

A WEEKLY JOURNAL 0F PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.


WORES OF THE NATIONAL MACHINE COMPANY OF mous quantitis are used by the rairoads in this feet in area The company is incorporated under the TIFFIN, oHIO. The National Machinery Company, of Tiffin, Ohio, welding by a special machine manufactured by this 1883. About 150 operators are employed. The scene a. scene in whose works we present to our readers in concern. Nail machinery, railroad spike machines, in the main shop represents the setting up of the the present issue, is an establishment devoted to the machines for forming, forging and bending, rock and National rock and ore crusher, which is a notable production of heavy machines and tools for manu- ore crushers, special machinery for manufacturers, all example of the work done, interesting on more than facturers. This feature really is its most characteristic one. Thus it does not manufacture bolts and nuts, but makes the machinery for the manufacture of such hese are typical products of this place. one account. The machine weighs 33,000 pounds and but makes the machinery for the manufacture of such area of 80 by 100 feet, a pattern shop 40 by 150 feet, and ratus yet produced. This point of interest is supplearticles. The drawbars of railroad cars, of which enor- the main shop, shown in our illustration, is 100 by 300 mented by the subjective one that the machine as


MAIN SHOP OF THE NATIONAL MANUFACTURING COMPANY, OF TIFFIN, OHIO.
shown was to be shipped, when completed, to Genera Coxey, the leader of the fawous "Coxey Army," which marched to Washington last year.
This is an example of one of the heavier machines produced, others running as high as 45,000 pounds each. The general view of the main shop shows a very com plete plant and indicates the great facilities possesse by the company for work of the heavier class.

## 

ESTAPIIKHED 1845.
MUNN \& CO.. Editors and Proprietors. pUblished weekly at

## No. 361 BIROADWAY, NEW YORK.

## o. D. MUNN. <br> A. E. BEACH.





The buibing Eilitiò or rey cientipic Anericin is a large an

##  <br> 

Elition of Postal Unioc con countries. ©nin.

##   

 Prif The safest way to remit is by postal order express money orderrata or bank check. Make all remitances payable to order of MUNN ar Readers are specially requested to notify the

NEW YORK. SATURDAY, JUNE 1, 1895.

table of contents of SCIENIIFIC AMERICAN SUPPLEMENT NO. 1013


## THE BERLINER TELEPHONE DECISION

It seldom falls to the lot of the federal governmen within the last in successio two such important and far-reaching defeats as those t has suffered in the income tax decision before the United States Supreme Court and in the Berline patent decision in the United States Circuit Court of Appeals. It is not long since we noted in these column the decision rendered by Judge Carpenter in the Cir cuit Court, in the suit brought by the government to annul the Berliner patent. The decision declared the patent to be invalid; it was based on the ground of wrongful delay in procuring the issue of the patent, in implying a want of diligence on the part of the appli ground for declaring the patent invalid.
The second ground was more of the statutory class, eferring to the issue of a prior patent to the same ap plicant for the same invention. On the 18 th of May the United States Circuit Court of Appeals, to which the case had been brought on a ppeal by the Bell Telephone Company, reversed the decision of the Circuit Court, but allowed the appellee, which is the govern ment, to file a motion as to the form of the judgment to be entered with a brief in support of the same. The decision, while a great triumph for the Bell Company is some what tempered by this last clause, as the gov ernment has on file a motion to amend the bill so as to allege a tacit understanding with the officials of the Patent Office in the matter of the delay of the Berline patent, which, if proved, would go to show possibly an absolute fraud. The case cannot be fully discussed until the rendering of the opinion of the Circuit Court. The United States will carry the case to the Supreme Court.

## THE HEAVENS IN JUNE.

The planetary maneu vers in the evening sky during June will be not less attractive than they were in May. Mercury will not only be visible after sunset during the first half of the month, but that shy planet will perform an exceedingly interesting evolution with Jupiter. On the first of June Mercury will be seen about $6^{\circ}$ west, or on the sunward side, of Jupiter. But, in consequence of its more rapid motion eastward, it will approach the giant planet, gaining about three-quarters of a degree upon the latter every day, and on the 3th will overtake it, passing on the north at a distance of only 47'. The nearest approach will occur at 10 o'clock in the morning. Afterward Mercury will continue to forge ahead of Jupiter until the afternoon of the 18 th , when it will turn back and begin a rapid flight sunward, meeting and passing Jupiter on the south at a distance of $2^{\circ} 34^{\prime}$ at 9 P . M. on the 21st. Then it will again distance its great competitor until it disappears in the solar rays.
Jupiter itself practically passes off the stage this month, getting too near the sun at the close to be well seen. It is still in the constellation Gemini.
Mars will remain in view a little longer than Jupiter but the ruddy planet has moved so far a way in its or bit that it no longer possesses any special interest as a telescopic object, while for the naked eye it has sunk into comparative insignificance. The question whether Mars has or has not an atmosphere sufficient to support life resembling that of the earth has not yet been settled to the general satisfaction of the disputants. Mars passes from Gemini into Cancer early in the month and continues in the last named constellation during the remainder of June.
Venus, which so completely outshone Jupiter during May, will grow still brighter in June. There is an education in the science of light in a study of the causes which make a planet less than 8,000 miles in diameter appear so much brighter than a planet more than 86,000 miles in diameter. The primary cause is, of course, the comparative nearness of the former to the sun and to the earth. Venus, seen with the telescope, will be very near the half-moon phase at the end of the month. She is moving eastward and south ward and will be in conjunction with Mars on June 5th at 5 o'clock in the morning. From Gemini she passes on the 5th into Cancer, and from Cancer on the 25th into Leo.
Neptune in Taurus is too near the sun to be observed.
Saturn, remaining in Virgo, some $10^{\circ}$ almost di rectly east of Spica, is the most attractive planet on the list for telescopic observation. The smallest tele scope worthy of the name suffices to reveal the principal charm of Saturn, the wonderful system of rings suspended above its equator. It gives the observer a picturesque sense of the enormous distance across which he is looking to recall, while his eye is at the telescope, the fact that those rings measure almost 170,000 miles from end to end of the elliptical figure which they present. There is no lack of exhibition space in the solar system.
The spectroscopic discovery, made by Professor J. E. Keeler, of the Allegheny Observatory, that the rings of Saturn actually consist-as Max well long ago math-
ematically proved that they nust do-of swarms of
small satellites or meteorites, is one of the finest of re cent achievements in practical astronomy. Professor Keeler's proof, which is wonderfully interesting as well as convincing, consists in photographs of the spectrun of the planet and its rings, which show the spectral lines displaced in such a way as to indicate that the inner edge of the ring system revolves around the planet nearly a mile and a quarter in a second faster than the outer and nearly two miles and a quarter aster than the outer edge. The movements of the various parts of the system as thus ascertained agre satisfactorily with the velocities that satellites revolv ing around the planet at corresponding distance should have according to Kepler's third law of planet ary motion.
Uranus renains near the star $\mathrm{Nu}_{\mathrm{i}}$ in Libra and some $3^{\circ}$ nearly east of Alpha Libræ. It is about equal in brightness to a star of the sixth magnitude and can consequently be seen with the naked eye. It may be recognized with the aid of a field glass by noticing for several nights in succession its position with reference to small stars near it. If careful charts are drawn of the field of view, the motion of the planet will soon be come manifest, and such an exercise is good discipline for a beginner in stellar observation.
June opens with the moon just past first quarter in Virgo. The moon fulls at 6 o'clock on the morning of the 7th in Sagittarius, reaches last quarter in Pisces at $6: 28 \mathrm{~A}$. M. on the 15 th and becomes new moon in Gemini at 4:51 P. M. on the 22d. The second moon of the month reaches first quarter at 1 minute past 9 o'clock on the morning of the 29 th , when it will be in Virgo, about $8^{\circ}$ west of Spica.
The moon visits the planets in June as follows: Saturn on the 4 th, at 12:58 A. M.; Uranus on the 5 th, at 2:56 A. M.; Neptune on the 21st, at 4:33 P. M.; Mercury on the 23d, at 12:14 P. M.; Jupiter on the 23d, at 1:43 P. M.; Mars on the 25th, at 6:27 A. M.; and Venus on the 25th, at 11:11 P. M. This last will be a comparatively close conjunction.
The astronomical summer begins at noon on the 21st.
Among telescopic objects for amateurs that will be well situated for observation this month (in addition to those described last month which still remain in view) are the following
The great star cluster, M 13, in Hercules. This is an mpressive object even when seen with only a 3 inch or 4 inch telescope. Those who have $41 / 2$ or 5 inch telescopes may try them upon the binary star Zeta Herculis. The distance of the components at present does not exceed a second and a quarter.
More interesting to the ordinary star gazer in search of he picturesque, and easy to divide with a 3 inch glass, is Alpha Herculis. Here a striking contrast of color will be noticed, the larger star being orange and the smaller emerald green. The distance is about $41 / 2$ seconds. Rho Herculis, whose components are nearly a second closer than those of Alpha, shows the combination of a white witì a green star. Still another interesting double in Hercules is the star 95, whose two components are 6 " apart, the larger being green and the smaller red.
A good 41/2 inch telescope, and sometimes even a smaller aperture than that, will show the celebrated companion of the great red star Antares in Scorpio. The distance is three seconds, and the color of the little companion is a vivid green. This is one of the finest sights among the double stars. While surveying Scorpio the observer should not neglect to look at Beta, a very easy double, which also exhibits a contrast of colors. The larger star is white and the smaller blue, the distance being about thirteen seconds. Its neighbor Nu is a fine triple, with which a 4 inch glass, or even a $31 / 2$ inch, is easily capable of dealing. The two nearest stars are about a second and three-quarters apart; the farthest star is distant forty seconds. For a beautiful combination of orange with blue look at the star 39 Ophiuchi. The components are twelve seconds apart, so that even a 2 inch glass will separate them.
As remarked last month, these objects cannot be readily found without the aid of a star atlas, a book that ought to stand next to the dictionary in all households where intellectual recreation is favored.

Garrett P. Serviss.

## THE MOON'S STORY**

## 

I do not think there is any chapter in modern science describe It has, in that all the elements of a ro mance. I am to sketch an event of the very rreatest moment in the history of this universe, which occurred at a period of the most extreme antiquity, and has at a period of the most extreme antiquity, an
The period of which I write is far more ancient than that of the Pyramids of Egypt. or of any other monuments erected by human effort. It is even more early than that very remote time, hundreds of thousands of
years ago, when man himself first came upon this globe. Our retrospect has to pierce right through those vastly protracted cycles which the geologists have opened up to us. We speak of a period long anterior to the ages during which our continents were being sculptured into their present mountain chains and river courses. We have to look through those periods still earlier, when great animals, long extinct, flourished on this earth. The time of which I write is more remote than that very remarkable epoch in earth history during which the great coal forest flourished. It is earlier than the supreme moment countless millions of years ago, when living organisms first became inhabitants of this globe. Even here,
however, our retrospect must not stop. We have yet once more to look back through certain anterior pe riods to a time when our earth was in its earliest youth. The chapter of history about which I am now writing The chapter of history about which I am now
is indeed in the very dawn of things terrestrial.
is indeed in the very dawn of things terrestrial.
It might be thought that it would be utterly It might be thought that it would be utterly im-
possible for us to learn anything with regard to what took place at a time so immeasurably anterior to all sources of tradition, and indeed to all the ordinary channels for obtaining knowledge by observation. It however fortunately happens that the darkness of this early period is illumined by a bright and steady source of light which will never deceive us if only we will follow it properly. Onr trustworthy guide is to be the pen of the mathematician, for it is well known that, unless we are going to dispute the fundamental proposition that two and two make four, we cannot im pugn the truths which mathematics discloses. This science knows no boundaries of space. It recognizes no limits in time. It is ever ready for discussing oper ations which take place either in the millionth part of a second or in the lapse of uncounted millions of centuries. The processes of mathematics are alike avail able for tracing out the delicate movements in the interior of a molecule not one millionth part of the size of a grain of sand or for investigating the properties of space so vast that the whole solar system only oc cupies an inconsiderable point by comparison. Let us therefore see what this infallible guide has to teach us with regard to that momentous epoch in the history of our system when the moon was born.
Our argument proceeds from an extremely simple and familiar matter. Every one who has ever been on the sea shore knows the daily ebb and flow of the waters, which we call the tides. Long ere the true nature of the forces by which the moon acts upon the sea was understood, the fact that there was a connec tion between the tides and the moon had become cer tainly known. Indeed, the daily observation of a fisherman or of any one whose business was concerned
with the great deep would have taught him that the with the great deep would have taught him that the
time of high water and the time of full moon stood at each place in a certain definite relation. The fisherman might not have understood the precise influence of the moon upon the tides, but if he had observed, as he might in some places, that when the moon was ful the tide was high at 10 o'clock in the morning, it would be perfectly obvious to him that the moon had some special relation to this ebbing and flowing of the ocean Indeed, we are told of some savage race who, recognizing that the moon and the tides must be associated were still in some considerable doubt as to whether it
was the moon which was the cause of the tides, or the was the moon which was the cause of th
tides which were the cause of the moon.

## tides which were the cause of the moon.

The ebbing and flowing of the tide opens up this chapter in remote history, which we can now explore, mainly by the help of the researches of Prof. George Darwin. For, as the tides course backward and for obvious that the tides must be doing work. In fact in some places the tides have been made to do useful work. If the water as it rises be impounded in a large reservoir, it can be made to turn a water wheel as it enters, while another water wheel can be driven as the reservoir empties itself a few hours later. Thus we produce a tidal mill. It is quite true that, so long as coal remains tolerably cheap and steam power is consequently readily available, it is not of ten possible to employ the direct power of the tides in an economical manner. For our purpose it is merely necessary to note that, day after day, week after week, year after year, the tides must be incessantly doing work of some year, the tides
kind or other.

