked by vinegar, macate of lead, for it is not attacked by vinegar, ma-
rine salt, or the greater number of acid or saline rine salt, or the greater number of acid or saline
solutions, even when concentrated; and resiststhe action of agents used in cooking or chemical operations. The silicate of lead enamel is whiter and more homogeneous, which explains the preference given it by the public, but it gives up oxide of great number of coloring matters, and it is at tacked by nitric acid, which communicates a dull color to it. On evaporation the liquid leaves a
white crystalline residue of nitrate of lead. This whamel is instantly darkened by dissolved sulphides. and also by cooking food containing sulphur, such as cabbage, fish, and eggs. 2. Can the same glaze be used on earthen tiles or other ware? A. Yes. 3. Can the glaze be colored green, blue, or yellow? A. ho color the enamel green, mix
with before heating 1 to 2 parts oxide of chromium to 10 parts enamel. For blue, use prepared obalt, red lead, niter, each 1 oz. For yelow, lead and niter 4 ozs Gold and purpleny, each are used for red and purple. For black, use calcined iron and cobalt, each 1 oz ., or zaffre 2 ozs ., mauganese, 1 oz .
(5) S. C. D. asks: In blowpipe analysis hat does the abbreviation B.B. mean? A. Bealso called ruddle and red chalk. It is red ocher containing some clay
(6) J. M. asks: 1. Will mercury evaporate if itssurface is covered with water? A. It will not. 2. Can any one use an electro-coppered plate for the purpose of collecting gold from any comon any patent right? A. Yes. 3. Can copper be oated with mercury without first being silver plated? A. Yes: clean the surface with a little sulphuric acid (dilute) and sand, rinse in clean waer, dip in the mercury, and rub evenly over the swer in a furnace for the cupelation of silver in
any form? A. An ordinary muffle is to be preferred.
(7) O. H. L. asks: How can I make a cyldier for compressing gas for the oxy-hydrogen ight? Is there any special joint or seam, or any
composition, in use for making the joint tight? A. These cylinders are made of boiler iron riveted
together in the same manner as a steam boiler.
(8) S. T. asks: 1. How are magnetic fish
ade? A. See p. 218, vol. 32. 2. Is the paper of which they are made magnetized? A. No.
What power of microscope is necessary for chemists' use, for examining blood corpuscles,etc.? A. Theoretically, the magnifying power of a lens bearsa altically this is not precisely the case, since the mechanical difficulties of grinding and fitting the component lenses produce slight variations in the focal distance, and, of course, in the power. A lens whose focal length is actually $1 \frac{1}{10}$ of an inch, and its magnifying power, when arranged with an
eyepiece as above, is about 45 diameters, may be eyepiece as above, is about 45 diameters, may be
sold as a one inch objective; or the error, as is more frequently the case, may be on the other f al inch objective, a lens having an actualpower when combined, of 55 diameters. For the use of chemists, we would recommend $a \frac{2}{3}$ inch object glass with an angular aperture of about $32^{\circ}$, magnifying, with the various eyepieces, from 75 to 450
diameters. For the use of physicians, a 1 inch obdiameters. For the use of physicians, a $\frac{1}{5}$ inch ob-
ject glass, with angular aperture of $100^{\circ}$, magniject glass, with angular aperture of $100^{\circ}$, magni-
fying from 250 to 1,500 diameters, will be found most useful.
How can I make a sea green paint? A. The following will give a beautiful blue-green tint: Add to a solution of sulphate of copper a decoction of To this mixture is then added 10 or 11 per cent of protochloride of tin, and lastly an excess of caustic potash. Wash and dry the precipitate
make a rood tobacco fertilizer? A Lime but make a good tobacco fertilizer? A. Lime, but perphosphate of lime.
(9) C. A. K. asks: Is heat visible? A. Heat is a motion of the ultimate parts of a body
and is not visible.
(10) A. F. asks: What is the difference be tween ebonite and vulcanized india rubber? A
Ebonite is made by heating india rubber with half Ebonite is made by he
its weight of sulphur.
Is there any method of reducing tortoiseshel A. No.
(11) M. D. W. asks: 1. Can the same still that is used for distilling oil of peppermint be used for manufacturing sassafras onl? A. Yes, if wel
cleaned. 2. Is there any difference in the proc 3 ss ? . Very little. The peppermint oil generally $r$ e (12) J. J. KcK. says: My hair grows ver won my forehead, in fact it reaches my eye brows and quite covers my temples, injuring my looks very much indeed. As I am a lady, I am
vain enough to wish it removed, if it can be done without scarring my face. A. The following ha been successfully used: Take sulphuret of calcium (fresh) and quicklime equal parts, reducethem separately to fine powder, mix, and keep the mix ture in a well stopped bottle. When used, a portion is made into a paste with warm water, and immediately applied to the part, previously shaved to render the paste more manageable. It require caution in its use. It should be applied to only small surface at a time, and great care should be taken to prevent it from extending to the adjacen parts. The powder loses its properties unless en tirely excluded from the air, and no liquid must be added until just before application, and then to $n$
(13) G. D. S. asks: Will Babbitt metal im part unbealthy properties to butter, when about inches surface of the metal in in contact with some risk especially if any souring took place (14) L. L. I. asks: Is it not good reasoning ought to separate? Nevertheless, I have an articl that I can honestly saw through ten times on the same line, and then hand it back very nearly a strong as ever. A. We have frequently seen a
similar result brought about by the proper use of magnetic force
(15) A. McG. asks: What is the cheapest eethod of finding water in a light, loose sand (16) G. S. A.
