

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

|  | NEW YORK, DECEMBER 31, 1887. | [ 83.00 per Year. |
| :---: | :---: | :---: |

## THE NEW PHONOGRAPH.

scarcely more than a scientific curiosity or an amusing /and thoroughly believed it was destined to become far 'I'en years ago a young man came into the office of toy. Edison, however, recognized the fact that it con- more useful than curious or amusing. He contended the Scientific American, and placed before the tained the elements of a successful talking machine, that it would be a faithful stenographer, reproducing editors a small, very simple machine about which very few p̀reliminary remarks were offered. Our visitor without any ceremony whatever turned the crank, and to the astonishment of all present the machine said: "Good morning. How do you do? How do you like the phonograph ?" The machine thus spoke for itself, and made known the fact that it was the phonograph, an instrument about which much was said and written, although little was known.

It was the latest invention of Edison, and the editors and employes of the Scientific American formed the first public audience to which it public audience to which it
addressed itself. The young addressed itself. The young
man was Mr. Thomas A. Edison, even then a well known and successful inventor. The invention was novel, original, and apparently destined to find immediate application to hundreds of uses. Every one wanted to hear the wonderful talking machine, and at once a modified form of the original phonograph was brought out and shown everywhere, amusing thousands upon thousands; but it did not by any means fulfill the requirements of the inventor. It was


PHONOGRAPH WITH MOLTIPLE EARPIECE.
not only the words of the speaker, but the quality and inflections of his voice; and that letters instead of being written would be talked. He believed that the words of great statesmen and divines would be handed down to future generations; that the voices of the world's prima donnas would be stored and preserved, so that, long after their decease, their songs could be heard. These and many other things were expected of the phonograph. It was, however, doomed to a period of silence. It remained a toy and nothing more until a few months since, when it was made known to the public that the ideal phonograph had been constructed; that it was unmistakably a good talker ; and that the machine which most people believed to have reached its growth had after all been refined and improved until it was capable of faithfully reproducing every word, syllable, vowel, consonant, aspirate, and sounds of every kind.

During the dormancy of the phonograph its inventor secured both world-wide fame and a colossal fortune by means of his electric light and
(Continued on p. 422.)


## ฐ̌inutitir gesmaricau.

HSTABLISHED 184E.
MUNN \& CO., Editors and Proprietors. published weekly at

No. 361 BROADWAY, NEW YORK.
O. D. MUNN.
A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.
One copy, one year, for the U. S. or Canada.
One copy, six months, for the U. S. or Canad
ne copy, one year, to any foreign country b
Remit by postal or express money order
Australia and New Zealand.-Those who desire to receive the Alonial bank notes Address

## The Scientific American Supplemen

a distinct paper from the Scientific American. THe SUPPLEMENT is issued weekly. Every number contains 16 octavo pages. uniform in size with Scientific american. Terms of subscription for Supplement, $\$ 5.00$ a year, for U. S. and Canada. $\$ 6.00$ a year to foreign countries belong thg to the Postal Union.
Combined Rates.-The Scientific american and Supplemens will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.
The safest way
existered letter.
Aupplement will be sent for a little over one year on receipt of $£ 2$ cur ent Colonial bank notes.
列
NEW YORK, SATURDAY, DECEMBER 31, 1887.

Contents.
(Illustrated articles are marked with an asterisk.)


TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT INO. 626 .

For the Week Ending December 31, 188\%. Price 10 cents. For sale by all newsdealers.
A RBORICULTURE.-The Snowdrop Tree.-The Halesia tetraptera, ${ }^{\text {PAG }}$ an interesting and beantiful flowering tree-1 illustration