Every practical man knows that a certain quantity of work can only be done by the expenditure of a cer tain quantity of energy. He also knows that there is in nature no such thing as the creation of energy. It is just as impossible to create out of nothing the energy which should lift an ounce weight through a single inch as it would be to create a loaf of bread out of nothing. If, therefore, the tides are doing work, and we have seen that they undoubtedly are doing work, it follows that there must be some source of energy on it follows that there must be some source of energy on
which the tides are enabled to draw. A steam engine which the tides are enabled to draw. A steam engine
is able to put forth power because of the energy developed from the coal which is continually supplied to the furnace. But where is the equivalent of the coal in the great tidal engine? We might at first hazard the supposition that, as the moon is the cause of the
tides, so we must look to the moon to provide the en
ergy by which the tides do their work. This is, how ergy by which the tides do their work. This is, how
ever, not exactly the case. The match which light the fire under a steam boiler is in one sense no doub the cause of the energy developed; but we do not therefore, assert that the power of the engine is de rived from the match. It comes, rather, from the fuel whose consumption is started by the match. In like manner, though the moon's attraction causes the tides yet it is not from the moon that the tidal energy is drawn. There is only one possible source for the en ergy necessary to sustain the tides. Every one who i conversant with mechanical matters knows the im portant duty which the flywheel performs in a mill. The fly wheel, in fact, may be considered as a reservoi into which the engine pours the power generated with each stroke of the piston, while the machinery in the mill draws on this accumulated store of power in the fly wheel. If the engine is stopped, the flywheel may yet give a turn or two, for the energy which it contains yet give a turn or two, for the energy which it contains
may be still sufficient to drive for a few seconds the machinery through the mill. But the store of energy in the flywheel would necessarily become speedily exhausted and the fly wheel come to rest un less it were continually replenished by the action of the engine.
The earth may be regarded as a mighty flywheel which contains a prodigious store of energy. That energy is, however, never added to, for there is no engine available. If, however, no energy were with drawn from the earth, then the globe would continu o spin round its axis once every twenty-four hour forever. As however the tides need energy to get through their work, they abstract what they require from the store which they find at hand in the rotation of the earth. Next time you see the tides scouring up and down a river you may reflect that the power which impels that mass of water to and fro has been obtained solely at the expense of the spinning of our globe. Indeed, the little child who digs a moat in the sand, which is filled by the rising tide, affects, to a certain extent, the revolution of this earth about it axis.
This withdrawal of energy from the earth is inces santly taking place along almost every coast. From day to day, from century to century, from won to æon, energy is daily being withdrawu and daily wasted, never again to be restored. As the earth has no other means of replenishing its stores, the conse quence is inevitable. The quantity of energy due to the rotation of the earth must be gradually declining Stated in this way, perhaps the intimation is not very alarming, but, placed in other words, the results a which we have arrived assume the more practical ex pression that the tides must be gradually checking the speed with which the earth turns round. The tides must, in fact, be increasing the length of the day In consequence of the tides which ripple to and fro on our shores, and which flow in and flow out of estua ries and rivers, to-day is longer than yesterday, and yesterday is longer than the day before. I may, how ever, admit at once that the change thus produced is not very appreciable when only moderate periods of time are considered. Indeed, the alteration in the length of the day from this cause amounts to no
more than a fraction of a second in a period of a more than a fraction of a second in a period of a
thousand years. Even in the lapse ordinary history, there is no recognizable change in the length of th day. But the importance of our argument is hardly affected by the circumstance that the rate at which the day is lengthening is a very slow one. The really significant point is that this change is alway taking place, and lies always in the same direction. It is this latter circumstance which gives the present doctrine its great importance as a factor in the devel opment of the earth-moon system.
We are accustomed in astronomy to reason about movements which advance for vast periods in one direction, and then become reversed. Such move ments as this are, however, not the real architects of the universe, for that which is done during one cycle of years is undone during the next. But the tides are ver in operation, and their influence tends ever in the same direction. Consequently the alteration in the length of the day is continually in progress, and in the course of illimitable ages its effects accumulate to a tartling magnitude
The earth now revolves on its axis once in twenty four hours. There was a time, millions of years ago,
very likely, when it revolved once in twenty-three very likely, when it revolved once in twenty-three hours. Earlier still it must have spun on its axis in the day was only twenty hours. The very same arguments applied in those times which apply at the present, so that if we strain our vision back into the excessively remote past, we find the earth spinning ever more and more rapidly, until at last we discern an epoch when the length of the day, having declined to eight hours and seven hours, had at last sunk to
something like five or six hours. This is the time something like five or six hours. This is the time when the moon's story commences. At this eventful
period the earth accomplished about four revolutions in the same time that it now requires for a single one.

We do not attempt to assign the antiquity of this criti cal moment. It must certainly have been far earlie than the time when this earth became fitted for the reception of organized life. It must have been at least many millions of years ago. If it be thought that the vagueness of our chronology is rather unsatisfactory, then it must be remembered that even his torians who have human records and monuments to guide them are still often in utter uncertainty as to the periods during which mighty empires flourished, or as to the dates at which great dy uasties rose o perished.
But our story has another side to it. Among the profoundest laws of nature is that which asserts that action and reaction are equal and opposite. We have seen that the moon is the cause of the tides, and we have further seen that tides act as a brake to check the speed with which the earth is rotating. This is the action of the moon upon the earth; and now let as consider the reaction with which this action must be inevitably accompanied. In our ordinary experience we observe that a man who is annoyed by another feels an unregenerate impulse to push the annoying agent away as far as possible. This is exactly the form which the reaction of the earth asumes. It is annoyed by the moon, and accordngly it strives to push the moon away. Just as he moon, by its action on the earth, through the medium of the tides, tends to check the speed with which the earth is rotating on its axis, so the earth reacts on the moon, and compels the satellite to adopt a continuous retreat. The moon is therefore gradually receding. It is further from the earth to-day than it was yesterday, it will be farther tomorrow than it is to-day. The process is never reversed, it never even ceases. The consequence is a continuous growth in the size of the track which the moon describes around the earth. It is quite true that this growth is a slow one, so too the growth of the oak is imperceptible from day to day, though in the lapse of centuries the tree attains a magnificent stature. The enlargement of the moon's orbit, though mperceptible from month to month or even from century to century, has revolutionized our system in the lapse of many millions of years.
Looking back through the mists of time, we see the moon ever drawing nearer and nearer to the earth. Our satellite now revolves at a distance of 240,000 miles, but there was a time when that distance was no more than 200,000 miles. There was a time, millions of years ago, no doubt, when the moon was but 100,000 miles away, and as we look further and further back, we see the moon ever drawing closer and closer to the earth, until at last we discern the critical period in earth-moon history, when our globe was spinning round in a period of about five or six hours. The moon, instead of revolving where we now find it, was then actually close to the earth, earlier still it was in fact touching our globe, and the moon and the earth were revolving each around the other, like a foot ball and a tennis ball actually fastened together.
It is impossible to resist taking one step further. We know that the earth was at that early period a soft molten mass of matter, spinning round rapidly. The speed seems to have been so great that a rupture took place, a portion of the molten matter broke away from the parent globe, and the fragments coalesced into a small globe. That the moon was thus born of our earth uncounted millions of years ago is the lesson which mathematics declares it learns from the murmur of the tides.

## New Telephone Transmitter.

Mr. C. F. Dunderdale, of Chicago, has recently brought out a type of telephone transmitter possessing everal novel features. While recognizing the good qualities of a granular carbon in a transmitter, the tendency to packing has to be avoided, and this he has secured by means of a constant rotation of the case containing the granules, so that the carbon granules are in a constant state of reversal of position, thus preventing their settling and the ensuing separation of the grains, the finer from the coarser, the former collecting at the bottom, and the latter at the top, and which the shaking only aggravated and increased the tendency to solidify
One of the means of accomplishing this result is to provide a lever and ratchet movement, the lever being the support hook of the receiver, the act of hanging up and taking down of which causes the rotation to be secured automatically.
Every characteristic of the voice is preserved, whether the transmitter is shouted at or whispered into, all extra-vibratory sounds or echoes being elimi nated.
The St. Charles, Mo., telephone exchange is fitted p with these instruments, and users there, it is as erted, can stand off thirty feet from the transwitter and talk in an ordinary tone of voice and have thei words clearly transmitted to the distant point.

If a match is held to a celluloid billiard ball, the ball will catch fire and burn.

A MACHINE FOR STAKING LEATHER OR SKINS.
The illustration represents an improvement in machines employing a main and a blind blade, over which roller is movable up and down, a supplemental blade being arranged in front of the roller to give the mahine a double action and iacilitate the uore tho ough stretching and working of the skin. A patent has been granted for this invention to Mr. Richard Holmes, of No. 939 North Front Street, Philadelphia, Pa. The lower jaw, as in the ordinary machine, is slidable in a suitable frame, and fulcrumed on this jaw is an upper jaw, a roller at the rear end of which is engaged by a pitman, to give to the jaw, and a roller


HOLMES' LEATHER STAKING MACHINE.
carried at its forward end, an up and down move ment. The lower jaw has a head which carries main and blind blades over which the roller moves, and in front of these is an extra blade, having vertical slots in ts body to receive the bolts by which the blade is adjustably fastened to the head at the desired height, the skin being worked between the roller and the blades as indicated by the dotted lines in the small figure. The drawing of the skin over the extra blade is designed to give it an additional stretch, insuring additional scraping and also increasing its measurement.

The Bower Birds of New Guinea.
Every one has heard of the bower bird-Chlamy-dera-who constructs a play ground or garden of delight, adorning it with all sorts of attractive objects, either for his own whimsical purposes or to please his mate. The bower is some little distance through, perhaps thirty inches along the ground, and is composed of short twigs and sticks so placed as to form a halfroofed tunnel. Here the bird passes much of his time diverts his mate by adding to their resort or by showing the gay material he has picked up, and in various wavs manifests his appreciation of his own ingenious devices. He is a plain fellow in his own dress, though his taste is for the gaudy and meretricious; his size too is swall in proportion to the Castle of Indolence he rears, for this is no nest, this retreat of his, but a pleasure house, a place of retirement, quiet amusement, or rollicking sport. His nursery is a different thing altogether, and is placed elsewhere. In his bower he gives his fancy full swing; he brings hither to garnish it every bright article he can discover, and lays a considerable territory under tribute to minister to his beloved habit, and so prodigal is he of his acquired treasures that the approaches to his singular aboed are strewn with spoils. Nothing seems to come amiss, hence he is as eager to possess himself of old bones, shells, stones, and all kinds of miscellanea, as bits of metal, flowers, leaves, dropped feathers, etc., although as a rule glittering objects prevail, obviously collected for decorative purposes. It is apparent that with so much evidence in plain sight, the little builder could not well conceal his structure, nor indeed was it the probable intention to do so; it was fa easier to hide the real nest, and this has been done so effectually that the most persevering efforts toward discovery have gone unrewarded. It is not likely, however, that arbor and nest are very far apart.

The Chlamydera cerviniventris or fawn-breasted bower bird is enough like the common female robin of this country to be mistaken for her. The bird is very plain throughout, the nearest approach to bright ness, and that but slight, being on the breast and abdomen, where a brownish yellow tinge occurs. The buff throat is streaked with dull yellow. The upper parts are uniformly drab or slate. It is rather longer than our robin-about twelve inches-with tail and wings extended more than strict proportions would permit. The bill is short and black, eyes are dark, legs and feet black. The male is said to sing sweetly, thus adding another accomplishment to his faculty of pleasing his mate as well as himself.
Another bower bird of New Guinea is the gardener -Amblyornis inornatus-who builds his hut or arbor
of a triangular shape, set back against the trunk of a tree; in front he scatters the usual assortment of shin ing, smooth, and curious objects together with perishable substances, such as small plants, flowers, insects, fruit and fungi, removing them carefully when they become offensive or timewor!. This little virtuoso is plain in color, a yellowish red predominating, and in size and general appearance not unlike a large brown thrasher. He seems always busy and, indeed, must be, for the nature of his work requires unflagging diligence, but the time of greatest activity probably is during the pairing season.
The best authorities describe the cabin of the gardener as built around the central stem of some bush, or as inclosing a cluster of shoots; in front the garden is placed, and is set out with that strangely rational though fantastic system of horticulture that has gained the bird its name. If there is no growth in the garden, we may infer that this branch of cultivation formed no part of the grand design; the results were all that was sought and these were to be always above ground. These birds have been classified by some naturalists with the Paridisea, though nothing in their appearance, habits or song (they are said to sing sweetly) seems to bear out such assignment.
This curious and fascinating bird is very local in its range, being confined so far as known to the Arfak Mountains in the northwest of New Guinea. It is only of recent years that it has been studied scientifically. Mr. Wallace knew nothing of it nor have naturalists since his visit to the great island added much to our knowledge. Dr. Becceari was the first to introduce the gardener to the world, and his graphic account of the abode of the little artificer has not been surpassed in merit nor greatly amplified in details by subsequent investigators. The Italian traveler, as in a picture, shows the hut or cabin close upon a small, flower be sprinkied meadow. It is built around the stem of a little tree as thick and tal as an ordinary walking stick. The ma terials used are moss chiefly, and form a structure about three feet in diameter. In shape the nest is conical, reminding one irresistibly in its whole appearance of the head covering Robinson Crusoe is usually represented as wearing. Inside is a little gallery or rurway built along the walls. The garden is arranged before the hut decked out as we have seen. Amblyornis-simple in attire and coloring as his specific name indicates -is now a favorite illustration with theorists o the adaptation of animate life to its surroundings. Certainly its dun and sober clothing assimilates easily with the tones of soil and vegetation around. Its home too, with all its adornments, harmonizes with, indeed forms a part, of the gay ©reen wood.-G. S. Mead, in the American Naturalist.

## AN IMPROVED BOILER

In this boiler the crown sheet and fire box sides are united by curved riveted flanges extended from the up. per portion of the sides of the fire box, a part of the crown sheet extending through the water compart ment. The improvement has been patented by Mr Richard Reeves, of 'Toledo, Ohio. Our illustration af fords a side view of the boiler, with portions of th shell and interior broken away. The fire box termi nates at its rear end in a flue chamber, and the bot tom part of the invertedly curved crown sheet is con nected by rivets at its rear end with a flange of the flue sheet conforming to the shape of the crown sheet The rear ends of the flues are supported by the flue sheet, and the flue chamber has a $U$-shaped crown


REEVES' STEAM BOILER.
sheet and a rear head, the letter being riveted at it sides and top to the crown sheet, and both the crown sheet and head being connected by stay bolts with the shell and the exterior head. The flue chamber is thus properly supported for the water to circulate around it, and the boiler affords a large heating surface in a comparatively small space.

## A SAFETY MONEY DRAWER.

To prevent mistakes in making change, and to de feat any attempt on the part of a purchaser to make the tradesman believe that a bill of a larger denomina tion has been given him than that actually handed in Mr. Michael R. Daley, of Fall River, Mass., has invented and patented the improvement represented in the accompanying illustration. Beneath the sliding tray containing pockets for small change, the till is divided into four front compartments for bills, the firs compartment for one dollar bills, the second for twos, the third for fives, and the fourth for tens and those of higher denomination, there being at the back of the till an alarm lock of the usual construction.
Over these bill compartments are three separate movable covers, sliding in guides to one side or the other, thus always leaving one compartment open, it being the principle of the invention to leave open the compartment in which is placed the bill received, that it may be in sight until the transaction is completed, and so that this bill only will be seen when the drawe is again opened. In Figs. 2 and 3 in the illustration the $\$ 1$ compartment is represented as open, and all the other compartments are locked, except as they may


2


## DALEY'S SAFETY MONEY DRAWER

be opened by moving their covers toward the left, while, as shown in Fig. 1, with the $\$ 10$ compartment at the right open, any of the other compartment may be opened by sliding its cover rearwardly.
To lock the lids of compartments 2, 3, and 4, so that they will not slide backward except when they have an open compartment at the right, a simple locking device, as shown in Fig. 4, is pivoted in the rear wal of compartments 2 and 3 , while at the rear of compartment 4 is a permanent stop. An arm of this locking device, in the rear of the compartment, is in ver tical position when all the covers are pushed to the right, but on pushing the covers to the left, either one or all of them may be moved to the rear, the lock ing arms being then held down by the covers. In this way all the lids to the right of an open compart ment are locked, while those to the left are free to be opened, and in making change when the drawer is operated according to this system, bills can only be taken from compartments holding lower denominations than the bill which has beentaken in, which lies in the open compartment. When the drawer is pulled open there can be only a bill of one denomination in view, the bill that was taken in last

## The screw Propeller

It is interesting to learn from a paper read at the Institute of Civil Engineers by no less authorities than Messrs. S. W. Barnaby and Thornycroft, that in their opinion the present speed attained by the screw pro peller has in the fastest craft now afloat approached the limit of efficiency. The Marine Engineer says: It will soon be a question, therefore, if this view be cor rect, not as to the comparative merits of twin and triple screws, but as to the scr ew in comparison with other methods of propulsion. Here is a vast field for other methods of propulsion. Here is a vast field for
experiment and research. We know neither the padexperiment and research. We know neither the pad-
dle wheel nor any modification, therefore, will help us, dle wheel nor any modification, therefore, will help us,
even if it were more efficient at high speeds, because of even if it were more efficient at high speeds, because of
its vulnerability. We must have some mode of applying the power below the water line.