(16) G. S. asks: How can I make laundry blue paper? A. Make a concentrated solution o ndigo carmine, in which steep the paper desired paper is coated with a heavy deposit of until the oring matter.
(17) J. G. H. asks: 1. What ingredient in the egg causes the spoon to be stained? A. Sul A compound of chemical change takes place? A attacks the silver, forming a sulphide.
(18) C. D. P. F. asks: How can the steel on an engine be cleaned so as to look bright and bur ished? A. Use fine emery pape
(19) G. L. S. asks: Is there anything that
can be used in making cologne that will make the perfume lasting? A. No
(20) E. E. E. asks: 1 . Should green apple wood for handles be cut into pieces the size of a
handle, and let it dry before using, or would it be better to saw into boards and cut up when dry ? A. The latter is best. Let the boards dry thoroughly before using. 2. How are light colore A. See p. 299, black and polished to imitate ebony polishing apple and other hard wood handles? A See $\mathrm{p} ., 72 \mathrm{vol} .26$.
(21) C. E. C. asks: Is there any way in which the dates on coins can be made clearer? A inse with water, and polish.
(22) L. H. W. asks: How can I best remove baked Japan surface from old sewing machines, order to get a smoother surface for anothe
(23) G. S. P ats: What
(23) G. S. R. asks: What size ?of cistern will it require tosupply a schoolof about 75 pupils, feet of spouting being used? A. Make your cis tern 6 feet in diameter in the clear on the inside and about 5 feet deep below the crown. 2. O what materials and shape should the cistern be A. Build it of brick with 8 inch walls laid up in Rosendale cement mortar, and with brick bottom and crown. Make it circular. 3. How can I mak with a 4 inch brick partition; bave small holes for the ingress of tion, and fill said one third space with a layer of gravel and clean coarse sand about 6 inches deep Place on top of this a layer of charcoal about inches thick, and then another layer of sand an gravel like the first. Let the water enter the cis-
tern into the larger space, and be drawn from the smaller.
(24) H. A. M. asks: I intend to build an out oor cellar of brick. Could I make it frost proo by having an eight inch wall outside and a fou the walls, filled with dust from the bed of a char coal pit? A. This would make a wall that should retain the warmth of the interior of the cellar; but care should be taken to bind the walls together to prevent their being thrown apart.
(25) J. V. says: I have just built a large feet high, in the basement of a building $21 / 2$ storie high, connecting it with two flues about $8 \times 8$, in the room above, about 10 feet from top of fireplace. There is a good draft to both flues, but not
enough to prevent the fireplace smoking terribly How can I remedy it? A. If the flues are to gether, and it is practicable, you had better remake them into one.
(26) D. J. F. asks: 1. How can I find the number of square inches on the face of a mill
tone or any other circle? A. (Radius in inches) 33.1416 gives the area in square inches. 2. How an I find the number of square inches on the surface of a triangle? A. Half the hig
by the base in inches gives the area.
(27) W. W. N. says: I tempered springs made from Bessener steel in oil at a very low
heat, and then flashed them off. But most o them would set too much, and a very few wer good. I tempered some in very cold running wa ter, then dipped them in oil, and flashed them off But most of them were too soft, some broke, an toughness that I am unable to hit. Can you sug-
gest some pickle that will help me? A. If the springs set too much, do not continue the blazin so long, but dip them in water as soon as the blazing commences. If they are too hard afte blazing, let them cool without dippin
them in a tank of oil placed over a fire.
(28) A. S. asks: Can a shaft be driven by out the aid of a third pulley? A. Yes by crown out the aid of a third pulley? A. Yes, by c
ing the pulley and keeping the shaftsin line.
(29) S. S. S. asks: 1. Is there anything
better for house plants than clear water? A. better for house plants than clear water?
Soapy water with a little ammonia is good. Soapy water with a little ammonia is good.
Should the dust in the pots be loosened often? If it bardens on top, yes. 3. What kind of plants as, and verbenas. 4. What kinds of plants are best for hanging baskets? A. Lobelias, musk and ferns.