Chemistry.-On a New Method of Examining Butter.-By
Thomas t. P. Bruce warren.-A simple analytical method Thomas T. P. Bruce Warren.-A simple analytical method of ally determined..
The Comparative Delicacy of Some Qualitative Tests. - By J. S. c. Welles.-The delicacy of prominent chemical reactions examined and tabulated.-Valuable data for the qualitative analyst
II. ELECTRICITY.-Elieson's New Secondary Battery.-A distinc tively new and original type of battery described and illustrated. -1 illustration.
The Manufacture of Electric Light Carbons. - The method in use by the Liepman Carbon Company, of London, for making pen-
cils for the electric light............................................
V. engineering.-Asphalt and Concrete Foot Pavements.-By Mr. G. R. STrachan.-Experiments with asphalt walks in Engfactors.............................................................
The City of London and Southwark Subway.-A new underground railroad now in process of construction in London. -The excavating machinery and general plans of the structure.-7 illustrations... method used by the Egyptians, is setting up their monoliths.-1 illustration...
The Eriection of the Forth Bridge.-By Mr. ANDREW S. BIG-GART.-A paper on the building of the trusses and cantilevers of
the world's greatest bridge.-Full details of the riveting cages, the world's greatest bridge.-Full details of the riveting cages,
etc. -8 illustrations.......................
. MINERALOGY.-Gems and Precious Stones.-By George W. KUNTZ.-A valuable treatise of the nature and origin of the
diamond and on other stones.-Reproduced by special permission diamond and on other stones.-Reproduced by special permission
from advance sheets of this important paper.........................
VI. MISCELLANEOUS.-An Earthquake Railway Station.-The San Mateo station on the Oroya railway as wrecked by an earthquake.
-1 illustration........... "Big Ben" an "Big Ben" and the Westminster Clock.-The details of what is beheved to be the most powerful clock in existence; its wonder-
ful accuracy; the dimensions of its various parts.- zillu ustrations Roburite, the New Explosive.- Recent trials of the new explosive agent as conducted in England; its uses and powe
VII. TECHNOLOGY.-Wool Hat Making.-A full account of the manufacture oflwoolen hats: the machinery and manipulation em-

## NAPHTHA EXPLOSIONS IN ROCHESTER AND JERSE

 CITYA very serious explosion, due to an escape of naph tha, took place in Rochester, N. Y., on December 21. The Municipal Gas Light Company of that city uses one of the modern gas making processes, in which naphtha is employed for enriching the gas. The gas works receive large quantities of naphtha from the Vacuum Oil Works, and the two establishments are connected by a pipe line, part of which is placed in the bed of the canal. Fourteen thousand gallons of the inflammable fluid had been pumped into the line to be carried by it to the works. One or more leaks existed in the pipe line, and, in consequence, a quantity of the naphtha escaped and found its way into the sewers. At 3:25 P. M. it caught fire and exploded near John H. Poole's mill. The roof was blown off the mill and the street was torn up at intervals for a distance of half a mile. Other explosions rapidly followed, and soon Mr. Poole's mill was in flames. Three flouring mills were completely destroyed before the firemen had the flames under control at half past eleven at night.

A leak has been found in the pipes near the Atkinson Street sewer. This is thought insufficient to account for the extent of the disaster, and the whole line will be tested by hydrostatic pressure. The loss of life is not yet known with certainty, but several people have probably perished. The sewers are badly damaged in places, and windows were broken everywhere.
Immediately following the news of this occurrence comes the tidings of another similar accident, though, fortunately, of far less extent. In the office of the Jersey City Gas Light Company, in Jersey City, N. J., a naphtha leak existed in the cellar. The heat of the steam pipes, it is supposed, vaporized the fluid, and about noontime on December 22 two explosions followed each other in quick succession, the second being the worse. The front of the building was blown out, but the occupants escaped with more or less serious injuries. One of them is not yet pronounced out of danger.
These two accidents enphasize the need of extreme care in dealing with naphtha. It is more dangerous than gas, because when a leak occurs it takes far longer for the last traces to disappear. Its comparatively stable nature makes it a fearful adjunct to a conflagration, as it burns and when mixed with air explodes The first explosion only disposes of a part of the danger; some will almost always be left to prolong the trouble. Water acts ineffectually in extinguishing it, $\infty$ it floate and burns upon the suriace.
In this city vast quantities are used, probably over a thousand barrels a day in the gas works alone. But, fortunately, these establishments are all situated on the edge of the water. The oil is brought in tank barges to the dock and then pumped through a short line into tanks, whence it is taken to the works. Yet, in the light of what has occurred, it would seem that more stringent regulations should be applied to its use. No line of pipe used for its transfer should be buried. The greatest element of safety in handling naphtha is exposure. Hidden pipes and tanks are a perpetual menace. Ventilation is also important security. Everything connected with its storage and transportation should be open both to inspection and ventilation.