Germany is now the only country whose univer sities do not admit women students.
gas engines for electric lighting plant. In connection with the new station, and the extensive alterations recently carried out at Leicester, the Midland Railway Company has put down the largest and most efficient electric plant driven by gas engines in this country. We are enabled to give an illustration of the engine and dynamo room, and also a few particulars of the plant. The motive power consists of four large gas engines and two smaller, and are all made by Crossley Brothers, of Openshaw. Manchester. They are all built on their well known lines, and are specially fitted for driving dynamos with the necessary steadiness. Each of the four large engines is of 25 nominal horse power, capable of giving off 40 brake horse power as a safe working load with Dowson gas; and instead of the two overhung flywheels usually employed, one heavy flywheel, 7 feet 6 inches diameter by 19 inches wide, and weighing 4 tons 5 hundredweight, is fitted on each engine, with a massive outend bearing and pedestalforsupporting the end of the end bearing and pedestalfor supporting the end of the minute, and with the means adopted very great steadiness is obtained. The face of the flywheels is slightly rounded, and the dynamos are driven direct from it. The crankshafts are cut out of solid steel forgings and are machined and polished all over, thus adding materially to the appearance of the engines. As is usual in all the engines made by Messrs. Crossley Brothers,
tions per minute. Each engine is fitted with governors used for electric lighting work, and is generally on the lines of the larger engines previously described. Although the heavy flywheels militate against the ef ficiency of the engines, it costs less to store up the necessary energy to insure steady running by increas ing the flywheel power of the engine than it would to achieve the same result on the dynamo
For the jacket water for these engines one large tank is fixed on columns and girders, and contains sufficient water for cooling the cylinders of the engines even if all were working at once. Under ordinary circumstances the engines are worked with Dowson gas, but arrangements are made whereby, in the event of anything being out of order with the gas plant, the engines can be immediately turned on to coal gas from the town's mains. Three of the four larger engines are connected to Brush series arc-lighting machines, capable of driving fifty 2,000 candle power lamps each; the fourth large engine driving an incandescent machine of 300 amperes.. Each of the smaller engines drives a small machine for incandescent lighting, giving an output of 125 amperes at 115 volts. The arc lighting is required for the goods yards and sheds belonging to the Midland and London and Northwestern Railway Companies, and for the platforms, etc., of the new pas senger station. The incandescent lighting is employed for the refreshment rooms, dining rooms, and offices.

Misfortunes of Birds.
I have noticed in a New York paper an account of a strange misfortune that happened to an English spar ow at the building of the Edison laboratory, Orange, N. J. The bird became entangled in a twine used in the construction of its nest, and metits death by hang ing. This has reminded me of a similar incident that occurred to a bird last summer, near Bowling Green Ky. It was a common or crow blackbird, and was seen hanging by the neck from the limb of a tall tree overhanging the road. Whether in flying with a long grass or string it became entangled with it or in what way it got caught in the noose and met it death, is a matter of conjecture. A queer incident of a woodpecker has come under my notice. The bird, a hairy wood pecker, was seen on a tree trunk, and though a stone was thrown toward it to see it fly, it remained in the same position. On going nearer, it was found hat the bill had been driven into the tree with such force that the bird could not extricate it, and had hung there, meeting a miserable death.
I have heard from a friend of an interesting life his tory of a mocking bird. It was quite a young bird when purchased from a negro bird catcher, and it was soon discovered to have sore feet. These were swollen twice the natural size, and though efforts were made to relieve this, it was only after it had lost several of its toes-two front toes on one foot and one on the other


GAS ENGINES FOR ELECTRIC LIGHTING PLANT.
the cylinders are fitted with loose liners, made like the pistons of specially hard metal, so that when they are worn beyond the stage at which reboring is possible, they can be renewed at the smallest possible cost. Owing to the high speed at which the engines run, special attention has been paid to the bearings, and to all the parts of the engines, with a view to easy main tenance and facility of renewals at the least cost.
As it is essential that when once started the engines should run without intermission until their work is done, automatic lubricators have been fitted to all the vital parts. A novel feature in connection with these engines is the new igniting arrangement recently brought out by Messrs. Crossley. Instead of the metal tubes, which are short lived, Messrs. Crossley now use a short porcelain tube, about 3 inches long, which, if not destroyed by careless handling, is imperishable. It is quickly heated, thus reducing the time required for starting after the burner is lighted to about a minute and a half, besides being low in first cost. The engines are started by Crossley's self-starting ap paratus, which enables an engine to be set in motion with nearly half load on. Thus fast and loose pulleys on the dynamo, or on other machinery the engine has to drive, are rendered in many cases unnecessary
The two smaller engines at Leicester are each of 14 nominal horse power, capable of working up to 25 brake horse power with coal gas, and are each fitted with two operhung flywheels running at 200 revolu-

The Dowson gas plant is placed in a separate building adjoining the engine house. There are two gas generators, and each has a gas cooler, hydraulic box, coke scrubber and sawdust scrubber. Space has been left for a third set, which has not yet been supplied The gasholder is 16 feet diameter by 10 feet deep. There are two small vertical boilers, but only one is used, the other being in reserve. We have no recent data as to the working, but we may mention that toward the end of last year they were working three 25 horse power and one 14 horse power from 5 P. M. or 6 P. M. to 10 P. M. or 11 P. M., and that one generato made gas enough. From $10 \mathrm{P} . \mathrm{M}$. or $11 \mathrm{P} . \mathrm{M}$. to 5 A. M. or 7 A. M. there were two 25 horse power and one 14 horse power, and during this time the production of gas was reduced to suit the smaller load. At that time all the arc lamps were not fixed, but when the full number is on the two generators will be worked, one of them being stopped during the hours of light load. The generators are fired with anthracite coal and the boiler with common boiler lack.
The whole installation, which is very complete in every detail, has been carried out under the supervision of Mr. W. Langdon, superintendent of the telegraph department of the Midland Railway Company, and is a fine example of a modern electric light plant, in conjunction with gas engines and producer gas.-The Engineer, London.
-that the feet were finally healed. After this it moult ed, losing about all its feathers at one time. Its eyes then became inflamed, and the eyeballs like drops of water. finally closed and the bird became totally blind. In getting its food it would stand at one side of the cage and follow the wires till it reached the food, it would then follow the side of the cage till it reached the water. It soon learned, however, to gage distances, and would fly to the perch without fail. It was a pitiable object, but strange to say, this poor maimed bird, lame and blind, developed into one of the finest of singers !-Sadie F. Price in Amer. Naturalist.

## Bordeaux Mixture.

W. T. Swingle (Jour. of Mycology) states that copper sulphate may be dissolved with steam; the stock solution should contain two pounds of copper sulphate to a gallon. The color of the mixture should be deep sky blue. The clear liquid after settling gives no brown color with potassium ferrocyanide solution, but does give a slight precipitate of light bluish color with copper sulphate solution. The addition of soap to the finished mixture greatly increases its wetting properties and adds to its value for all plants with waxy coating on the parts sprayed.

THE skeleton alone of an average whale weighs twenty-five tons.

## Sorrespondence.

## Irrigation by wind.

To the Editor of the Scientific American :
In your issue of May 18 is an alleged discussion of "Irrigation by Wind." The writer takes the bicycle as an illustration, and traces its growth from its crudest forms through forty-six years to its present marvelous perfection-the most perfect, from a mechanical point of view, of any machine now in existence, not even excepting the watch, because the bicycle has more scientifically and perfectly constructed bearings than the watch. The writer then tumbles from this exalted height to the "Jumbo" windmill and lauds it for its "ease of construction, economy of cost, capacity in power," etc., none of which qualities does it possess
In the first place, the "Jumbo," 21 feet in diameter and 27 feet long, with eight fans alluded to, will re quire 2,264 feet of lumber for the shield up to its shaft. This makes no mention of the frame on which the lumber is to be nailed and which carries the wheel, and which would doubtless bring it up to 4.000 feet of lumber. As a moment's reflection will show, of the eight fans described, but a quarter of them, or two, will be exposed to the wind at any one time, and of those two you really get no benefit except from one of them, for either one shields the other or else both stand so obliquely to the wind that not more than half efficiency is attained. You are, therefore, reduced to oneeighth of the sail surface. This one-eighth, by reason of the fact that it faces in one of two directions, is re duced to one-half of its efficiency again, leaving the sail surface with an efficiency of only one-sisteenth. Now add to this the further fact that it is not practica to get these wheels up where they get a good wind exposure, and the efficiency is reduced to almost nothing, which is found to be the case in practice.
A wheel needs to be at least 30 or 40 feet above the ground even in a level country to get good results, and in these prairie countries where irrigating is now being done, numerous groves are being planted, and the efficiency of the wheel that must be placed on the ground is very small and very little figuring will show that its cost is very large as compared with the mar velously efficient steel wheels now made. So far from the "Jumbo" being the germ of a new idea, it is a very old form that, together with a similar wheel with a vertical shaft, which is much better, were among the first of wind wheels and the most frequently rein vented and the most easily demonstrated to be utterly worthless.

A modern steel wheel, on a 40 foot steel tower that will pump more water in a year than this "Jumbo" described, can be bought at one-fifth its cost, and the pump for the steel wheel, since it works constantly when the wind blows instead of only a small portion of the time, is proportionately smaller and proportion ately less costly.
L. W. Noyes.

## Breaking of the Earth's Crust.

From the point of view of the general geographer, whose scope takes in not only the superficial aspect of a country, but its physical construction as well, perhaps the most interesting contribution to African knowledge that has been made within late years is the demonstration by Dr. J. W. Gregory, of the British Museum, that there exists in Eastern Africa, occupying a very considerable portion of its extent, narrow, and in places a very deep, trough, in which the great lakes and many of their tributaries are lo cated, and which, with a more or less open and de pressed lowland, communicates with the basin of the Red Sea, and yet further with the Dead Sea and to the Valley of the Jordan. To use Dr. Gregory's own words: "From Lebanon, then almost to the Cape, there runs a deep and comparatively narrow valley, margined by almost vertical sides, and occupied either by the sea, by salt steppes and old lake basins, and by a series of over twenty lakes, of which only one has an outlet to the sea. This is a condition of things ab solutely unlike anything on the surface of the earth.' The presence of such a rift, for rift it appears to be can only be compared with the long lunar rifts which have solong puzzled astronomers. To Professor Suess, the eminent geologist of Vienna, we owe, indeed, the first demonstration that over large areas of the earth's surface the crust has been steadily breaking through in the direction of the earth's center, and that the crust has been torn and rifted throughout all time by the subsidences of earth blocks; and he truly, many years ago, pointed out the probable wexistence of this vast Afro-Asiatic trough, the evidence to which has now been supplied by Dr. Gregory
This investigator was actually able to trace a long parallel-sided and steeply-walled valley, of perhaps twenty to twenty-five miles wide, extending southward from the Great Nyanza to beyond the first parallel of south latitude, or over a linear distance of some 150 miles or more. Over much of this extent the bound ary walls are described as being "so precipitous that not even the most expert of cragsmen could scale
$\left\lvert\, \begin{aligned} & \text { them } ; \boldsymbol{n} \text { sheer precipices are indicated with elevations } \\ & \text { of } 800 \text { and } 1,000 \text { feet. This remarkable structure of }\end{aligned}\right.$ of 800 and 1,000 feet. This remarkable structure of most unique development and extraordinary persist ency must be regarded as one of the most interesting features of the earth's surface.-Prof. Angelo Heilprin

## SIMPLE AND EFFICIENT FANS.

For ventilating or cooling sleeping rooms and other apartments, or for use in any situation where running water, at a pressure of twenty pounds or more, is avail able, the simple fan and connected motor herewith illustrated is designed to afford most efficient service, at a low first cost, and needing but the slightest possible
attention afterward. The stand ard or base, a shown, may be fixed in a vertical or horizontal poition, and the water connections may be satisfac torily made with hose where it is not desired to make permanent lead or iron pipe connections, the work being done by any one without the aid of a
mechanic. This improvement has been introduced
THE WEED WATER FAN MOTOB by Messrs. A. F. Weed \& Company, to operate a line of mechanical models requiring a light power. It has been found to be so well propor tioned and so accurately adjusted that it runs at high speed without vibration and almost without wear, re quiring no attention beyond an occasional oiling of the bearings, and has been adapted for all kinds of light machinery. Fittings are furnished for ready attach ment to any style of basin cock, and, once installed the device is always ready to operate by simply turn ing the faucet.

## A NOVEL WRENCH.

In the wrench shown in the illustration the pivoted jaw arms are pressed apart by a spring, and one of the arms carries a pivoted holder or bail which extends over the other arm, limiting its outward movement the jaws of the two arms being held in close gripping engagement with a nut, pipe, or other article by sliding a wedge along one arm and under the bail. The im provement has been patented by Mr. Alexander Del hommer, of - Breaux Bridge, La. The wedge has a rearwardly extending shank in which is a longitudinal slot engaged by a screw screwing in the arm, and when this screw is loosened the wedge is free to slide along the arm, but when the jaws are brought into engagement with an article to be gripped, and the


DELHOMMER'S WRENCH.
wedge is moved forward under the bail, the wedge is astened in position by means of the screw, lockin the gripping jaws upon the article

The Clean Streets of Rome.
A correspondent of the New York Sun, in a recent tter from Rome, writes as follows:
I have been a good deal interested in observing the mode of cleaning the streets in Rome. They are kep so clean, even the poorest of them are kept so much cleaner than the best streets in New York, that I have given some time to the study of the system in force here and its expense. I have been kindly furnished by the officials of the city, on a request made through the consul-general, with answers to a series of questions which I framed in order to enable me to obtain accurate knowledge on the subject.
What the stranger sees of the process of street clean ing is that all over the city are men in a cheap uni form, armed with a broom of $t$ wigs, a basket, a shove and a small red painted covered cart, very much as we see used by the men engaged in repairing the pavements with us, only smaller. Each obviously has allotted to him a certain portion of the street, and he is engaged all day in keeping it clean by
sweeping up the dirt and putting it into his red cart. When he has no work of this kind to do he sits down on the edge of the sidewalk and proceeds, rom a supply of twigs, to mend or make his broom At stated periods in the day he wheels his cart of to a place of deposit, where its contents are emptied into large carts in waiting, which in turn carry the dirt out to places just outside the city gates.
There are two circumstances which render it easier to keep the streets clean at Rome than with us. One is the excellence of the pavement. A little more than one-half of the superficial area of the streets is macadamized, while the other half is chiefly paved with small trap rock blocks, almost identical with those brought from the Palisades and used with us. About one per cent of the superficial area is paved with asphalt, and a very small fraction with wood But, however paved, the streets are kept smooth, so hat there are no inequalities to retain dust
The other circumstance which facilitates street clean ing here is that nothing is ever thrown into the streets rom the houses or stores. No one seems to think of throwing any such matters into the street, for the eason in part that garbage and all the dirt and refuse that accumulate in the houses and stores are taken rom them daily by men employed by the city, who ordinarily come into the houses and buildings and remove such refuse and carry it off in carts to places of deposit outside of the city. When the owners do not arrange to have the raccogletoli, as the collectors of garbage are called, come into the houses, they deliver it o them at fixed hours.
You will be astonished at the absurdly small figure which it costs to keep clean and sweet the streets of Rome, a city of 500,000 inhabitants. The following are the official figures, which include not only the expense of sweeping the streets and removing the sweepings to the places of deposit outside the city, but also the like removal of the garbage and house dirt and the watering of the streets. The horses and carts belong to the city, it having been found that the work was done more cheaply and better in that way than by ontract, though ordinarily the contract system pre vails for similar public work-such for instance as the collection of the octroi-much more generally than with us. A small charge, averaging only six cents a month, is made for the removal of garbage from each house, where the owners elect, as they almost univer sally do, to have the collectors come into the house for that purpose. The sweepings are taken away rom the several places of deposit outside the city wall by the peasants, who are glad to come and get the tuff.
If we reckon the dollar at five francs, the total ex penditure in 1894 for all the service I have specified was $\$ 148,461$, but from that must be deducted $\$ 31,428$ received from various sources, including about $\$ 29,200$ or the removal of garbage from houses, so that the net expense was only $\$ 117,033$.
With reference to the length of streets swept there are in all about 180 miles, of which all except eighteen are swept daily. Each street is not only swept in the daytime, as I have described, but also specially each night. As to the superficial area there are about $2,956,000$ square yards of street and 332,000 of sidewalk, making a total superficial of $3,286,000$ square yards for the city.
There are employed in the performance of the work I have specified about 813 persons of all grades. Of these, 453 are the sweepers, 42 the cart drivers who carry away the street sweepings, 58 the cart drivers who carry a way the garbage and refuse of houses and stables, and 129 the men who enter the houses and carry out the garbage from them. There is one superintendent, who has twelve clerks and as many assist ants. Hostlers, farriers, harness makers, watchwen, etc., make up the balance. The total number of 813 is sometimes increased by men for a special service to 853 .
The amount of street surface assigned to each sweeper varies with its width, its locality and importance, and with the mode of pavement. In the streets that are macadamized it is a maximum of about 30,000 square feet, while in those that are paved it is in some cases as low as 12,000 square feet. The average for the city is about 20,000 square feet to the weeper.
The surprise which the small aggregate expense will excite will be much diminished when we come to know the wages that are paid. The street sweepers get, if we reckon the franc at 20 cents, 36 cents a day, and are entitled to a summer and winter suit of clothes and to two hats and two pair of shoes a year ; but the total expense of these for the whole 453 sweepers is only $\$ 2,680$ a year. The highest salary paid is $\$ 850$ a year, to the superintendent, and there are only thirteen persons who receive annual salaries, some of them getting only $\$ 216$ a year. The cartmen get from 45 to 50 cents a day. Those who deal with house garbage get from the city 25 cents a day, but are allowed to have some pickings from the matter removed. The highest wages paid to any employes is to the foremen, $\$ 1.25$ a day. The mechanics get 50 to 60 cents and harness makers 50 to 80 cents.