(30) H. R. asks: Is the motion of the valve uniformly the same in a locomotive engi
(31) F. G. says: In tempering steel, some neohanics use the lead bath. Is the molten lea (32) W. S. R. asks: Which is the best way to drill saw plate? A. Use a dlat drill, and run slowly, with a little oil.
(33) G. W. L. asks: How can I harden files? A. Heat them to a red heat, and quench (34) W. G. B. asks: How can I stick cloth cn glass, so that it will hold frm, in order glass with into an article? A. Try painting the glass with
oil paint, letting it dry, and then using glue as a cement.
(85) W. B. asks: What is the best kind of
pipe to connect a cistern with an iron pump where pipe to connect a cistern with an iron pump where purposes? A. Use tin-lined lead pipe.
(36) W. F. M. asks : 1. I have almost completed a small steam engine, $1 \cdot 5$ bore $x 3$ inches
stroke, which I wish to run at a speed of about 200 revolutions per minute. I have made the steam ports $\frac{3}{8} \times 3 / 8$, exhauste ports $\frac{5}{3} \times 3 / 8$. I Intend the
fly wheel to weigh 10 lbs. The engine is a vertical fly wheel to weigh 10 lbs . The engine is a vertical
link motion, so arranged that, by means of a lever and notched segment, I can cut it off at almost any point of the stroke. Will a $1 / 4$ inch tube be large enough to supply steam, and a $8 / 8$ one to ex-
haust tit A. Yes. 2. Will such an engine, working under a steam pressure of 20 or 30 lbs . per lutions, develop sufficient power to run a sewing machine? A. Yes. 3. If it is necessary to have a
governor, will it answer to attach it to the cut-off governor, will it answer to attach it to the cut-off
lever and let it operate in that manner? A. A governor is not absolutely necessary. The method well. 4. Will you be good enough to tell me what you think of the engine, as near as you can judge? A. Judging from your account, you have turned
out a very creditable piece of work. 5. I never worked in any machine shop, nor attended any scientific school, but I have always had a great
liking for machinery. I made all my drawings, liking for machinery. I made all my drawings,
patterns, etc., myself, as also the hand planer I use. From what I have written, do you think it a a visable for me to enter a machine shop rather than any other business? A. It would be better
for you to enter a good scientific school; but if for you to enter a good scientific school ; but if
you are determined and persevering, you can enyou are determined and persevering, you can en-
ter a machine shop, and get a good education out of shop hours.
(37) D. B. W. asks: What makes our gage, in very cold weather, show 60 or 70 lbs.
pressure when there is no steam in the boiler? A. The gage must be frozen
(38) M. C. says: I saw a notice in your paper about using zinc in steam boilers. I had a
pipe to convey the feed water into a boiler some pipe to convey the feed water into a boiler some
26 feet long ; it was gas pipe; and in about 12 that they looked as if drilled. To stop them, I covered them with a sheet of zinc, and the next time that I cleaned the boiler I found many scales had left the tubes and shell, and were in the mud receiver. At the time, I did not know the reason;
but seeing the account in your paper, $I$ have continued the zinc until now, and only stop using it boiler. Does it act on the iron injuriously? boiler. Does it act on the iron injuriously? $A$.
We do not think it will injure the boiler; and by keeping a careful watch, you can discover any cor-
rosion, should it take place, before much harm is rosion,
done.
(39) A. A. C. asks: What would be the proper length of a belt to drive a stone crusher?
A. It depends on the distance between centers of A. It depends on the distance between centers of
pulleys, and will be a little less than the circumpulleys, and will be a little less than the circum
ference of the driving pulley increased by twice the distance between centers.
(40) H. J. M. asks: Given a cistern 10 feet long $x 10$ feet wide $\times 10$ feet high. What is the of water? A. The pressure is the area of the side, in square feet, multiplied by the distance of the
center of gravity of the side below the surface in
eet, multiplied by the weight of a cubic foot of
water in lbs.
(41) J. E.
(41) J. E. P. asks : Where can I get a book the publishers of "Rod and Gun," West Meriden,
(42) H. S. S. asks: What, if any, difference would there be in the power required to run a pulley with a given load and width of belt in the
following three cases? (1) With a belt long enough to run loosely without slipping. (2) With (3) With much shorter as to require a tightener eneral answer cannot begiven to sury tight. $\Lambda$. A With narrow belts, there would be little, if any, difference in the three cases; but in the case of wide and a thick belt, method No. 3 would probablygive the most satisfactory results. We do no know of any work that treats specially of this sub ject; but we imagine many of our readers have will be glad to impart, and which we shall be leased to receive.
(43) J. A. W. asks: How can I put walrus stay on? A. Use the best glue.