## POSITION OF THE PLANETS IN JANUARY

 venusis morning star. An interesting event in her course oc curs on the 2 d , at 11 h . A. M. She is then in conjunction with Jupiter, the planets being only $1^{\circ} 51^{\prime}$ apart, Venus being that distance farther north. The planets rise on the morning of the conjunction about three hours before the sun. Venus rises on the 1st at 3 h .54 m. A. M. On the 31st she rises at 4 h .47 m . A. M. Her diameter on the 1st is $188^{\prime \prime}$, and she is in the constellation Libra.

## JUPITER

is morning star. He signalizes his progress in the sky during the month by his meeting with Venus on the 2d. He makes also a close conjunction with Beta Scorpii on the 24 th , at 6 h . P. M., being at that time only $8^{\prime}$ south of the star. At the close of the month he rises four hours and a half before the sun. Jupiter rises on the 1st at 4 h .4 m . A. M. On the 31st he rises at 2 h .30 m. A. M. His diameter on the 1st is $31^{\prime \prime}$, and he is in the constellation Libra

## SATURN

is morning star until the 23d, and then evening star On the 23d, at $9 \mathrm{~h} . \mathrm{A}$. M., he is in opposition with the sun. He is then at his nearest point to the earth, and is visible under the most favorable conditions, rising at sunset and continuing above the horizon all night. Saturn rises on the 1 st at 6 h .26 m. P. M. On the 31st he sets at 6 h .49 m. A. M. His diameter on the 1 st is $19 \cdot 2^{\prime \prime}$, and he is in the constellation Cancer.

MARS
998 is morning star. On the 5 th, at $7 \mathrm{~h} . \mathrm{A} . \mathrm{M} .$, he is in quadrature with the sun, rising at that time about midnight, and is easily visible as a small ruddy star
in conjunction with Uranus, being $1^{\circ} 10^{\circ}$ north. Mar rises on the 1st at $0 \mathrm{~h} .15 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. He rises on the 31st at 11 h .13 m. P. M. His diameter on the 1 st is $74^{\prime \prime}$, and he is in the constellation Virgo.

## MERCURY

is morning star until the 18th, and then evening star He is in superior conjunction with the sun on the 18 th at is h. P. M., passing beyond the sun, and changing from his western to his eastern side. Mercury rises on the 1st at $6 \mathrm{~h} .53 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 31st he sets at 5 h . $48 \mathrm{~m} . \mathrm{P}$. M. His diameter on the 1st is $48^{\prime \prime}$, and he if in the constellation Sagittarius.

URANUS
is morning star. On the 7th, at $7 \mathrm{~h} . \mathrm{P}$. M., he is in quadrature with the sun. Uranus rises on the ist:a 0 h .37 m. A. M. On the 31 st he rises at $10 \mathrm{~h} .35 \mathrm{~m} . \mathrm{P}$ M. His diameter is $3 \cdot 6^{\prime \prime}$, and he is in the constellation Virgo.

## NEPTUNE

is evening star. He sets on the 1st at $4 \mathrm{~h} .4 \mathrm{~m} . \mathrm{A} . \mathrm{M}$. On the 31st he sets at 2 h .4 m. A. M. His diameter on the 1st is $2 \cdot 6^{\prime \prime}$, and he is in the constellation Taurus. At the close of the month, Mars, Uranus, Jupiter, and Venus are morning stars. Neptune, Mercury, and Saturn are evening stars.