Safoguards Againat Deterioration of Drag Stock.
A recent number of the Bulletin of Pharmacy contains an interesting article on this subject by Leon $C$ Fink, from which we abstract the following:
A large proportion of the materials which constitute the stock of an average drug store are particularly prone to deterioration, and painstaking pharmacist are required to exercise more than ordinary circum spection to prevent exposure of sensitive pharmaceuti cals to pernicious influences. In fact, the art of afford ing such protection is quite as important as the ability to select drugs and prepare medicines properly.
A complete tabulation of all the chemical and physical changes which can modify and injure pharmaceuti cal preparations is not within the scope of this article, but it is deemed apposite to mention a few exemplary forms of deterioration which will serve to suggest to the minds of intelligent pharmacists others which can occur from similar causes.
The importance of maintaining a uniform temperature through day and night, in a pharmacy, is apt to be overlooked. Remember that your stock is largely made up of fluid preparations holding chemical sub stances in solution. These are reasonably permanent at a normal temperature, but, as the temperature lowers, the solvent power of the menstruum is reduced and precipitation of the less soluble ingredients occurs. Results grow gradually worse as the temperature goes down, until disaster comes in the freezing of aqueous solutions and consequent bursting of bottles.
Change of temperature may also cause loss and an noyance from breakage of demijohns through expan sion or contraction of liquid contents. If a demijohn is filled with cold liquid, tightly corked, and subsequently transferred to a warm room or climate, the liquid will expand with rise of temperature and blow out the cork or burst the vessel. Tightly corked demi johns filled with hot liquids frequently collapse under atmospheric pressure as the contents cool and contract. It is therefore a safe rule never to fill such large glass containers completely, but rather leave an ample cushion of air to aliow for expansion and contraction.
Sunlight can do incalculable damage to chemicals, pharmaceuticals, plush goods, and toilet articles in general, unless special precautions are taken to prevent its injurious action. Calomel is not altered by the at mosphere if kept in the dark, but when exposed to sunlight it gradually turns gray or black, indicating decomposition. Santonin acquires a yellow color by exposure to sunlight. Silver nitrate becomes gray or black on exposure to sunlight in the presence of organic matter. Sunlight darkens yellow mercurous iodide and yellow mercuric oxide in consequence of their partial reduction. Bright green scales of soluble ferric phosphate and soluble ferric pyrophosphate turn dark on exposure to sunlight. Red mercuric iodide is permanent in the air if kept in the dark, but acquires a brownish tint by exposure to sunlight. Quinine bisul phate readily acquires a deep brown-red color on ex posure to direct rays of sunlight. Quinine sulphate and quinine hydrochlorate are gradually colored yellow by similar exposure. Ferric salts in solution with sugar are reduced to ferrous salts by action of sun sugar are reduced to ferrous salts by action of sun-
light. Many volatile oils are injured by prolonged exlight. Many volatile oils are injured by prolonged ex-
posure to atmospheric oxygen and sunlight, while some posure to atmospheric oxygen and sunlight, while some
are eventually rendered worthless and entirely unfit for use. Perfumes exposed to direct rays of sunlight rapidly degenerate and soon acquire a rank odor. It is apparent, therefore, that they should not be habitually presented in show windows.
Drugs and chemicals are frequently injured by absorbing moisture or carbonic acid, or both, from the atmosphere. Solids that absorb moisture from the air are called hygroscopic. Solids which absorb moisture from the air and become liquid, or dissolve therein, are called deliquescent. Crystalline substances which part with their water of crystallization on exposure to air, thereby losing their crystalline form, are called efflorescent.
On exposure to atmosphere, caustic soda absorbs water and is liquefied, subsequently solidifying and becoming efflorescent. This change is caused by the absorption of carbonic acid and the crystallization and efflorescence of the sodium carbonate thus formed. Potassa also deliquesces and absorbs carbonic acid under similar exposure. Chlorinated lime absorbs moisture and carbonic acid from damp atmosphere. with loss of valued properties and formation of a plastic mass; it should, therefore, be kept in a closely covered jar and stored in a cool, dry place.
Lime becomes "air slaked" by exposure to ordinary atmosphere, absorbing water and carbonic acid, and being converted into hyd rate and carbonate of calcium. Carbonate of potassium is extremely deliquescent in humid air, forming a colorless or yellowish alkaline liquid of an oily appearance. Chloride of zinc, acetate liquid of an oily appearance. Chloride of zinc, acetate
of potassium, and chloride of calcium are also very of potassium, and chloride of calcium are also $\boldsymbol{\nabla}$
deliquescent salts which require special protection.
deliquescent salts which require special protection.
Powdered extracts should be carefully protected from exposure to moist air, in small bottles with mouths wide enough to admit the blade of a spatula. Selected corks should be used, and the bottles should
be kept in a cool place-never in a current of hot air rom a stove or furnace.
It is particularly essential that granular effervescent salts be kept in securely corked bottles, for if access of air be permitted, sufficient moisture will soon be absorbed to cause the acid to act upon the carbonated base and gradually liberate carbonic acid. The valued effervescent properties of the preparations will thus be irretrievably lost.
If clear lime water be exposed to the influence of air, a pellicle of calcium carbonate is formed upon the surface; this film sinks to make room for another, until finally nearly all the lime is rendered insoluble and the supernatant liquid is comparatively valueless. It is essential, therefore, that a goodly excess of lime be kept in the bottom of the lime water bottle to maintain the strength of the solution. The container should be kept in a cool place, as cold water dissolves more lime than hot water.
Solution of lead subacetate is decomposed on exposure to air or on being mixed with water containing air in solution, white precipitate of insolublecarbonate f lead being formed. When freshly made, it should be divided into two or four ounce bottles, kept full and tightly sealed until required for use. Liquor potassa and liquor soda also possess marked afflity for car bonic acid, and should be preserved in securely stop pered bottles.
Quinine sulphate, like some other alkaloidal salts, does not "lose strength" by exposure to ordinary dry atmoshere, but rather loses water of crystallization by evaporation and becomes correspondingly richer in quinine. It should be borne in mind also that effloresced carbonate of sodium is stronger than the normal crystallized salt in proportion to the amount of water it has lost. Sulphate of soda, commonly called Glauber salt, contains more than half its weight of water of crystallization, nearly all of which is dissipated on exposure to dry atmosphere, leaving a dry, whit powder which is a correspondingly richer salt. Sulphate of zinc also effloresces slowly in dry air.
Atmospheric oxygen causes many undesirable changes in chemicals and pharmaceuticals. On ex posure to air the color of sirup iodide of iron slowly changes to yellow and subsequently to brown, the change of color proceeding from the exposed surface down ward. This color can sometimes be bleached and the sirup restored to its original appearance, but here is a case where an ounce of prevention is worth a pound of cure-keep the sirup in small bottles, full and we corked.
Certain fixed oils will remain unchanged for a great ength of time in air-tight vessels, but when exposed to the atmosphere they attract oxygen and ultimately become concrete. The tendency of linseed oil to dry Exposed to the air lard air is typical in the extreme. Exposed to the air, lard absorbs oxygen and become rancid; it should, therefore, be kept in well closed vessels, or procured fresh when required for use. In the rancid state it irritates the skin, and sometimes exer cises an injurious reaction upon substances mixed with it.
Phosphorus absorbs oxygen from the atmosphere with sufflcient avidity to cause rapid combustion and necessitate its preservation under water. Prolonged exposure to air gradually trausforms light green ferrous carbonate into the familiar red brown "subcarbonate
of iron," which is ultimately little more than ferric oxide and can undergo no further change from similar influences.
Not content with ravaging the pharmacist's stock, this belligerent element exhibits a remarkable propen sity, in the presence of moisture, for rusting his spatu as and other metallic utensils.
Serious pecuniary loss by evaporation of volatile solids like camphor results from exposure of these sub stances in ordinary open wooden drawers. Menthol is extremely volatile, and should therefore be kept in se curely corked bottles to prevent loss. Exposed to the air, carbonate of ammonium partially volatilizes, becomes opaque, and crumbles into a white powder. odine is most advantageously kept in securely closed lass receptacles-most ordinary wares are iable to be slowly when exposed to dry atmosphere. Powdered drugs which depend upon volatile constituents for medicinal virtue, like cinnamon, cloves, orris ront, and valerian, should, so far as practicable, be kept in bot tles or some other comparatively air-tight container.
Stronger water of ammonia should bekept in strong, glass-stoppered bottles, which should be stored in a cool place and opened with extreme care. When warm, the liberated gas frequently forces the stopper out with considerable violence, and many accidents result ing in injury to the sight of operators are on record. Pressed roots and herbs are more convenient to han dle, occupy less space, and are better preserved than crude drugs in bulk form. Furthermore, the danger of error is materially reduced by handling neatly pressed, wrapped, and labeled packages.
Examine your stock of dandelion and rhubarb roots
ccasionally to be sure that parchasers do not find
worms in them and form unfavorable impressions of you and your business methods.
Cantharides should be thoroughly dried and kept in securely closed containers. The vapor of chloroform quickly bills insects which infest cantharides, and their destruction can be accomplished by placing a small quantity of chloroform in a wide mouth bottie or other open vessel upon the surface of the infested drug and securely closing the container. The heavy chloroform vapor will then gradually sink through the drug and destroy the insects.
The modern method of marketing chlorinated lime in hermetically sealed parcels is not only a source of convenience, but affords protection which serves to prevent loss of the loosely combined chlorine, upon which the value of the preparation as a disinfectant is almost entirely dependent. The disagreeable odor of chlorine which clings to the hands of the operator is also avoided.
Charcoal is used in medicine chiefly for its absorbent and disinfectant properties. Owing to its absorbent powers, it should not be unnecessarily exposed to the atmosphere of a laboratory or pharmacy, lest it be thus rendered unfit for medicinal purposes.
Fine sponges should be kept in a closed showcase or drawer. Carriage and slate sponges, which are frequently allowed to become soiled and lend an untidy appearance to the store by rolling about in a window or on the floor, can be conveniently kept assorted and conspicuously displayed in the wire basket with separate compartments for different sizes.
Oxalic acid should not be kept in paper parcels, since it soon renders the paper fragile, and in being thus scattered about may, by admixture with other drugs, cause loss of life. Owing to its external resemblance to Epsom salt, and its very poisonous nature, the sul). stances should not be kept in similar drawers. The practice of keeping them in containers of different style and safely remote from each other is less likely to lead to accidental confusion.
Remember that heated atmosphere usually accumulates near the ceiling, and preparations subject to injury by exposure to elevated temperature should not be kept on upper shelves. Several cases are on record wherein chlorinated lime, which is known to greedily absorb water and carbonic acid from a humid atmosphere, was put up in securely corked and sealed bottles, which were then placed upon an upper shelf until the heat of summer, or a very warm apartment, had liberated sufficient gas to cause a startling explosion. sometimes followed rapidly by a succession of similar ones and a cloud of dust.
Lard, ointments, cerates, and, in fact, nearly all animal fats, are liable to grow rancid by prolonged exposure to air, this change in many cases being accelerated by heat and light. Every precaution should, of course, be taken to avoid such decomposition; but when rancidity is apparent, preparations should never be dispensed, for, instead of having the mild demulcent properties wifich constitute their chief value, they become irritant and entirely unfit to serve as vehicles for medicinal substances to be applied to the skin. Ointment jars should invariably be thoroughly cleaned and freed from rancidity before refilling with fresh stock.

With ordinary drug store arrangement it is scarcely practicable to entirely protect tinctures and fluid extracts from injurious effects of air, light, and changes of temperature, but any provision which tends to pre. vent precipitation from these causes is commendable. The stock of tinctures should be placed in charge of one capable employe. who should be held responsible for its condition. Haste is apt to make serious inroads upon accuracy in preparing pharmaceuticals.
The danger from leaving bottles insecurely corked is apparent when we consider that if a fluid extract prepared from a menstruum composed of diluted alcohol be exposed to the air in an open vessel, the alcohol will evaporate much more rapidly than the water. By this change of character in the menstruum certain resinous constituents of the drug frequently become insoluble and are deposited, rendering the fluid more or less turbid, and materially lessening its medicinal value. Collodion loses ether by evaporation, and becomes comparatively worthless.
The deterioration which can occur in a single drug store from causes indicated here commands the constant attention of the manager, and much greater is the problem which confronts the wholesale manufacturer, who must prepare a great variety of products in large quantities to be distributed in the market in all directions, where they are expected to remain unchanged through the extreme variations in temperature which characterize the severe winters in the north and the torrid summers in the south; and no less in. jurious is the improper exposure to which pharmaceuticals are frequently subjected in temperate ceuticals
climates.

IT is stated that Dr. Bertillon has discovered a new method for identifying handwriting by enlarging the letters by photography and measuring the alterations due to beating of the pulse.

## THE TRANSPORTATION OF LARGE CABLES.

The cable system of propelling cars has found favor in New York City, and the Third Avenue, the Broadway, the Columbus Avenue and the Harlem cable railways are in operation and the Lexington Avenue railway will soon be ready. The cables come to the railway will soon be ready. The cables come to the
power house either entire or in sections in big spools weighing from 40 to 50 tons. The spools are trans ported by means of gigan tic trucks, drawn by long strings of horses; in some cases twenty horses are at tached to the truck. W give illustrations, one give illustrations, one o which is a near view o truck and cable spool : the other engraving shows the procession of horses em ployed in drawing the truck. Our engravings were prepared from pho tographs kindly supplied to us by Mr. A. Montant of this city, who is a skilled amateur photographer.
When the spools hav reached the power house they are hung on trunnions and the cable is then run into the slotted tube that extends through the street. This is usually done by means of a platform ca weighted with iron as here tofore illustrated in the Scientific American
The cables ou the Bro
The cables ou the Broad way road are one and one half inches in diameter They have a manila center Around this and pressed closely into it are six strands each made of nine teen steel wires. After the cable has been threaded into the slotted tube, or conduit, and spliced, it is treated with wood tar and this coating is renewed from time to time. The cable is lubricated with linseed oil to render it easy to slide through the grips and around the curves. A cable for the Broadway road costs about $\$ 15,000$ and wears very unevenly. The life of a cable varies greatly, but in general it is from 65,000 to 90,000 miles. On the Brooklyn Bridge a cable has lasted for 1,140 days, which is far above the average, which is 500 days.

Fast Railway Speed.
According to the Railroad Gazette, the time made April 21 last, by the newspaper train from Camden N. J., to Atlantic City, $58 \cdot 3$ miles, was $453 / 4$ minutes being an average rate of 76.46 miles per hour.