(44) L. W. asks: 1. Can I use a copper plate instead of platinum or silver in a Smee battery? A. No. 2. Will a galvanic pile, composed
of 100 pairs of copper and zinc plates 1 inch squar produce as heavy a shock as one of 100 pairs of nch plates? A. Yes. 3. Will it produce a shock that can be felt by taking hold of the wire with the hands? A. Yes. 4. What is the best work on
galvanic and frictional electricity? A. Noad's or De la Rive's are probably the most comprehensive carbon for battery plates? A. See p. 186, vol. 32 . (45) E. L. G. asks: Can permanent steel
nagnets be magnetized so strongly that their power will not be increased by use? A. We think the can.
(46) S. asks: 1. How shall I proceed to silver plate lightly sheets of thin copper on on
ide? A. Cover the other side with wax. 2. Must I prepare a special battery, and how? A. Use Callaud's or Daniell's battery. 4. Will the ordinar the negative action? A. It will answer for the positive plate. Use copper for the negative. 4.
How shall I proceed to test a galvanic appliance determine how many degrees it will deflect the magnetic needle? A. Connect the battery with
(47) B. D. asks: 1. Can a magneto-electri machine be made powerful enough to produce a
two inch spark? A. Yes. 2. Is there any book two inch spark? A. Yes. 2. Is there any book ex
plaining the construction of such machines? A Yes, "Introduction to Chemical Physics," by J. R.
(48) H. S. says: I put up 5 Tom Thumb ing the current through a drop of water on late, the oxygen immediately rose in very smal bubbles on the negative pole. After a short time By moving the wires to different places such lump were formed at every place. What ar they? had well water to try it in. A. The lumps are blue oxide of copper. The bubbles which arose from the negative terminal were of hydrogen gas, Hydrogen, being electro-positive, is always drawn
to the negative pole of the battery, as are all electo the negative pole of the battery, as are all elec-
tro-positive metals, for the same reason. The ox-tro-positive metals, for the same reason. The oxygen of the water, united with the copper of the
positive terminal, formed small lumps of blue oxide of copper, and for this reason the oxygen classified as electro-negative
(49) R. G. W., of (ilasgow, Scotland, asks. How can I solder or otherwise join broken cast
iron stove patterns? A. Use hydrochloric acid killed by zinc, and sal ammoniac for a flux.
(50) H. N. S. asks: How can I determine what distance from the end of a stick of timber, of uniform size, a bar must be placed under it in
order that three men, two taking hold of the bar and the third taking the other end of the stick, may carry the stick and each carry an equal share?
A. Place the bar at $1 / 4$ the length of the stick from the end.
(51) H. H. asks: How can I true up paper cylinders? The cylinder is formed of disks of paper pressed together. A. Tools for turning wood
will answer. Run your cylinder at a very high velocity.
(52) J. B. W. says: In answer to several have replied: To determine the strength of any flue, made of good iron, well pur together and
perfectly cylindrical,divide 806,000 times the square of the thickness in inches by the product of the diameter in inches and the length in feet; but to K. $K$, who asked what would be the difference be-
tween the pressure necessary to explode a boiler from the inside, and that necessary to crush or flatten it from the outside, you say the internal pressure required to rupture it is the thickness in inches $\times$ tensile strength in lbs. per square inch +
by the diameter in inches; while the external crushing force is $111,000 \times$ (thickness in inches) ${ }^{2}+$ by the diameter in inches $\times$ length in feet. Why do you use the unit 808,000 for the flue, and 111,000 for
the shell when the cases are identical? In Roper's "Handbook of the Locomotive," I find that the
"Hese unit is $806,300 \times$ by square of the thicknessin inchc $s$ +by diameter in inches $\times$ the length in feet, and this sum $\times 3$. In the example given, the length of his flue is 10 feet; where does he get the 3 from, and why have you discarded the odd 300 ? A. The 111,000 should have been 806,000 . In Roper's rule,
he probably uses a factor of safety of 3 , and so he probably uses a factor of safety of 3 , and so
makes the fue 3 times as thick as it would require to be, if it were just strong enough to resist the
pressure. Cur rules had reference to the ultimate strength of the flue, and we would recommend the
(53) A. R. C. asks: I want to run an engine inch minute,at 100 lbs. pressure. I will cut off when piston has traveled $1 / 3$ distance, or at 3 inches. I want to know what fire surface is necessary to
keep up steam at that pressure. A. From 60 to 80 keep up ste
(54) S. F. S. asks: Which is the most eco omical to carry, high or low water, in a boiler of he locomotive style? $\Lambda$. There is not a great dea of difference; but probably some of our readers nave made experiments bearing on the se would be glad to hear from them.
(55) S. W. asks: Would a boiler 3 feet long 1 foot in diameter be large enough for an engin 4 inches stroke by 4 inches bore? A. No.
How long ought a person to be learning to zood telegraph operator? A. A few weeks, if he s intelligent, and has a chance of learning in an office where much business is done.
(56) B. D. W. says: An engineer claim hat the lead of an engine can be lengthened or shaft without touching the valve or connecting rod. I say it cannot be done without lengthening
or shortening both ends of the valve. Which is or shortening both ends
right? A. The engineer.