## Saved by the Scientific American

Mr. J. J. Stranahan is the editor of the Exponent, bright paper published at Chagıin Falls, Ohio. In a recent issue of his journal he gives the following

Those wishing to be well up in scientific and me chanical matters cannot afford to be without the Scientific American. It has been a constant visitor at our sanctum for fourteen years, and the other half of our family says that it is nip and tuck between the Bible and the Scientific American so far as we are concerned. We, however, have a double interest in the Scientific American, for, but for it, a new man would be behind the editorial quill of the Exponert When we came near crossing the dark river, when taken by cramps while swimming across Mark Neice's pond in Newbury last summer, the first thought that entered our mind in that awful moment was an article which we had read about two weeks before in the Scientific American, on how good swimmers are drowned by becoming frightened, when by coolness and deliberation they could save their lives. Although ten rods from shore, in twenty or thirty feet of water, with severe ramps in neck and thigh, we swam to shore, and spoiled a nice funeral and cheated some other fellow out of seat in the sixty-eighth general assembly. And there are doubtless those who wish that the SCIENTIFIC american was in Hades before that article was published."
Mr. Stranahan further states that the facts above given are true to the letter.

## Artificial silk.

The author dissol ves 3 grms. of nitro-cellulose in 100 to 150 c . c. of a mixture of equal parts of alcohol and ether. He adds 2.5 c . c. of a filtered solution at onetenth of the dry ferrous chloride of commerce in alcohol; or of stannous chloride, and further 1.5 c . c. of a solution of tannic acid in alcohol. The whole is filtered in a closed apparatus to prevent loss by evaporation. The liquid is placed in a vertical reservoir, having at its bottom a blow pipe nozzle of glass or platinum. This pipe forms an acute cone with an orifice of from $0 \cdot 10$ to 0.20 mm ., the thickness of the margin not exceeding 0.1 mm . This aperture opens into a vessel of water acidulated with one-half per cent of mono-hydrated nitric acid. The level in the reservoir being some centimeters higher than in the vessel of water, the outflow proceeds easily. The fluid thread hardens at once in the acidulated water, and may be drawn out by a uniform movement. The thread thus formed must be dried rapidly by traversing a current of dry (not hot) air, and may be wound up as soon as dry. It is gray or black, but a number of soluble coloring matters may be introduced into the ethereal solution, thus obtaining threads of all colors.-M. De Chardonnet.

## How to Invest Nine Dollars.

By remitting $\$ 9$ for the Scientific American, Soi entific American Supplement, and the Architect and Builders Edition of the Scientific AmeriCAN for 1888 , the subscriber will surely have the latest and best scientific, engineering, mechanical, architectural, and building information to be had, and it is only in these three publications that a great deal of the information they will contain can be had at all.
The number of engravings of new inventions, engineering works, scientific experiments, the elevation and plans of new buildings, etc., which have appeared in the three editions of the Scientific American during the year just elosing reaches the large number of twenty-eight hundred and forty-nine. Every issue of the Architect and Builder contains views of modern houses printed in colors, accompanied with scale drawings of plans in detail.
an interesting patent discussion in the senate
For several years past the Department of Agriculture has been conducting experiments with a view to promote and increase the production of sugar from cane and sorghum. The more recent of these experiments has resulted in important gains of sucrose by what is known as the diffusion process, which, in brief, consists in reducing the cane by cutters into thin slices, and soaking them in water. The solution is then boiled down in the usual manner.
In this way a larger yield of sucrose or saccharine matter is obtained than by the ordinary process of squeezing between rollers.
In the ordinary process of concentrating the sucrose, much trouble is occasioned by the acidity of the saccharine solution, which caused the inversion of the crystallizable sugar into glucose, resulting in great losses of sugar.
The Department of Agriculture undertook a series of special experiments, having in view the highly important object of discovering a practical mode of preventing the inversion and saving the sugar.