The train consisted of one combined passenge and baggagecar, No. 5,116, and locomotive No. 1,658 It left Camden at 5:353/ A. M. and arrived at At lantic City at $6: 211 / 2$ A. M. running time $453 / 4$ minutes. From Liberty Park to Absecon, 49.8 miles, the running time was $371 / 2$ minutes and average speed $79 \cdot 7$ miles an hour; from Berlin to Absecon, $35 \cdot 6$ miles, running time $253 / 4$ minutes, average speed 82.9 miles an hour . from Winslow Junction to Ab secon, $24 \cdot 9$ miles, running time 16 minutes, averag speed 83 miles an hour The fastest mile was made in 41 seconds, equivalent to a speed of 87.8 miles pe hour. This was near Ab secon, on a grade falling 10 feet per mile, following a. short stretch of leve track.
The engine is of the American type, 4 driving wheels coupled, 78 inche in diameter. The cylinder boiler carries a steam pressure of 175 pounds per square inch. The size of the grate is $33 \cdot 25$ square feet and the heating surface is 1,583 square feet

American Art Products in Germany
Commercial Agent Louis Stern writes from Bamberg the State Department as follows: "It is well known that, on the occasion of the Columbian World's Fair, a number of specimen productions of American art and skill in fashioning the precious metals on exhibition


TRUCK FOR CARRYING A CABLE SPOOL.
rt Museum, of Berlin This collection, consisting of forty-seven ornamental art pieces and decorative tabl vessels produced for the most part by the establishments of Tiffany \& Company, the Whiting Manufacturing Company, and the Gorham Manufacturing Company, is now being publicly exhibited in those German indus trial cities which represent the same branch of indus try. In this connection, therefore, it will undoubtedly prove a source of great satisfaction to the business and other circles interested in the United States to learn that these American works of art are meeting with most cordial encomiums on the part of German expert most cordial encomiums on the part of German expert
judges. At the present time, the collection mentioned
are 19 inches by 24 inches, and the weight of the engine is on exhibition at the Royal Drawing Academy of the in working order is 122,600 pounds, with about 87,000 city of Hanau, one of the leading places representative pounds on drivers. It burns bituminous coal and the of the German gold and silver ware industry. The


HORSES DRAWING THE CABLE SPOOL of the German gold and silver ware industry. The exhibit, calling particular attention to the fact that these Ámerican products are not only effective by rea-
of the charm of novelty, but that they also affor instructive study as regards form and technical de velopment.
"I close this short report with the translation of th critical judgment rendered by a German expert in the branch of industry in question, recently published in branch of industry in question, rec
the Hanauer Zeitung. He writes :

On the whole, from a technical standpoint
ployed, each giving the mpress of his own particular schooling to the work of art produced, must also be taken into consideration The nataral result is that American productions show something of the peculiar, the novel, and the surpris ing.
" Many of the effects attained are bizarre, it is true, but then there is much that is original, of inventive ingenuity, and worthy of study. It is our opinion that, without any doubt, many fruitful suggestions can be gained from these works, especially as regards technical execution. The novel technical process consisting in the galvanic coating of pottery and glass sisting in the galvanic coating of pottery and glass
vessels should be adopted with advantage by our branch of this industry. The effort to increase the color effect of silverware by employing stone decora tions, enameling, etchirg, and vari-colored gilding is likewise worthy of general imitation.
"The great republic across the sea has added to its progressiveness in al other respects an advance in the dexterous manipu lation of the precious met als which should not be undervalued by us in Ger many."

Prune Rust.
The prune and other drupaceous fruits are frequently seriously injured by Puccinia pruni. It is most destructive to the prune in California, but also occurs on the peach, plum, cherry, nectarine, apricot, and al mond. Mr. Newton B Pierce finds that this disease can be held in check by spraying with ammoniacal carbonate of copper or modified eau celeste; a the fungus is endophytic treatment must be pre ventive. The fact is to be noted that the dry sum mers of California allow the spray to remain on
the foliage until the fall rains.-Jour. Mycology.

The celebrated Villino Ludovisi, in Rome, has been leased for the new American School of Architecture and Archæology.

## THE STAINED GLASS WINDOW INDUSTRY

There are few arts combining both the useful and ornamental that add so much to the gratification of the public as the introduction of stained glass windows in edifices, whether public or private. To so temper the glare of light passing through an opening in the wall, and render it a source of pleasure to the eye, by means of harmonious colors, is the study of the stained glass window producers.
In church edifices. this use of colors in windows has now become quite general, and to meet the æsthetic demand, glassmakers and artists are taxed in devising new shades and designs to meet the local or sentimental tastes.
For design, it is quite natural that the great field of Scripture should furnish an endless variety of central subjects, while a framing may be composed by a harsubjects, while a framing may
In arranging a window the artist is first governed by the cost of the materials and the sum allowed for the finished work. That being stated, he arranges the sash space into the most beautiful and appropriate design that the pecuniary limit will allow. The de sign is first arranged on a small water colored sketch, then enlarged to full size by pencil outline on heavy manila paper. Each of the parts of the design are now cut out by use of double shears, shown in the illustration. These shears are made double for the purpose of cutting away as much of the paper on the line as will compensate for the thickness of the leads that join all the various pieces join all the various pieces
together. A simple design together. A simple design is shown above the shears, cut into its parts and a tack through each to keep them in place on a board, and from which they are rewoved to lay upon the glass, while a diamond or wheel follows their edge as a guide in cutting. There are five different sizes of leads used, shown in cut, the height being the same, but of varying widths of face presented; the double shear concerns, of course, only the upright, standard portion of the lead.
At this point, the taste of the artist is further supplemented by the skill and eye of the glass selecter. From a profusion of colored glasses, with surfaces of smooth or roughened texture as required, he selects the quality and color he thinks most effective for the location. This he writes upon each piece of the design and then they are given over to the glass cutter.

The glasses most used are prime colors-ruby, blue, amber, purple, and green. In addition to these are plain hammered cathedral (all shades), antique, variegated cathedral of two or more shades, blended brown and amber brown and blue, brown and pink, olive and amber, imported Venetian, American Venetian, ondoyant, and, the most useful of all, opalescent glass. Most of these varieties are made in this country and are prized for their clearness. The surfaces are in all designs and degrees of coruscation
If the window is to have figures included in the design, or portions that require special treatment, then the work, such as portraits, hands, feet, animals, etc. is painted with metallic colors on plain glass and "burned in," in a gasoline heated muffle furnace shown in lower left corner of cut. This requires great skill and management in gradual raising of the temperature to the flowing point, and final slow cool ing. Even with the greatest care, fine bits of painting are sometimes cracked and ruined in the furnace, necessitating a repetition of the work.
Having all the various pieces of glass prepared and laid upon their corresponding part of the paper design, the board upon which they rest is removed to a large table, where, in a square corner of the table, two piece of the lead are mitered and placed against the right
angle sides of the elevated edges. The first corner piece is placed in the groove of the lead, a short piece is cut the length for the lower edge and another for the angle end and side. The workman is provided with a hook shaped knife, as shown in the lower right corner of cut, with which he easily cuts the soft leads, while the weighted opposite end of the knife handle serves as a tamping hammer
A second piece then follows in its place and is similarly surrounded with the grooved leads; curved edges are readily placed by the very plastic lead. Occasional measurements are taken, and with a soft wood guard the work is tamped up to reduce any enlargement of work, by crooks in the intervening leads.
When the pieces are all in their appropriate places, the workman goes over every joining of the leads with a soldering iron and solder, thus fastening the whole together. This necessarily must be done with both sides. To make a window rainproof, the glass must be puttied in ta the sash. The leads are made slightly deeper than the thickness of the glass, for this prodeeper than the thickness of the glass, for this pro-
vision, and now the workman daubs thin putty over
has been conducting a series of tests on emmensite, this test demonstrated that it cannot be fired in safety in large charges. Until the test on May 11, it has been successfulls fired in shells from powder guns of medium caliber. The 7, 11, and 12 inch guns being used, the charges not exceeding thirty pounds. It was then determined to try an old 15 inch smooth bore gun which had been rifled. After testing the gun with large charges of gun cotton a stecl shell was filled with 230 pounds of emmensite and the gun was loaded. Extraordinary precautions were used and the gun was fired by electricity. A terrific explosion followed when the firing key was touched, and the air was filled with flying bits of iron and sand. The gun carriage was torn to bits and scattered. A hole 10 feet deep and 25 feet in diameter was made in the ground. No one was injured

The electric candle is in great request in England for the lighting and decoration of dining and other tables. the lighting and decoration of dining and other tables.
An ingenious device for lighting the candles is provided by placing small pads under the table cloth, and taking the current from them by means of two pin points in the base of the candlestick. The candles, of course, are extinguished on being taken from the table, and are relighted when they are replaced in the proper position. They are so arranged that the bulb and the glass imita tion of a wax candle can be removed, when the candlestick can be used for an ordinary candle. When used with shades of colored silk, the electric candle makes one of the prettiest additions to a dinner table that it is possible to imagine.

## The Protection of Iron and Stee

The Gesner method of protecting iron and steel from rusting is described in La Revue Scientifique The principle of the process consists in forming on the surface of the metal treated a double carbide of hydrogen and iron which is extremely hard and adhesive. In carrying out the process, the article must first be thoroughly must first be thoroughly cleaned from rust; but it not so essential that all oil or grease should be re moved from their surfaces The treatment is effected in a pair of gas retorts, set side by side, and raised to a temperature of from 600 to $700^{\circ} \mathrm{C}$. The articles to be treated are placed in a retort for about twenty minutes, when a curren of hydrogen is turned into the retort, and kept on for forty five minutes. Then a small quantity of naphtha is introduced; the supply being kept on for
THE STAINED GLASS WINDOW INDUSTRY
the whole glass, and with a handless broom he sweeps ten minutes. The naphtha is then shut off ; a cưrrent in every direction over the window and drives the putty into the spaces, finally cleaning off the surplus by a bath of sawdust and a vigorous brushing.
Nothing remains to do now but put the glass in the sash, set it up as shown, and wire it securely to thin coss bars for security from high winds, etc.
We are indebted to Chicago firms for information and sketches pertaining to this industry, and it is a pleasure to us to speak our gratification of the work done, both in an artistic and workmanlike manner, by Messrs. Geo. E. Androvette \& Company, Flanagan \& Biedenweg, and the Wells Art Glass Company of Chicago. Weare pleased to know that many churches, private residences, and places of trade are beautified with their products.

## Bursting of an old Fifteen Inch Gun.

A test of emmensite, the new high explosive, at the Sandy Hook proving ground on May 11, resulted in an explosion of the shell in the gun, which was shattered, some of the fragments being found a quarter of a mile away. According to Captain Frank Heath, who
of hydrogen being turned on for fifteen minutes longer, when the process is finished. All that remains is to cool the retorts down to $400^{\circ} \mathrm{C}$; and as soon as this temperature is reached, the retort lids can be taken off and the product removed. The coating thus produced has a bluish colur, and is stated to be so adherent to the metal that a treated bar can be bent through an angle of $45^{\circ}$ without disturbing it. The thickness of the protective coating is not stated

The Boston Herald says: A Portland business man has hit on a new scheme for being awakened at the proper time in the morning, which he declares beats any alarm clock that ever was invented. He has his telephone in his bedroom, and each night when about to retire he calls up the central office and requests the operator to call him up at a designated hour, in order to find if the "phone" works properly. Promptly at that hour the bell rings loudly, and he is awakened with neatness and dispatch. He claims that the service thus rendered is alone worth the annual rental of the telephone.

ABSTRACTS OF DECISIONS RELATING TO PATENTS. Supreme Court of the United States.
RISDON IRON AND LOCOMOTIVE WORKS V. MEDART Et al On appeal from the Circuit Court of the United States for the Northern District of California.
This was a suit in equity instituted by Philip and Williann Medart against the Ridson Iron and Locomotive Works, for the infringement of three letters patent granted to Philip Medart, viz. : Patent No. 248,599, dated October 25, 1881, for the manufacture of belt pulleys; patent No. 248,598, also dated October 25, 1881, for a belt pulley ; and patent No. 238,702, granted March 8, 1881, also for a belt pulley.
In the first patent, No. 248,599, the patentee stated in his specification that his invention "relates to that class of belt pulleys formed of a wrought metal rim and a separate center, usually a spider, and usually made of cast metal.
"Heretofore considerable difficulty has been encountered in the manufacture of such pulleys, much time, skilled labor, and large and elaborate machinery have been required, and their production has been correspondingly expensive.
"The object of my in vention is to cheapen and simplify their construction, overcome the objections above mentioned, and produce strong and periect pulleys in a quick and efficient manner.
"My invention therefore consists in an improved process of manufacture, whereby the above results are obtained."

The drawings accompanying the specification repre sent the machinery for carrying out the invention, and the pulloy at various stages of its manufacture. The specification sets forth in detail the manner in which the machinery is operated, and winds up with the fol lowing statement :
"Pulleys thus manufactured are perfectly balanced, faultless in shape, strong and durable, and can be produced more rapidly and at less expense than the imperfect pulleys heretofore made.
" The machinery herein shown and referred to has not been described more in detail, as its operation will be clear to those skilled in such matters; and no clain to it is herein made, it being my purpose to se cure protection for such apparatus by other applications hereafter to be made.'
The claims, which are four in number, are all for the described improvement in the art of manufacturing beit pulleys, which consists in centering the pulley senter or spider and then grinding the same concen trically with the axis of the pulley, the several claims stating with more or less detail the principal steps in the manufacture.