(57) A. D. says: I am making a boiler of 12 pieces of 1 inch gas pipe, 12 inches long, connected
t each end with Ts. Steam dome is 3 inches in di t each end with Ts. Steam dome is 3 inches in dies square. All the pipes are exposed to the fire Will the above be suitable for an engive $13 / 8$ inches in diameter $x 23$ stroke? A. It is probably larg enough, but you may have some difficulties in
asing it. We would be glad to hear from you using it. We would be glad
(58) J. B. says: I am building an engine nches bore and 6 inches stroke. Will ports 2 inches long and $1 / 4$ inch wide be large enough to let the
team into the cylinder? A.Yes. 2. Will $\%$ iron be large enough for the piston rod? A. Yes.
(59) E. G. C. says: 1. I am making a small uigh, of $\frac{3}{16}$ inch iron, with heads $3 / 4$ of an inch hick, wit 4 inches in dam. What will be safe pressure? A. About 100 lbs. per square inch.
2. What power from an engine, $11 / 2 x 3$ inches, ould I get with 40 lbs , of steam, running at 100 feet per minute? A. Multiply pressure on piston
by speed in feet perminute, and divide by 33,000 .
(60) R. B.asks: How many horse power ca e got from an engine of which the pulley is 3 nch pulley? The 32 inch pulley runsat 150 . A Under favorable circumstances,from 15 to 18 hor
(61) P. S. H. asks: Is the pressure the sam n the steam chest as it is in the boiler? A. It is team in passing through the pipe, and some being (62) R. H. M. pays: I. I want to put an en nge 1 foot or 15 inches of water. What horse pow er do I require to drive her at 6 or 8 miles an hou in still water? A. About 2 horse. 2. How large crew and of what pitch will be requised? A. D
meter, 28 to 30 inches; pitch, 3 to $31 / 4$ feet. (63) J.F. asks: 1. Can the officers of a cor ngine within said town on the plea of danger from fire or any other cause? A. It depends entirely upon the local laws. 2. Can a steam boiler be sup-
plied with water from a tank above it by a pipe running through upper shell of boiler to within ninch of lower shell by merely the force of wa ter? A. Not unless the pressure of the column of
water isgreater than the steam pressure. Insert team pipe into the top of the tank, however, and brium oil cup.
(64) S. N. M. says: To the questions lately
 hamerer the blow of a pile driver, and of a steam tance, you reply that it can only be determined by experiment. You question whether the rule given
in the books, that the "momentum of a fallin in the books, that the "momentum of a falling
body is equal to the weight multiplied by the vel ily, will produce the same effect as the blow. the rule, the momentum of 1 lb . falling $16 \frac{1}{1,}$ feet s equal to 321 lbs. I lately extemporized a simple nexpensive apparatus. I took a small lever, of uniform size and density, and made a slight crease
across the center of it; $I$ balanced it on a dull knife edge in the crease and hung a weight of $32 \frac{1}{6}$ ozs, to one end; et on to the end from a hight of 161 feet just sunk that end away from the stop, perhaps the $\frac{1}{3 \sigma}$ of an inch. I next let drop a bullet about
2 dwts . lighter; it did not sink the lever awa from the stop. Though my apparatus and exper ment were necessarily somewhat imperfect, my esult came so near the rule that I maintain that steadily, will produce the same result as the blow. (65) O. E. W. says, in reply to S. S.'s query largest pu pulleys: The offset from the size of the largest pulley in the treadle wheel must be the of cone, and the offset frem the second to the smallest size in treadle wheel must be the same a
(66) O. E. W. says, in reply to C. D.., who of water, whiter foaming and showing a boiler fu This has been my experienc our works dry stood idle from February 20 to April 5, the scale in the boiler became loosened by successive freezing
and thawing. It was then cleaned out and a boiler and thawing. It was then cleaned outand a boiler
purge, composed of terra japonica, carbonate am-
monia, and soda, freely used. The result was foammonia, and soda, freely used. The result was foam-
ing to such an extent that the water would show in he same minute would of the glass out of sight in the glass, with a steam pump working at its highsty speed to fill the boiler. We use steam to heat
dry house and factory, and to run the engine $(20$ dry house and factory, and to run the engine ( 20
horse power) and steam pump, and for several ther purposes; but were obliged to shut off all except the engine and pump for an entire day.