An appropriation of $\$ 94,000$ was made to carry on these experiments, at Fort Scott, Kansas, under the general direction of Professor Wiley, a distinguished chemist. On July 19, 1886, the Hon. Norman J. Coleman, Commissioner of Agriculture, appointed Professor Magnus Swenson to be superintendent, to conduct the experiments, under the direction of the chemist.
Professor Swenson set to work most energetically, and it was not long before he hit upon the happy idea of preventing the invertive action of the organic acids in the cane chips upon the sugar during the process of extraction by adding lime to the saccharine or diffusion solution.
The remedy proved at once successful, and the important fact was immediately communicated to the Department of Agriculture by Professor Wiley, who gave ample and deserved credit to Professor Swenson for the suggestion and realization of the experiment. This was in December, 1886.
Very soon after making this new and valuable discovery, namely, on December 29, 1886, Professor Swenson applied for a patent, which, after long ringering in the Patent Office, was finally granted on October 11, 1887, number 371,528 .
The discovery of Prof. Swenson appears to be rapid ly gaining in importance. It seems likely to prove to be the key to the success of the sorghum sugar industry, and unless his patent can in some way be suppressed, he is likely to be handsomely rewarded for his invention. This is looked upon with horror by many people, who may be required temporarily to pay perhaps the one thousandth part of a cent per pound of sugar for the use of a discovery that may add untold millions of wealth to our agricultural resources.
Complaint has already been made to the Senate, and there seems to be a strong disposition in that body to throttle the patent before it has time to swell into a gigantic monopoly, like the barb fence, the driven well, the telephone or the telegraph, or the Standard Oil Company.
On the 15th of December last, Senator P. B. Plumb, of Kansas, submitted a resolution which was passed after being modified as follows:

Resolved, 'That the Attorney-General be requested to investigate the issuance of letters patent No. 371,528 to Magnus Swenson, of date October 11, 1887, and if in his judgment the same is invalid upon any ground, or was procured by reason of information obtained from experiments made by the government, and if in his judgment a suit can be maintained in the name of the United States, that he commence suit promptly to have the same canceled or the use of the same by said Swenson or any one claiming under him perpetually en joined."
Prior to passing the resolution a long discussion took place in regard to the jurisdiction of the Senate, the power of the Attorney-General, etc., in which a number of Senators'took part ; but only a few mémbers made remarks touching the merits of the invention or the
rights of inventors who are in governmental employ, rights of inventors who are in governmental employ, etc.