In his specification to patent No. 248,598 the pat entee states that his "improved pulley belongs to that class of pulleys composed of a separate spider, usually of cast metal, and a wrought metal rim, which is secured to the spider;" and that his invention "consists in a pulley which is perfectly true and accurately balanced, that is, a pulley in which the center of gravity and geometrical center or axis coincide."
In his specification to patent No. 238,702, which was granted about seven months before the other patents, the patentee states that his invention "relates to certain improvements in belt pulleys, and has for its object, first, the production of a cheap,
light, and durable pulley; and, secondly, the produclight, and durable puliey; and, secondly, the produc-
tion of irregular sizes of pulleys without the necessity of a separate pattern for each size of pulley required, and this invention consists, first, in constructing the usual crown or dish on the rim of wrought metal rimmed pulleys by bending said rim transversely durpulley having arms formed of wood, preferably of a cylindrical shape, which at their inner ends rest in cylindrical shape, which at their inner ends rest in
sockets cast on the hub, and at their outer ends are sockets cast on the hub, and at their outer ends are
provided with bracket lugs, to which the pin is secured by rivets or other equivalent means."
Fig. 1 of the following drawings exhibits a perspective view and Fig. 2 a vertical section of the patented pulley.
The defendant appeared and demurred to the bill upon the ground that the patents did not show invention upon their faces. The demurrer was argued and overruled and leave given to answer, and upon a subsequent hearing upon pleadings and proofs it was ad-
judged that all of the patents were valid; that the defendant had infringed the first, second, and third claims of patent No. 248,599, the two claims of patent No. 248,598. and the first claim of patent No. 238,702, and defendant was enjoined from further infringing. A final decree was subsequently entered, upon the report of the master, for $\$ 1,811.25$, from which decree the defendant appealed to the Supreme Court.
Mr. Justice Brown delivered the opinion of the court.
Patent No. 248,599 is for an improved process of manufacturing that class of belt pulleys formed of a wrought metal rim and a separate center, usually a spider, and usually made of cast metal.
It may be said in general that processes of manufacture which involve chemical or other similar elemental
action are patentable, though mechanism may be necessary in the application or carrying out of such process, while those which consist solely in the operation of a nachine are not. Most processes which have been held to be patentable require the aid of mechanism in their practical application, but where such mechanism
is subsidiary to the chemical action, the fact that the patentee may be entitled to a patent upon his mechanism does not impair his right to a patent for the process; since he would lose the benefit of his real dis covery, which might be applied in a dozen different ways, if he were not entitled to such patent. But, if the operation of his device be purely mechanical. no such considerations apply, since the function of the machine is entirely independent of any chemical o other similar action.
The patent in question clearly falls within this category. It is upon its face "for an improved process of manufacture," and mechanism is shown and described simply for the purpose of exhibiting its operation, which is described in detail. The result is a pulley more perfectly balanced, more faultless in shape, stronger and more durable, perhaps, than any before produced; but this was not because the patentee had discovered anything new in the result produced, but because the mechanism was better adapted to pro-
duce that result than anything that had before been known. As pulleys of that description had been produced before, doubtless with greater care in the manufacture of them, a pulley as perfect as his might have been made. So that all that he invented in fact was a machine for the more perfect manufacture o such pulleys. The operation or function of sucher
Patent No. 248,598, . granted upon the same day, is obviously, though not in so many words, for the product of the mechanical process described in the patent just disposed of-in other words, for a belt pulley

made substantially in the manner detailed in that patent.
After detailing the advantages of having the pulleys perfectly balanced and shaped with absolute accuracy, and setting forth in general terms the manner of securing this by grinding the rim concentrically with the axis, he claims, first, "the improved belt pulley herein described, having the ends of the spider arms ground off concentrically with the axis of the pulley;" and second, the same pulley with the rim and the ends of the spider arin ground off concentrically.
Obviously the patent in question is not for a new device, nor for a new combination of old devices. It contains precisely the elements of every other belt pulley, and operates in substantially the same way. It is in eality a patent for a belt pulley which differs from other belt pulleys only in the fact that the rim and ends of the spider arms are ground off concentrically with the axis. Obviously this is not a patentable eature. The specification states in substance that is better made, more perfectly balancer other because it is better made, more perfectly balanced, and is one in which the center of gravity and geometrical center, or axis, coincide. It is said that such perfection of balance can only be obtained by the process described in the prior patent, viz., by grinding off the ends of the spider arms; but it does not follow that some other person may not, by another process, or by reater care or superior skill or deftness in the hand ling of tools, manufacture a pulley which shall be qual to this. But if this patent be valid, he would be an infringer in so doing, though he employed no me chanism whatever in the manufacture of such pulley, and did the work entirely with his own hands, if only he ground off the ends of the spider arms.
In short, this is a patent only for superior workman ship, and within all the authorities is invalid. This court has repeatedly stated that all improvement is not invention. If a certain device differs from what precedes it only in superiority of finish, or in greater accuracy of detail, it is but the carrying forward of an old idea, and does not amount to invention. Thus,
if it had been customary to make an article of unpolished metal, it does not involve invention to polish it. If a telescope had been made with a certain degree of power, it involves no invention to make one which

If boards had heretofore been planed by hand, a board better planed by machinery would not be patentable although in all these cases the machinery itself may be patentable.
Patent No. 238,702, also for belt pulley, antedated the other patents by seven months.
The claims are as follows:
"1. A wrought metal rimmed pulley having a crown d, formed on its rim during the process of manufac ture, as described, and for the purpose set forth.
" 2 . A belt pulley provided with wooden arms, B, cast metal hub, A, having radial sockets a, and bracket ugs $C$, for the attachment of the rim, $D$, as described, and for the purpose set forth."
If, as stated in the specification, it had been "usual" heretofore to form the rim with a crown or dish, it makes no difference, so far as the completed article is concerned, whether it be formed during the process of manufacture by bending the rim transversely, or in any other way. Indeed, it is difficult to see how the crown could be made except during the process of crown could be made except during the process of
manufacture, as it is part of such process. We are manufacture, as it is part of such process. We are
dealing with a belt pulley as a new article of manudealing with a belt pulley as a new article of manu-
facture, and the question how the pulley is made, facture, and the question how the pulley is made,
or how the crown is made upon the rim, is entirely immaterial. As the first claim does not describe a pulley which differs at all in its completed state rom prior pulleys, it is clearly invalid.
The second claim is for a belt pulley provided with wooden arms and a cast iron hub with sockets and bracket lugs, for the attachment of the rim. But as this claim was not found by the court below to have been infringed, it is not necessary to consider it.
For the reasons above given we think all these pat ents are invalid, and that the demurrer to the bill should have been sustained, except perhaps so far as the second claim of the last patent is concerned.
Medart may or may not have been entitled to a pat ent for the machinery employed in the manufacture of the belt pulleys in question; but he certainly was not entitled to a patent for the function of such machine, nor to the completed pulley, which differed from the prior ones only in its superior workmanship.

The decree of the court below must, therefore, be reversed, and the case remanded to the circuit court reversed, and the case remanded to
with directions to dismiss the bill.

Specific Gravity and weight of wheat.
Mr. J. U. Lloyd read a paper before the American Pharmaceutical Association, 1894, in which he presents some figures on the grain weight and density. The average weights of wheat from the several principal wheat countries were:


Average weight from the heaviest sample of each ountry:

|  | Grains. |
| :---: | :---: |
| India. | $84 \cdot 190$ |
| South America. | 77890 |
| Australia and New Zealand | 77.878 |
| England.... | . $77 \cdot 378$ |
| United States and Canada. | 74430 |
| Russia. | . $56 \cdot 638$ |
| Total average | 74734 |

Australian and New Zealand wheats (three specimens) and some Bombay samples combine high weight and large size or grain with high density, ranking first in the list. These are followed by two samples from Eng. and, California choice, and last Chile, which has lowest density combined with large size and high weight. Most United States and Canada wheats belong to class of small size and low weight, but high density.

## A New Thermo-Battery

A further attempt to make a thermo-chemical gal vanic cell has been described in the Comptes Rendus by M. Desire Korda, who worked with ordinary gas retort carbon. M. Korda finds that, if barium peroxide is heated to redness in contact with a carbon plate, the oxide becomes reduced to baryta, with the attendant phenomenon of a difference of electrical potential of about one volt, the carbon plate being negative. A similar result was obtained with cupric oxide, when a layer of potassium carbonate was placed between the oxide and the carbon; the difference of potential in this case amounting to $1 \cdot 1$ volts. In these experiments, the plate of retort carbon was connected by means of a platinum wire to one terminal of a Richard voltmeter; and a few cubic centimeters of the salt operated upon were placed on the carbon. A platinum wire dipping in the salt served to complete the circuit. The carbon was heated to a dull red in an atmospheric gas flame, when violent effervescence took place; carbonic acid being given off, and the voltmeter showing a deflection. This deflection of the needle remains constant as long as any of the higher oxide is left upon the carbon. The experiment is at any rate a simple one.

## flying crustacea

Man is impelled by an irresistible desire to dominate space. Scarcely has he made sure of a motion of a desired velocity upon land and water than he thinks of conquering the atmosphere that surrounds bim, and constructs apparatus of greater or less ingenuity for ascending above the planet trodden by his feet. May it not be the same instinct that has in all times led him to interest himself particularly in animals that fly, and especially in such of them as, by their primordial organization, are essentially terrestrial and aquatic beings? It is always the case that every new fact in this order of ideas very naturally excites in us a new feeling of curiosity.
Aside from birds and insects, there have, up to the present, been known several animals that, owing to a special arrangement of such or such a part of the body, are capable of flying, or at least of maintaining themselves in the air for a greater or less length of time. Such are the bats and the flying squirrels, among mammals, and the exocetes among fishes. Such beings belong to the vertebrate branch of the animal kingdom, but analogous facts have been very recently discovered among the invertebrates. The insects are no longer the sole arthropods that have the faculty of cleaving space and transporting themselves by aerial way. The same faculty has been observed in a crus-tacean-a very small one, which neither in size nor form recalls the crustaceans known to everybody, the lobster or the crab, for example
The following are the facts in all their si uplicity Dr. Ostrooumoff, a very distinguished scientist, direc tor of the biological station of Sebastopol, made an excursion in a boat last summer along the coast of the Crimea. One morning, while the sea was very calm and the sky of an azure such as one sees only in southern countries, he observed clouds of small beings hovering like flies above the tranquil surface of the water. Approaching slightly, our naturalist was, as were his son and the boy who accompanied him, enabled to observe the phenomenon at leisure, and the following was wnat was ascertained : Each of these small ani. mals in the first place took a proper position on the surface of the water, as if seeking to gather strength, and then made a leap and described in the air a long and gentle curve in order to fall back again into the iquid element. To collect a certain number of these beings and examine them with the lens was the work of a moment, and what was not the astonishment of the Russian naturalist whenhe recognized that the captive animals were crustaceans that are quite common in


Fig. 2.-COPILIA VITREA, HAECKEL. ( $\times 20$. )
the Black Sea, and that belong to the genus and spe cies Pontellina Mediterranea (order Copepodeæ).
If we examine certain small crustacea under the microscope, we shall be much surprised at their odd aspect. We shall mention a few examples. The Calocalanus pavo, which is quite common in the Mediter. ranean, exhibits a transparent body, and, at the extremity of the abdomen, carries eight golden yellow symmetrically arranged feathers (Fig. 1).
Another crustacean of the order Copepodeæ has analogous but much more developed appendages; it is the Copilia vitrea (Fig. 2), an odd little animal, every leg of whose transparent body is provided with a rich fan of microscopic feathers of a brick red.
Finally, a. species scarcely distinct from that observed by Mr. Ostrooumoff is the Pontellina plumata (Fig. 3). Examined at an amplification of from 40 to
50 diameters, it presents a multitude of silken hairs
that ornament its legs as well as the extremity of its abdomen, vulgarly called the "tail" in the crustatrast by their bright orange color with the blue body of the animal and its transparent limbs. There is no doubt that these numerous hairs singularly facilitate the aerial excursions of the crustacean and uphold it after it has once risen into the air by a leap. We might multiply the descriptions of the species, but it meems to us that what we have said will suffice to convince our readers. Let us add that our figures were prepared from the plates of the excellent monograph of the copepods of the Gulf of Naples published by Mr. Giesbrecht in 1892.
If the pontelline, with its relatively small hairs, can


## Fig. 1.-chlocalands pavo. (×20.)

sustain itself for a few instants in the air, the two other crustaceans that we have mentioned are still more cap able of doing so with their wide penniform appendages.
According to Mr. Ostrooumoff, whose interesting communication has been reproduced in one of the last numbers of the Zoologischer Anzeiger of Leipzig (October 22, 1894), the flight of the pontellines has some connection with the phenomenon of moulting. It would notably facilitate the beginning of this act, which is always very troublesome to animals. We know at least that other crustaceans of the group of Entomostraceæ, such as certain Polyphemides (Evadne, Pleo pis, etc.) maintain themselves at the period of moulting upon the surface of the water, or a little above it, thanks to a float formed by their old cuticular envelope, cast off and filled with air.
However this is, the demonstration of this faculty of flight in crustaceans is still another proof that nature varies its processes to infinity in order to attain the same end. In mammals and reptiles we see aerial locomotion assured by the aid of interdigital membranes or by that of a portion of the skin stretched between the limbs. In fishes and insects, it is rendered possible in consequence of the transformation of the limbs (fins or dorso-lateral appendages of the thorax) into membraneous wings. Finally, in the birds and in the crustaceans, such locomotion is ef fected through the aid of apparatus formed of feath ers (wings and feathery appendages). The last word of the scientific observation is not yet said, and it may be that we shall find in animals still other means of aerial locomotion besides those that we have just mentioned.
Who knows whether man, in imitating the pro cesses of nature, will not some day succeed in sur mounting certain obstacles, such as watercourses, ditches, walls, etc., by rising in the air and supporting himself for some time therein, as Mr. Lilienthal has recently tried to do? The practical applications of the idea of short distance aerial locomotion might render appreciable services in the military art, and would also be of great help to explorers and pioneers in coun tries destitute of roads.-La Nature.

## The Greenland Scientific Expedition of 1895

Efforts are now making to raise a fund of $\$ 12,000$ for the purpose of bringing Mr. Peary and his two assist ants home from Northwest Greenland early next fall, and, in connection with this, to prosecute scientific investigations during the available summer season. It is hoped by this means to charter and fit out a staunch steamer built for Arctic service and commanded by experienced Arctic navigators, which shall start from St. John's. Newfoundland, on or about July 5, 1895, for Inglefield Gulf, Northwest Greenland, latitude $78^{\circ} \mathrm{N} ., \mathrm{Mr}$. Peary's headquarters. The co-operation of museums, scientific and educational institutions and individuals is invited, not only because they will thus
tion of the results of his extended labors, but also be cause such an expedition will afford the most favora ble advantages to eight or ten specialists for obtaining the rich results that are possible in a prolific field that, for a generation to come, may not again be easily and economically accessible
Mr. Peary, who has done great service in opening this interesting region to scientific study, will render every aid in his power to the expedition. His thor ough knowledge of the natives, of methods of trave and work, and of points of interest, will greatly facil itate the present undertaking; and conspicuous awong its results will be the fact that it will bring back, not only the fruits of its own labors, but also the product and records of the able and brilliant explorer who, for several years. has devoted all his time, energy and money to the study of Arctic life and phenomena and to widening the bounds of geographic knowledge in the North Polar area
The American Geographical Society contributes one thousand dollars toward the expenses of such expedi tion, provided that other subscriptions, sufficient to make up the sum required to send the expedition, are obtained.
A limited number of scientific societies, educational institutions, or individuals, contributing $\$ 1,000$ to the fund, will be entitled to have each a representative on the expedition, who shall be approved by the scientific leader. The expenses of each member over and above $\$ 1,000$ will be the cost of his scientific outfit, transpor tation from his home to St. John's, and from New York or Philadelphia to his home. The proposed work will require three months. Further information can be had from Emil Diebitsch, 2014 Twelfth Street, N W., Washington, D. C.

## Direct Laryngoscopy.

Dr. Kirstein, of Professor Senator's polyclinic in Berlin, has devised a new method of examining the larynx and trachea, in which the interior of these organs is seen directly and not by the intervention of a mirror or prism. He does not say, however, that his plan is applicable generally, butonly that in "many persons" it can be carried out. The patient is placed on his back in the horizontal position, with the head hanging down, and an œsophagoscope is introduced. A metal speculum in the form of a tube about ten inches in length can then be passed behind the epiglottis and illuminated by a "Caspar's electroscope" and through it the larynx viewed with the naked eye. It does not do for the observer to wear spectacles, as these rapidly become dimmed with moisture. The tube itself acts as a tongue depressor, being a lever whose fulcrum is the edge of the upper incisors. Dr. Kirstein does not, of course, suggest that this method should ordinarily be employed instead of the common method of


Fig. 3.-PONTELLINA PLUMATA, DANA. ( $\times 30$ ).
laryngoscopy, but he thinks that in some cases it will be found capable of extending usefully our methods of laryngeal and tracheal examination, and he asserts that it is by no means so severe a procedure as may be imagined, and that, especially if cocaine is employed, it causes the patient no distress either at the time or subsequently.-Lancet.

Temperature of Incandescent Filaments.
Prof. Weber has lately given the results of a number of experiments made by him to determine the tempera. tures of filaments in electric incandescent lamps. He has found that the normal temperatures of all species of incandescent lamps is approximately the same, and is comprised between $1,565^{\circ}$ and $1,588^{\circ} \mathrm{C}$. In the case of some lamps giving a very brilliant light-that is to say, with very thick filaments-the temperature is $40^{\circ}$ higher.