(67) D. N. says, in reply to H. M. F., who a cog wheel, having the number of cogs and the itch. A very simple rule is to multiply the number of cogs by number of thirty-second parts in he pitch, and point off the two right hand figures or decimals. For example: In a wheel of 2 inches pitch with 100 cogs, there are 64 thirty-seconds Take any pitch, say $3 /$ and 25 cogs: $25 \times 12=3 \cdot 00$ nches. This is the way that $I$ bave found the pitch ne of wheels for the last 15 years, and it is perect. The rule can be inverted and the numbe
of cogs found if the diameter and pitch be given (68) O. E. W. says, in answer to E. R. C.'s query as to using lead pipe to convey steam: Thi or 10 lbs . per square inch. I made an attempt to arry steam at a pressure of from 40 to 60 lbs . (unerground), and the result was a reduction of the ioad to a white paste or powder in a few weeks he pipe. I have found by many years' experienc hat lead in contact with steam under pressure of ver 10 lbs. per square inch very soon loses its strength, and it is therefore good neither for pack gjoints nor conveying steam
Minerals, etc.-Specimens have been re
 examined, with the results stated:
G.M. O.-Iron pyrites.-H. P. W.-It shows little articles of sulphuret of iron, but you must look
arther if you suspect zinc or silver ore.-R. S. F. It is a piece of ordinary spelter or castzinc. G. H. \& J.S.C.-It is oxide of iron, with a large ercentage of silex.-H. W. S.- It is not nitrate of tash; it is yellow magnesian limestone.-S. P.-sed.-T H B-They are rock ergtalsor crystal ized quartz. -H. W. B. - Iron pyrites.-B. E.-It is muscovite, or potash mica, containg about 10 pe
ent of potash. If spread upon the ground, it ould decompose in the course of time, and the potash would be converted into a soluble form and ould serve as a fertilizer to plants. It would be The o ther uses to which muscovite can be with it. will be found in the Science Record for 1875, p . 137.-J. D. P.-The metal particles appear to be ulphuret of some kind, probably pyrites. If you will send some of the metal free from the gangue this can readlly be determined. The amount sent as not sufficient for analysis.-C. G. O.-One o fully white kaolin. The other contains beautimount of oxide of iron- - We have received spec ens of porcelain clays of inferior quality from W. L., Central City, Col. Ter., and M. P. A., West Bloomfield, N. Y. The price depends largely on quality, etc. The purest is retailed in New Yor t 10 cents per lb .
S. L. G. asks : 1. Are violin tops and bottoms sawn thin and then bent? 2. Is there a block or -R.M. C. asks: How can I mak sed by the express companies?-F. E. W. asks: here anything besides tin with which I can coa tead castings before covering them with vulcan zed rubber -T. C. H. says: I wish to run an en gine of from 5 to horse power in the smallest with an apparatus for sprinkling small quant coke of cru Who can tell me of the results of this method?

## COMMUNICATIONS RECEIVED

The Editor of the BCientific Amreican ao ginal papers and contributions upon the following subjects:
On Drawing Ovals. By E.c.T
On Light. By F. G. F.
On Criminal Entailments. By B. S. B.
On Chemical Elements. By W. T.
On Euclid, I, 47. By F. M.S.
On Curves in Nature. By E. C
Also enquiries and answers from the following.
T. L. S.-o. P. S.-J.W. S.-P. O. H.-C. R.-W.-
H. w. G.-X. Y. Z.-L. N. S.-J. S. L.

## HINTS TO CORRESPONDENTS

Correspondents whose inquiries fall to appear may conclude that for good reasons, the Editor de clines them. The address of the writer should a ways be given.
Enquiries relating to patents, or to the patenta :lity of inventions, assignments, etc., will not b published here. All such questions, when initial it would fil half of our paper to print them all but we cenerally take pleasure in answering briefl by mail, if the writer's address is given.
Hundreds of enquiries analogous to the following are sent: "Whose is the best system of short hand? Who sells a book on the Turkish bath? Who sells works on chemistry? Where can I get a good mi All such personal inquiries are prinled.as will be ob erved, in the column of "Business and Personal hich is specially set apart for that purpose, sub column. Almost any desired informanon can in tolumn. Almost any desired inform
［OFFICIAL．］ por whiog
Letters Patent of the United States were

## Granted in the Week ending

 May 4，1875，
## AND EACH BEARING THAT DATB

［TLose marked（r）are retssued patents．


## Kiln，brick，N．B．Heafer．．．．．．．． Knitting machine，D．Bickford <br> Laddcr，firemen＇s extension，H．Bastian，Sr． Ladder，itremen＇s extension，P．Peterson <br> Lamp，carriage，F．C．Cannon． Lantern，light house，O．Cook Lantern，magic，A．G．Buzby． Lantern，magic，L．J．Marcy．．．．．．．．．．．． Lathe for turning wood，w．R．Hodge 162，896，

 Lathe for turning wood，W．R．Hodge．．Lathing，metallic，J．w．Hoyt．．．．．．．．．． Leather rounding machine，H．F．Osborne Lightning rod，J．A．Kleckner．．．．．．．．．．．．．．．．．．．．
Liquids．arawing efterv escent，F．w．Wiesebro Lock for doors，etc．，P．Werni． Loom shedding mechanism， Loom temple，N．Chapman．．．．．．．．．
Mail bag fastening，J．C．Franklin． Mcat cutter，c．Fogelberg．．
Metal bullion，refining base Milling tool，E．F．Bonaventur Housfield Millstone dress，H．T．Ashworth． Mines，etc．，ventilating，L．H．Henry Mirror，tollet，E．T．Starr．．．．．．． Mortising machine， S ．H．Whas Music teaching apparatus，J．A．Scarritt． News 1 aper file，F．B．Alderson． Nuts，making box，Marland and Lewi Nuts，making hexagonal，A．Marland Ordnance，breech loadins， D ．Davison． Ore separator，W．J．Evans Overalls，S．I．．Krouse
Ox bow pin，w．Varnum．
Paddle whecl，feathering，C．A．Lamphere
Pan，steak cooking，D．B．Smith．．
Pautaloons，shaping，E．B．Viets．
Pantaloons block，J．McCurdy．．．
Paper can，E．T．Covell．．
Paper vessel，D．．N．Russell．．．．．．．．．．．．．．．
Pegging machine，Bickford and Sturtevan
Pianoforte agraffe，Kranich and Bach．
Planoforte agrafte，Kranich and Bach
Pipe，Lansdell and Leng Pipe，Lansdell and Leng．
Planing machine，o．G．H．
Flaning machine，G．Spire．．．
Planter．corn，F．Van Doren．
Plow．T．J．Meroney
Plow，D．b．Smith．
Plow caps，making，
Plow caps，making，Marland and Lewis．
Plow，corn，L．G．Claw．．．．．．．．．．．．．．．．
Plow，steam，D．Beaumont．
Plow，sulky o．Oeborn
Plow，sulky，O．Osborn．．．
Post，fence．M．W．Colwel
Pot and kettle，B．M．McLean．
Press，baling，J．M．Albertson
Pump．centrifugal，L．Chapman
Pump faucet，air，T．Bingham．．
Rallway，elevated，C．L．Horack
Railway signaling apparatus，J．E
Railway raill，street，J．P Nessle
Railway rall，street，J．P．Nessle．．．
Railway switch，street，C．B．Barlo
Refrigerator，A．F．Bronner．．．．
Roller，trawl，$\Lambda$ ．L．McDonald．
Rooting tilc，G．Manvel．．．．．．
Sad iron，Ellyson and Askew
Sash holder，T．Walker
Saw buck，G．Collins．．
Saw frame，fret，o．Evans．．
Saw guard，Graves and Howes．
Swas，etc．setting，W．Bry son．
Scraper，road，B．Goodrich．
Scraper，road，J．L．McKeen
Scraper，road．．L．Mck
Screen，G．W．Brown．．．．
Screw cutting die，M．A．Grifith
Screw threading die，F．E．Wells．
Screw threading die，F．E．Wells．
Screw threads．cutting，C．T．Litch
Sew
Sewing machne wider，
Sewing machine take－up，etc．，M．M．Barnes
Shaft hanger，counter，J．J．Squire． Shaft hanger，counter，J．
Shaving mug，D．Hesto．
Shaving mug，D．Heston．．．．．．．．．．．．．．．．．．．．．．．．．．．．．
Sheep washing device，C．H．J，H．McCall．．
Shingle machine
Shoe fastening．T．Tucker．．
Shutt er，tireproof，S．Fales
Skate，O．Ed wards，（r）．．．．．．．．．．．．
Sleigh shaft attachment，D．Smith Sleigh bent knee，etc．，D．O．Card（1）
Slicing utensil，kitchen，A．Iske Soap holder，E．Cundey ．．．．．．．．．．
Soldering machine，w．L．Ballie Sole fastening，B．F． Sole fastenings，making．B．F．Sturtevant Sole fastening rod，B．F．Sturtevant． Spinning machine bobbin，G．Richar
Spinning bolster．G．Richardson（r） Spinning bolster．G．Rich
Steam tray，F．A．Pratt．
Stereosco
Stereoscoplc print cutter，Smillie \＆Siebert Stil，petroleum，J．L．Stewart
Stove，cooking，E．H．Bates．．． Stove door handle，A．S．Shont Stove door hinge，W．T．Howard．．
Stove pipe damper，G．W．Leading Stove，pocket lamp，T．W．Houchin． Stove，reservoir cooking，G．H．Phillips．
Stoves，ventilator for cooking，A．Leigh Strap loop．S．C．Talcott，（r）．．．
Stump extractor，A．McKenney Stump extractor，A．McKenney．．．．．．．．．．． 162,936 Table，extension，N．Petry．
Table，folding，sprigade \＆Schnoerin
Table，slide，extension，W．J．Bod
Table slide，extension，J．C．Turner．
Telegraph．fire alarm，A．Rosenbusch
Tobacco boxes，raising，C．J．Hauck
Tobacco，laminating stems of G．P．
Tobacco，treating，G．S．Prince ．
Tobacco，treating，G．S．Pr
Top，adjustable，$\Lambda$ ．Clarke．
Bensol
Toy muney box，J．Hall．
Truss，J．N．Zirkle．．．．．．．．．．．．．．．．．．．．
Tubing，making welded，J．Huggins
Turntable，s．M．Carpenter．
Umbrella，Hayes \＆Somerset．
Valve，lock－up safety，E．D．Kunkle
Valve，plug，T．Shaw．．．．
Velicle end gate，J．Heald．
Velicle end gate，J．Heald．．．．
velicle wheel lub，W．Gallan
Velicle wheel lub，W．Gallan．．．．．．．．．．．．
Vessels，construction of，T．W．Pratt．
Vssels，custing the lead on，C．E．Eirtl
Wash bench and wringer，Holden \＆Corey
Watercloset，W．S．Car
Wheat，etce．，drying groun
Wheat，etc．，drying groun
Whifletree．J．．Brown．

Wire way，endless，A．S．Hallidie
Wringer，T．E．McDonal

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| 88 |

> DESIGNS PATENTED
> 304.-Yaise Locks.-G. Bernheim, New York city.