RECENTLY PATENTED INVENTIONS. Railway Appliances.
Locomotive Bell Ringer.- Henry Breitenstein, Laramie, Wyoming. This inventor has d rates a plunger or piston in one direction only, the move ment in the reverse direction being effected by the weight of the bell. It comprises a cylinder with inlet and ex aust ports, and a shifting valve having a port dischar ing aganst the operating piston, this port being alter ately brought in register with the inlet and exhau ports. The cylinder also has a supplemental port dis harging under the shifting valve, so that when the pis down under the shifting valve and shift it to an exhaust position.
Car Fender.-Marguerite and Victor F. Maidhof, New York City. This is an improvement on a formerly patented invention of the same inventors, providing for a yielding connection between the fender and the car body, so that any motion of the car will not
interfere with thefender, and roller bearings are provided fr the pivot of the fender, to operate in conjunctio with the yielding connection. A better rolling support is aiso devised for the receiving member of the fender, oads or underground trolleys, or when a slot occurs be ween the track rails. The entire fender remains at all imes close to the pavement and under the platform of
he car, its forward supporting wheels traveling upon the the car.

Drop Bottom Car.-Henry D. Car ryl, New York city. The hinged bottoms of cars may
according to this improvement, be conveniently operated or wholly or partly and positively opening or closin解 ree ends of the hinged bottous, and the rods are als pivotally connected with a movable head having an inte rior screw thread screwing on a screw rod. On the lower nds of the two screw rods on the sides of the car a bevel gear wheels on a transverse shaft adapted to be urned with a crank arm or wrench, positively and simul aneously moving both doors. The car bottom door does not interfere with the operating devices.

## Electrical.

Stop Motion for Warping Ma chines.-Clayton Denn, JohnCocker, and Charles Denn,
Philadelphia, Pa. This is an improvement on a formerly patented invention of the same inventors, insuring a positive action of the circuit closer at all times, the closing the circuit and stopping the machine. The thread guides are pivoted on a conducting strip forming ne terminal of the circuit, the pivoted ends of the guides having a sliding connection with the strip and a contacting strip forming the other terminal of the circuit, while an inclined contact surface is adapted to be engaged by he lower bent ends of the guides.

## Mining.

Placer Mining.-Samuel S. Harper, enver, Col. This inventor has devised a method and pparatus for raising gold-bearing gravel and dellvering the pit which the dredger digs. The stream is dammed nd diverted around the pit, washing the dredged grav and draining the pit, while the bedrock is cleaned up and the scrapings washed. A dredger is emplosed to
raise the gold-bearing gravel and deliver it to a flume or a eries of cluice boxes, the latter being formed of removable or separable counections suspended from trolleys movable on transverse cables. by a temporary dam, in which the dredger.may float and be at work while the pit previously digged is having its bottom scraped.

## Mechanical.

Cotton Elevator and Distributer. Friedrich Zodor and Perry L. Ward, Cuero, Texas This invention is for a mechanical conveyer in connection with a blast devico, making a positive force feed, placing ployed and independent means of feeding box is emhrough the blast drom a vehicle or bin or rom the overtlow box. The blower or fan employed in connection with the pneumatic convering device may also be used for forcing the seed delivered from the gin o any desired pont. The machine is very simple and inexpensive, and is designed to have a substantially per
Printing Metallic Capsules.-Falk Lewin, Herzogenbosch, Netherlands. For printing in colors the side surfaces of these capsules, such as are used to close vessels, or as etiquettes on the mouths of
bottles, this inventor has devised an apparatus consisting bottles, this inventor has devised an apparatus consisting
of two movable frames pivoted on independent paralle! pivots, the frames being engaged by screw-threaded portions of a rotatable spindle, while a shaft journaled in one of the frames carries a holder for the article to re-
ceive the impression. In the other frame are journaled two shafts. one forming a holder for the impression head and the other carrying an inking head. The coloring thus produced is very durable an
and the work is rapidly performed.

## Agricultural

Corn Planter.-Albert J. Helvern nd Joseph W. McGuire, Burrows, Indiana. This planter is designed to accurately check row, the parts being au-
tomatically operated and driven from one of the ground wheels, and the construction being exceedingly simple and inexpensive. The check markers drop in making a mark, and move rearward with a timed movement while the mark is being made. The mechanism operating the
drop slide is controlled by a trip device operated by a drop slide is controlled by a trip device operated by a
wheel independent of the frame of the machine and located to track one of the ground wheels. It is designed
that, with a complete revolution of this regulating wheel
tracking either of the ground wheels, two hills shall be
Thrashing Machine. -- William H. or a movement of the straw discharge fork, the straw being also shaken todischarge any grain clinging to it. The fork is near the delivery end of a series of carriers fork being pivoted to a support, while a shaft jous naled below its tines carries S-cams with shoulders at each sfre of their centers, the shoulders alternately engaging the tines to raise them, while the points of the cams extend upward between the tines and toss tho

Plow Subsoil Attachment.-Le Roy rcWhinney, Creston, Ia. The common plow may be readily connected with this attachment without discon-
necting or rearranging any of the parts. The subsoil attachment has a supporting portion at the right side of the shear edge, to cause it to run level and take off the he shear or cutting plow raised, and the right side and side so that when the cutting edge wears away is sharpened it does not become narrower. When a
pair of these attachments is secured to the plow, one of them may be fastened to the plow standard and the and side.

Stump Puller.-Charles F. Anthony Cedar Rapids, la. This device comprises a windlass on heavy plank, the base of the windlass having a hook other support, and there being at its top a cap which may be conveniently engagead by a sweep. On the post of the windlass is a spool carrying a cable which pass hrough tackle blocks, one of which is connected by ope or chain with the stump to be pulled, while the ther tackle block is connected with a near-by stump or ided for thedraught cable and the whole apparatus very simple, a small power only being required to heavy stumps.

## Miscellaneous.

Butcher's Derrick. - Charles F Brow, Shreveport, La. This is an inexpensive, easily to facilitate lifting a carcass in position for taking of the hide and for other work upon it. It comprises three pivoted legs, on one of which is a roller which rolls upon the ground, and on one leg is a windlass, the hoisting ar or cable being so arranged that it may also

Back Pad for Harness Sadble. John s. Powen, Marshan, Tesas. This inventor has vised a back pad having a concave top enabling the saddle to fit nicely upon it, the concavity being made in cheap and simple manner, and the pad top being neatly
and inexpensively finished. The pad back has transverse holes at opposite sides of its center, the outer edge of the holes being stitched together and the strip betwe the holes being fastened to the pad at its edges to overlap the edges of the holes.
Operating Organ Pressure Bel-oows.-William Schwarze, Brooklyn, N. Y. This improvement provides simple means for operating pressure
box bellows to provide for a quick response between the pressure of a key and the sound of an organ tube, the valve or pallet controlling the bellows being actuated quick and pressure or exciont. The operation is very pensive.
Pencil Attachment.-Cyrus C. Clark ert J. Vick, Waterloo, Wis. This a ferrule-lii spring clasp, open on one side, and adapted to be readil its shank secured to the outer side of the clasp, an out wardly bowed portion causing the free end of the blade to lie along the surface of the pencil, and the attachment
thus forming a convenient envelope opener and paper thus fo
Lamb's Wool or Slipper Sole.LAMB'S WOOL OR SLIPPER SOLE.-
Samuel Borchardt, New York City. This invention re Samuel Borcharat, New York City. This invention re which does not require binding. A stiffening strip is secured to an upper strip of soft material, a fastening strip of leather or similar material being cemented to the stiffening strip, while the finishing or bottom strip is wider than the other strips, and has a draw string at its margin, by drawing up which the margins of the other wardly extending flange for attachment to the upper, the sting likewise being a medium for attaching the upper to the sole if desired.
Overshoe Fastener.-Wakefield C. Arnold, Columbus, O. This 18 a devicefor automatically ocking the overshoe at the heel upon the shoe proper, readily releasing the overshoe when desired. It consiste terial of the overshoe at the heel, and embracing and in terlocking with a spring dog adapted to engage the he crease of a leather shoe where the heel joins the upper The overshoe is thus locked in place when the leather
shoe is pressed down into it, and may be released by pressing together the upper limbs of the dog, when the latter may be drawn away from the heel of the leather

Sewing Machine Felling Attach-rent.-Joseph W. Betz, Brooklyn, N. Y. This device formed on or secured on an extended end portion of the base plate. The device affords means for convenient adjustment to gage the width of the welt, and insure an even width for felled seams, which may be readily felled
thereby at any point on a garment on an ordinary sewing mereby at any point on a garment on an ordinary sewng on the back and sleeve seams of tailor-made coats.
Bathing Appliance. - Joseph L. Prentiss, Canon City, Col. This inventor provides a against the body through a diaphragm having many small passages, the water being projected from the
pressure head against submerged portions of the body,
especially against sore joints, and the device thus acting as a massage bath, affording pleasurable sensatio , and effecting
$\underset{\text { Metal MIR R O }}{\text { Manner, Jr., Hoboken, N. J. For the manufacture of }}$ Wanner, Jr., Hoboken, N.J. For the manufacture rames for mirors, stans, etc., his inventor provides buckling. It consists of a flexible narrow strip of sheet metal having at one edge an ourward and aniward bend overhanging the body of the strip, and legs secured exteriorly on the strip, the points of connection on the strip veing overhung by the outward bend.
Curling and Crimping Iron.-John H. Broomall, Baltimore, Md. The members of this iron notion, so that they do not have a tendency to pinch and burn the hair near the handles nor hang in the hair their outer ends when opened. The device has a single ande, having a mandrel and parallel clasp member, to the handle and carrying one of the members of the curling iron.
Design for a Whiffletree.-Rice . Gregory, Owensborough, Ky. This whiffletree has to the longer central portion, the arms terminating at each end in returned ends or hooks.
Note.-Copies of any of the above patents will be
furnizhed by Munn \& Co., for 25 cents each, Ilease urnished by Munn \& Co., for 25 cents each, Ilease
send name of the patentee, title of invention, and date

## p

## NEW BOOKS AND PUBLICATIONS

## Ahext Book of Chemistry.

for the use of pharmaceutical and
Sadtler and Henry Trimble. Phila
delphia: J. B. Lippincott Company
189. Pp. 950 P. P1
dmirable contribution to chemical science be a really signed for the library of the physician, and. It is dent in chemistry, pharmacy, and medicine. It contains brief outine of quantitative and qualitative analysis, in cluding a number of pharmaceutical assays accordng to
the pharmacopeeia. It opens with a course in clementary hysics, treating of the special properties of matter, hat light, and magnetic and electrical energy. It then treat successively of the chemistry of the non-metals and
the metals, of organic chemistry and of analytical chem istry and pharmaceutical assaying. In this one volume a singularly complete resume of pharmaceutical science is found, the whole making a very attractive contribu tion, and covering the entire field of mechanics, physics,

Mineral Resources of the United States. Calendar year 1893. Wash
ington: David T. Day. 1894. Pp. 810.

It is doubtun if any of the government publications are entitled to more favorable notice than are this serie It is sufficient to say that the present now been issued David T. Day, covering the calendar year of 1893 , is of the full standard of merit established by its predecessor As its letter of transmittal indicates, it is a species farewell to Major Powell, long known as the head the United States Geological Survey. It is to be hoped hat the publication will be continued in the future, the Antisepsis and Antiseptics. By Charles Milton Buchanan, M.D.
Augustus C. Bernays. Newark, N. J.:
The Terhune Company. 1895. Pp. $\mathrm{xvi}, 352$.
This very useful work considelable ground and will be found of decided interest. It contains numerous very suggestive and rather its illustrations include some tice as produced by the artist from the field of actua hospital practice. The author advocates the unfor tunately odoriferous dry dressing as superior to wet dress ing. There are two indexes, one of subjects and one o constitute an effective testimony to the careful prepara tion of the book.
Gardenier's Ready Help for Loco motive Engineers. Being an eduational chart for locomotive schola seeking promotion, for the scholar examiner when employing or promoting new wen: and is a ready help to prising a remedy for every conceivacecur to a locomotive. By Norman Gardenier. Philadelphia: Ed wa
Meeks. 1895. Pp. 117. Price $\$ 1$.
This book is a catechism for locomotive engineers, and possesses the very great virtue of having the questions
given separate from the answers, so that when a question is given its answer does not immediately follow, and the student can endeavor to answer it before turning
over the fifty or more pages which intervene between the answer. The book contains 596 questions. Taschenbuch zum Praktischen GeBRAUCH |FUR Flugtechniker UND von Hauptmann H. Hoernes, Dr. V. Kremser, Ingenieur P. Lilienthal, Dr.
A. Miethe, Professor Dr. K. Mullenhoff u. A. Herausgegeben von Her mann W. L. Moedebeck, Hauptmann und Kompagnie-Chef im SchleswigHolsteinschen ${ }^{\text {Fuss-Artibbildungen. }}$
ment Nr. 9 . Mit 17 Textab
Berlin W. ${ }_{\mathrm{I} 895}$. Pp. 198 .

The Pocket List of Railroad OfficIALS. Containing the names of officials in charge of railroads, private
car companies, fast freight lines and car companies, fast freight lines and transportation companies of the United States, Canada and Mexico. Also showing the gage of each road, ng stock in service of each company. New York: Published by the Railway Equipuent and Publication Company. G. P. Conard, President and $\underset{\text { Manager, ; 326 Pearl Street. Pp. } 292 .}{\text { Treasure }}$ Price $\$ 1$ per annum.
Boiler Incrustation and Corrosion By F. J. Rowan. New edition. Re$\begin{array}{rrrr}\text { E. Idell. New York: D. Van } & \text { Nos } \\ \text { Company. } & 1895 . & \text { Pp. } & 118 .\end{array}$ Price 50 cents.
This little work is to be recommended to the users of
boilers. It brings out strongly the evils to be avoided and contended with in preserving boilers from deteriora ion.

The Century Magazine.-The Cen
 have just issued in handsome binding the Century Magane fie last six months, from November, 1894, Martin describes and illustrates with half tone prints Tesla's most important inventions, and a full description with illustrations, of Maxim's flying machine, which ha This article is written by the inventor, in which he claims to have solved the air ship problem. The new weapons of the United States army, with eighteen illustrations, in
which the writer, Victor which the writer, Victor Louis Mason, claims that our equipments are now equal to those of any European
nation. It is needless to add for the information of the regular readers of the Century that this volume contain ther articles of equal interest to those denoted by lead ing writers of the day.

## SCIENTIFIC AMERICAN

BUILDING EDITION
MAY, 1895.-(No. 115.$)$

## TABLE OF CONTENTS

Plate in colors, showing a residence at Glen Ridge, N J., recently erected for W. T. Taliaferro, Esq. Per-
spective elevation and floor plans. A fine example in the Colonial style. Mr.Chas.E. Miller, architect, New York.
Perspective elevation and floor plans of a cottage a Tenafly, N. J., erected for Chas. Vogt, Esq., at a
cost of $\$ 5,800$ complete. Mr. W. L. Stoddart, cost of $\$ 5,800$ complete. Mr. W. L. Stod
architect, New York. An attractive design.
3. A dwelling at Kennebunkport, Me. Three perspective elevations and floor plans. A most picturesque
residence, with many artistic features. Mr. Henry P. Clark, architect, Boston, Mass.
4. A log cabin chapel recently erected at Black Rock, Conn. Perspective elevation and ground plan Mr. Brace Price, archtect, New York
cottage at Park-Hill-on-Hudson, N. Y., recently
erected for Geo. L. Rose, Esq., at a cost of $\$ 12,000$ complete. Two perspective elevations and floo complete. Two perspective elevations and floor
plans. Mr. A. F. Leicht, architect, New York. A
well executed design, showing many excellen features.
6. A house at Orange, N. J., recently completed for Thomas L. Smith, Esq. Messrs. Child \& De Goll,
architects, New York. A pleasing design in the architects, New
Colonial style.
The Youkers Public School, No. 8, at Bronxville, N
8. A dwelling of modern design, recently erected for M Strong, Esq., at Montclair, N. J. Two perspective
elevations and floor plans. Cost complete, $\$ 6,000$ Mr. Christopher Myers, architect, New York
house at Indiana, Pa. Perspective elevation and floor plans. Cost complete $\$ 3,100$. Architect, Mr.
E. M. Lockard, Indiana, Pa. An attractive design in the Colonial style
10. A very attractive residence at Montclair, N. J., erect ed for Frederick S. Gage, Esq. Perspective ele-
vation and floor plans. Mr. E. R. North, architect, Montclair, N.
11. Vie
12. Design for a fireplace.
13. The brick power station of the Brooklyn City Rail road Company.
Miscellaneous Contents : A State park in the Catskil
Mountains.-To prevent Mountains.-To prevent the slamming of screen doors, illustrated.-Quarrying by means of tire.-A
new lawn sprinkler, illustrated.-Art in metal tile roofing, illustrated.-An improved hot wate heater, illustrated.-A macadamized road through swampy land.-Tinners' hardware and roofers ing, illustrated.- doors, illustrated.- Stair finish illustrated.-Ventilating the school room.-Gas burning range, illustrated.
The Scientific American Building Edition is issued monthly. $\$ 2.50$ a year. Single copies, 25 cents. Thirty two large quarto pages, forming a large and splendi Magazine of architectire. richly adorned with elegant plates and fine engravings, illustrating the most tion and allied subjects.
The Fullness, Richness, Cheapness, and Convenience

## ⓤsiness and $\mathfrak{P e r s o n a l}^{2}$

 The cinarge for Insertion unier this head is one Dollar a linfor eaci insertion : aiour eiont words to a iine. Aaver tisements must ie receivei at puobication office as eariv a
Thursiay morning to appearin the followino weê่'s issue.
"C. S." metal polish. Indianapolis. samples free.
Marine Iron Works, Chicago. New catalogue free. Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. J Handle \& Spoke Mchy. Ober Lathe Co.,Chagrin Falls, 0
Best Handle Mach'y. Trevor Mifg. Co., Lockport, N.Y Daley safety money drawer. Canadian patent fo sale. See illustrated desc
R. Daley, Fall River. Mas
Screw machines, milling macnines, and drill presse Wanted-Superintendent for composition roofng fac tory. Address, giving experience, salary wanted, etc. Box 773, Scientific American, New York.
The best book for electriclans and beginners in elec-
tricity is " Experimental Science," by Geo. M. Hopkins. by mail. क4; ; Nunn \& Co., publishers, 36 Broadway, N. Y Machine work solictted. Complete equipment moder machine tools. Pattern making, Designing, Experimen-
tal work; technical assistance if required. Best facilities, very reasonable prices. P. Pryibil, $512-524$ West 41s
St., New York. Send for new and complete catalogue or Scientific and other Books for sale by Munn \& Co., 361 Broadway
New York. Free on application.

## 

HINTS TO CORRESPONDENTS.
Names and Address must accompany all letters,
or ontention will be paid thereto. This is for our
information and not for publication information and not for publication.
16 cerences to former articles or answers should
give date of paper and page or number of question "quirices not answered in reasonable time should
be repeated; ;correspondents will bear in mind that
some answers require not some answers require not a little research, and,
though we endeavor to reply to all either by lette
or in this department or ins wishing to purchase must take his turn. in our colums will be furnished with addreesses
 personal rather than general interest cannot b
expected without remuneration. Scientilic Anrerican supplements referre
to may be had at the oftice. Price 10 cents each.
Books referred to promptly supplied on receipt price.
inerals sent for examination should be distinctly
marked or labeled.
(6538) C. A. G. writes: I am making a chime of three whistles, the bells to be of 2 inches brass tabing, $1 / 8$ inch thick, the longest tube or bell to be 8 inche de course shortening air column that amount. The long st bell being the key note, I wish the others to be higher
 major, C, E, and G. I wish to know of what length to and ith ime whistle is a matter of experiment until the red ve conditions are found. Make the low tone whistle in the bell for regulatin he tones of the other whistles. The steam slot should be about one-fiftieth of an inch opening
(6539) J. H. M. writes: I have two nests of boilers, six in a nest, and what is the horse ower of each boiler, or what is the horse power of 12
oilers? Each boiler is 47 feet 7 inches in length by 30 inches diameter. Fire box 16 feet in width by 6 feet in ack. What is the cause of a set of boilers foaming hen the fires are kept all the same heat, briage wall inu lly? to If your boilers are plain cylinder boilers ithout flues they are 19 horse power each, or 238 horse power for the 12. The foaming is probably caused by driving too hard, or by bad water.
(6540) W. S. M. writes : I purpose to lay some old $21 / 2$ inch and 3 inch pipe along both sides of Engine exhaust 4 inches. My idea is to connect with wo 3 inch pipes and go down each side, which is 78 feet, and return with $21 / 2$ inch pipes; this will use all we have got, but will return the second time if you think feasinto one 3 inch and $21 / 2$ inch to begin with and have no return? Size of shop 78 feet by 38 feet. A. The plan of dividing the exhaust with a 3 inch pipe and returning with a $21 / 2$ pipe on each side is correct. The last ends o the return pipe should be open, so as to allow drip and excess of steam to escape freely. This arrangement prevents undue back pressure in the engine. All pipes
should be laid to allow water of condensation to run with he steam to drips or to the end of the line
(6541) J. H. asks for a rule to find strain brought on staybolts. Also how to find horse power of an she mis. The strain on a staybolt the whole area of plate due to any one bolt multiplied by the steam pressure. If the stays are 6 inches apart in each direction, the area is 36 inches. You will need a book on the indicator for the horse power problem. See Pray's book, "Twenty Years with the Indicator," \$2.50 by mail. The displacement is also an intricate problem. (6542) W. H. P. says: Inclosed is a twig from a Pirus Japonica bush growing in Philadelphia, which seems to be suffering from a white scale covering most or dying. What is the remedy for this if any and Answer by the Entomologist, United States Department of Agriculture.-This is' the common scurfy bark louse (Chionaspis furfurus) found abundantly on pear, apple, etc. Spray about June 1 with dilute kerosene emulsion ( 1 part to 10 of water) or during winter with $1 / / 2$ pounds

An experience of nearly fifty years, and the preparatio
of more than one nundred thousand applications for pa awsand practice an both continents, and to possess un



INDEX OF INVENTIONS

## For Which Letters Patent of the United States were Granted

May 21, 1895,

## IND EACH BEARING THAT DATE.

ir brer
 har poucc holetinol bag. appatus, Crosson \& Lipp-

Band cutter and feeder. Cronk hite \& Austin....
Barrel lifter, w. Hasher, Jr.
Bart swing sup
Bat
${ }_{\substack{\text { Bat } \\ \text { reat }}}$


## Bucket, self-looding and discharging. E. Barrett










Car fender, J. J. Feely.
Car fender, $\mathbf{W}$. Ais.
Car fender. J. Zeis.....

Car san
Car sif
Car step
Car tran
Car whe

 Carburetor, R. Sawrence......
Carding enine. Lebe \& Haieg
Carpet sweper, S. Raymond


Clamp. See Bicycle bell clamp. Electricai bond








Digger. See Potato diggar.
Display aparat....................
te as, coin controlled



Drying machine, J. K. Proctor.
Dye, bue. Herze. Moenter W. . . . . .


Electrical distribution ssstem, E. W. Rice,
Electrical distribution system, C. Piteln
Elevator. See Fireman and hose eivevator.
Flevator


Griffitt ent for chairs, etc., automatic, E .
Fastening for coverings for feet, metai, D .





## 

787

539,50
c.....: 539,43 539,435
5
539,599
5
${ }^{3}$

如要





|  |
| :---: |
|  |  |
|  |  |
|  |  |
|  |  |

## 




|  |
| :---: |
|  |  |
|  |
|  |
|  |

## 

| andie. See 'ool handie. |
| :---: |
| Harrow scraper mecb |
| Harvester, bean, R. |
| Harvester, cutter bar, Burrell \& Griffth |

 ...........





| $\substack{\text { Jai } \\ \text { Jaf } \\ \text { Jn } \\ \text { Kn } \\ \text { Kn } \\ \text { Kn }}$ |
| :---: |







Med


## 




 Nain


 ....
$\qquad$






|  |  |
| :---: | :---: |
|  |  |
|  |  |

 ..... 
 ..... 
Tick ines. si is





## DESIGNS

|  |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |

TRADE MARKS.

|  |
| :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

## PRINTS


 yand



ఖひDertisements.
 The above are charges per apate line about eiliht

 $W 00 D$ or MEEAL WORXEESS Footanchana P Power vinachinerig SEND FOR CATALOGUES-
-Wodework SENECA FALLS MFG. COMPANT.
695 Water St., Seneca Falls N.
LATHES, Shapers. Rianers Drill, Machine shoo


THE SLMPLON TUNNELL-DESCRIP-



VANDUZENTEAM PUMP


 THE E. W. VANDUZEN CO:,

 Mand 's. of the Famus SHIPMAN ENGINES

$\mathrm{C}_{\mathrm{G}}^{\mathrm{Genentan}} \mathrm{n}$ I for the MARSH STEAM PUMPS




12,500 Receipts. 208 Pages. Price
Bound in Sheep, $\mathbf{~ s 6}$. Half-Morocco, $\$ 6.50$.






 thagrrections for working many dilferent processes in




MUNN \& COI, Publishers,
SCIENTIFIC AMERCDAN OFICE





 and 8 Sosenea, st:
Clevelana, ohio.

## ROBERT POOLE \& SON CO

ENGIMEERS \& MACHINISTS.
TRANSMISSIOM MACHIMERY
MACHINE MOULDED GEARING
SPECIAL FACILITIES FOR THE
HEAVIEST CLASS OF WORK BALTIMORE, MD.


## TELEPHONES


 WESTRRN TRLEPHONR Construccion Co,


## TOWERS and TANKS

ALL PARENT SECTIONAL TOWERS of 4 and 12 columns,
Waterer Worka,
cities
To PLAIN, ALL WOOD TOWERS For Automatic Find Panks iron and steel tanks. Louisiana Red Cypress Wood Tanks W. E. CALDWELL CO., $\begin{gathered}219 \text { E. Maln street } \\ \text { LOUSVILLE, KY., U. s. }\end{gathered}$.

## G GIE NIFIC MERICN

[8) ESTABLISHED 1845.
The Most Popular Scientific Paper in the World
Only $\$ 3.00$ a Year, Including lostage
Weekly--52 Numbers a Yen
This widely circulated and splendidly illustrated
paper is published weekly. Every number contains sixeen pages of useful information and a large number of representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity,Telegraphy, Photography, Archi-
tecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.
Terms of Subscription.-One copy of the ScIenTIFIC AMERICAN will be sent for one year- 52 numbers-
postage prepaid, to any subscriber in the United States, postage prepaid, to any subscriber in the United States,
Canada, or Mexico, on receipt of Tliree Dollars by the publishers; six months, 81.50 ; three months, 81.00 . Clubs.- Special rates for several names, and to Postmasters. Write for particulars.
The safest way to remit is by Postal Order, Draft, or
Express Money Order. Money carefully placed inside Express Money Oraer. Money carefuly placed inside
of envelopes, securely sealed, and correctly addressed, seldom goos astray, but is at the sender's risk. Address
all letters and make all orders, drafte, etc., payable to all letters and make all orders, drafts, etc., payable to
MUNN \& CO., $\mathbf{3 6 1}$ Broadway, New York.

Sicutitic Gamericam Supplement This is a separate and distinct publication from The
SCIENTIFIC AMEricas, but is uniform therewith in Size, every number containing sixteen large pages full
of engravings, many of which are taken from foreign of engravings, many of which are taken from foreign
papers and accompanied with translated descriptions. papers and accompanied with translated descriptions.
THE SCIENTIIC AMERICAN SUPPLEM ENT is published weekly, and includes a very wide range of contents. It preserts the most recent papers by eminent writers in
all the principal departments of Science and the Useful all the principal departments of Science and the Useful
Arts, embracing Biology, Geology, Mineralogy, Natural
History, Geography try, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Eneineering, Mining, Ship Building,
Marine Engineering, Photography, Technology, ManuMarine Engineering, Photography, Fecinology, Manu-
facturing Industries, Sanitary Engineering, Arriculture, Horticulture, Domestic Ecconomy, Biography. Medicine,
etc. A vast amount of fresh and valuable information etc. A vast amount of fresh and valuable information
obtainable in no other publication. and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT. Price for the SUPPLEMENT, for the United States,
Canada, and Mexico. $\$ 5.00$ a year; or one copy of th SCIENTIFIC AMERICAN and one copy of the SUPPLE-
MENT, both mailed for one year to one address for $\$ 7.00$. Single copies, 10 cents. Address and remit by postal order, express money order, or check,
MUNN $\&$ CO., $\mathbf{3 6 1}$ Broadway
gifuxidixy giditionx.
The Scientific American Bullding Edition is
issued monthly. 82.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and elegant plates and other fine enkravings; illustrating the most interesting examples of modern Architectural
Construction and allied subjects. A special feature is the presentation in each number
of a variety of the latest and best plans for private residences, city and country, including those of very mod-
erate cost as well as the more expensive. Drawings in erate cost as well as the more expensive. Drawings in
perspective and in color are given, tovether with Floor
Plans, Plans, Descriptions, Locations, Estimated Cost, etc.
The elegance and cheapness of this magnifcent work have won for it the Largest Circulation of any
Architectural publication in the world. Sold by all


Gexport gedition
of the SCIENTIFIC AMERICAN, with which is incor-
porated "LA AMERICA CIENTIFICA E INDUSTRIAL,"
or Spanish edition of the Scientific American is pubor Spanish edition of the Scientific American is pub-
lished monthly, and is uniform in size and typography lished monthly, and is uniform in size and typography
with the Scientific American. Every number contains about 50 pages, profusely illustrated. It is the ffnest
scientiffc, industrial export paper published. It circuscientiffc, industrial export paper published. It circu-
lates throughout Cuba, the West Indies, Mexico, Cenlates throughout Cuba, the west Indes, Monish possessions -wherever the Spanish language is spoken. Til a large guaranteed circulation in all commercial places through-
out the world. $\$ 3.00$ a year, postpaid, to any part of the world. Single copies, 25 cents.
foreign trade may bave large and handsomely displayed announcemen ${ }^{*}$ s published in this edition at a very




Are perfect in construction, workmanship provements than any other Camera: W ROCHESTER OPTICAL CO. 22 South Street, Rochester, N. Y


THE "ROUND BOX" TYPEWRITTER RIIBBONS five perifect satisfaction whe

 Manufacturers for the Trade
Cor. Park \& E.E. Aves., Park Ridge, N.

## The

## American <br> Bell Telephone <br> Company,

125 Milk Street, Boston, Mass.

This Company owns LettersPatent No. 463,569 , granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.



The New Model
 FOOT and POWER Hand Lathes high class. ted W. W. Low prices OLatogue. Buifalo. N. Y
WHY NOT MAKE RUBBER STAMPS??


Remington ${ }_{6}^{2}$ Typewriter. matchless Construction Unequaled durability, Unrivaled Speed
Many Notable Improvements Yekoff, Seamans \& Benedict 327 BROADWAY, NEW YORK.

 THE LARGEST AND MOSTCOMPLETE Morse Machine manaractureder by You want and
 better than secure a Now Now
Pressan and Manuracturing Outht.
Any live man can make mone
 paty any Stationer or Printer elit toput in one of our machines, and fruit Growers and
others using many Stamps will find it very protitable to make Stamp for their own use
and for sale.

 Proft," which makes every detail so plain, that any person, without previous ex-
peri,the can turn
This book is isu



## The Bullet.

 A roll film camera that hits the mark every time.It's a repeater too s shoots 12 times and can be Reloaded in Daylight.
The Bullet is fitted with our new automatic
shutter. One button does it all-sets and releases theter. One button doos ind changes from time sets and releases the shutter and changes from time
Achromatic lens. Handsome finish.
An Illustrated Manual, free with every instru-
ment, explains its speration and tells how to tinish EASTMAN KODAK CO. Fiscuan min oume Phenomenally low in cost of operation."-Franklin Inst. NEITHER
STEA K K
ENOINEER NOT Gasoline
 PRIESTMAN \& COMPANY, Inc


PRINTING INKS