> ,306.-Stair Covers.-W. B. Gould, Montrose, N. J. $\begin{aligned} & \text { 8,307.-FANs.-B. Hecht, New York city. } \\ & \text { 308.-Types.-H. Ihlenburg, Philadelph }\end{aligned}$ $\begin{aligned} & \text { 8,308-TYPEs.-H. Ihlenburg, Philadelphia, Pa, } \\ & \text { 809.-Clips For C ARDs.-G. W. McGill,New }\end{aligned}$ $\begin{aligned} & 8,309-\text { Clips for Cards.-G. W. McGill, New } \\ & 8,310 .- \text { Fase.-E. W. Perry, Cincinnati, Ohio. }\end{aligned}$
$\begin{aligned} & \text { 8，312．－Crff－BrTrovs．－L．S．Beals，Astoria，N } \\ & \text { 8，313．－TyPE－J．M．Counor Grcenville，N．J．}\end{aligned}$
$\begin{aligned} & \text { 8，313．－TyPE．－J．N．Counor Grcenville，N．J．} \\ & \text { 8，314．－TyPs．－II．Ihlenburg，Philadelphia，Pa．}\end{aligned}$
$\begin{aligned} & \text { 2，415．－GIN．－Adams \＆Taylor，Boston，Mass．} \\ & 2,46 .- \text { WHISk }- \text { Adams et al．，Boston，Mass．} \\ & 2,417 .- \text { GIN．－Adams，Blake，\＆Taylor，Boston，Mass．}\end{aligned}$
$\begin{aligned} & \text { 2，418．－SOAP．－J．P．Babcock \＆Co．，Stonington．Conn．} \\ & \text { 2，419．－ELSENCE OF GINGER．－F．Brown．Philadelpha，Pa．} \\ & \text { 2，420．－LINIMENT．－G．O．Clark，College Point，L．I．，N．Y．}\end{aligned}$
$\begin{aligned} & \text { 2，131．－Sod．Waterapp．iratts．－J．W．Tufts，M } \\ & \text { Mass．} \\ & \text { 2，432．－Corfee．－G．Boyd \＆Co．，Philadelphia，Pa }\end{aligned}$
$\begin{aligned} & \text { 2，432．－Coffee．－G．Boyd \＆Co．，Philadelphia，Pa } \\ & \text { 2，433．－Birters．－E．Brown \＆Co．，Jersey city．N．} \\ & \text { 2，434．－COFFEE．－D．Focht \＆Co．，Phlladelphia，Pa．}\end{aligned}$
$\begin{aligned} & \text { 2，435．－WoolenClothis．－Middlesex Co．，Lowell，Mass．} \\ & \text { 2，436．－Cinspagne．－Moën et al．，Epernay，France．} \\ & \text { 2．437．－LARD．－G．C．Napheys \＆Son，Philadelpha，Pa．} \\ & \text { 2，438．－MEDICINE．－J．R．Nichols \＆Co．，Boston，Mass．}\end{aligned}$
$\begin{aligned} & \text { 2，438．－Medicine．－J．R．Nichols \＆Co．，Boston，Ma } \\ & \text { 2，43．－Oils，erc．－H．Phillips，New York city．} \\ & \text { 2，} 2 \text { H0．－Mustard，Etc．－Pinckney \＆Co．，N．Y．city．}\end{aligned}$
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$\begin{aligned} & \text { On lssuing each original Patent．．} \\ & \text { On appeal to Examiners－In－Chief }\end{aligned}$
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$4,695 .-$ J．J．Cobb，Grand Rapids，Mich．，U．S．Sides and wings for sleighs．April 28． 1875.
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