The only man in the Senate who seems to have had the courage to say a word in behalf of the inventor was the Hon. Wilkinson Call, of Florida.
During the progress of the debate, Mr. Plumb said: "The subject matter of this resolution and the issuance of a patent to Mr. Swenson is of very great importance to the people of this country, because if Mr . Swenson's claim is substantiated it may prove that he has a very important control over the manufacture of sugar from sorghum, the value of which has been demonstrated by experiments made by the government, and the opportunity for the obtaining of this patent having been presented to Mr. Swenson by reason of his employment by the government. I should be very glad, therefore, to have the resolution passed, in order
that the Attorney-General may be admonished to do whatever he may find legally- within his power in the direction of setting aside the patent at an early day.
"If Swenson has a valid patent, he has it upon a mere technicality. Properly speaking, morally speak-
ing, he has no right to a patent. He was in the em ploy of the general government; every step of the experiment which resulted in the development of this process was taken by reason of the expenditure of the money this process could not have been developed, a least at the time that it was."
The Hon. J. B. Beck, of Kentucky, said: "From very long experience and observation here, I have found that whenever we constituted a board, whether it was to examine into guns, or ships, or anything that the government wanted, or even to a canceling stamp for
the Post Office Department, and when we furnished them the money and all the facilities for making the investigation, and without our money and without the facilities furnished by us they would have had no idea of the suggested matters in the nature of improvements that they afterward patent; and thus we are constantly handicapped by men who have obtained all the information that enabled thein to take out their patents
through the means and instrumentalities that we have through the means and instrumentalities that we have
furnished, and through the money we have put into their hands for the purpose of doing it. If there is any way of breaking that up, I want to break it up.
"If I were to go over the history of the last twenty or thirty years of inventions that have been claimed by men who have been the trusted officers of the govern-
ment to make improvements for the use of the government, in guns and in the machinery that we have needed, it would be found that a very large majority of the patents have been taken out by men who were in our employ, and who obtained the information to take them out by the means furnished by the government, and the information elicited under the investi-
gations made with the money of the government. It can do no harm for us at least to get the opinion of the Attorney-General as to what our rights now are, so
that we may guard against these abuses by law, if need be, in the future."
Mr. Call said : "I think there is a great deal of doubt whether the resolution ought to pass. I should be very willing to vote for a general law authorizing the Attorney-General to bring suits in all cases where there is reasonable cause to believe a patent invalid; but to declare that he shall bring suit to invalidate this patent because the inventor discovered the invention while in the service of the United States, or on the broader ground contained in the amendment, on account that it was in the course of experiments made by the United States, seems to me utterly illogical. Neither fact affords any ground whatever for declaring the patent invalid. Shall we limit the human mind in discoveries to facts which have not been elicited by government investigation? Why is not an invention as meritorious, why are not the operations of the intellect in discovering some great mechanical principle of benefit to mankind because the facts on which the intellect operated were discovered in the course of experiments made by the government and at its expense? The invention is of as much service, and has as much right, and is as commendable, and ought to be as much encouraged, if he discovers some great benefaction from facts elicited by the government as from any other source. The gov-
ernment has no claim on his thought, on the operations of his intellect, and I think the ground of this resolution therefore is entirely erroneous:
"This resolution declares, so far as the Senate has power to do so, that a man in the employment of the government who inakes a new discovery of some law of nature, of some process heretofore unknown, shall not have the advantage of it, simply because he is in the employ of the government, and that all his intellectual faculties belong to it outside of the special purpose for which he is employed. I shall vote against it. A poor man's talent is all that he has, and the go
Mr. George.-"Suppose this discovery is made in the rocess of experiments carried on by an employe of government with the government's money, then what?"
Mr. Call.-"It does not make the slightest difference. The government does not buy the man's brain for anything but the special purpose for which it employs him, namely, for his use of the already ascertained laws of mechanical operation which may be used. It does not contract with him that whatever new discoveries may be made in the vast field of nature shall be compensated for by his employment to use those already known and discovered. There is no such contract, and there ought to be none. If a man discovers
some great and new principle, some great benefaction some great and new principle, some great benefaction to mankind, shall it be said because it was done with
the government's money that that was contemplated in the contract? Certainly the proposition denies itself; the proposition that when a man contracts. with the government to render a specific service he also contracts for all new discoveries in the unknown realm of nature which may be made by him.
"The government is a poor paymaster at the best, and invention will not be promoted by denying the inventors all benefit from their inventions. On the contrary, the power of monopoly, the power of money, will be promoted by the principle of securing the sale of man's genius before he has made an invention.
"The Senator from Kentucky said that he had known or many years men in the employ of the government using the government's money in its experiments, and then obtaining a patent for some new invention that had been discovered in the course of their employment. If any such patent has ever been issued, it has been by the fraud of the Interior Department or their igno rance. The law has always been to the contrary. The law has always been that a discovery once used anywhere is a dedication to the public. The invention must be new and unused, and not put in service, or a patent cannot be obtained for it."
Hon. Henry M. Teller, of Colorado, said : "I haveno objection to the resolution if the facts are as I understand them in this case, and if the law is, as it seemsto me it ought to be, that the man who, while engaged in studying a single question for the government under it s pay, discovers something greatly advantageous to the people of the United States while so employed, ought not to be allowed (although it is possible the law may permit it now) to obtain a patent for that discovery. He ought not, in equity and right, to be allowed a patent, and thus take the discovery away from the people and make it useful only to himself."
Hon. John Sherman, of Ohio, said: "This invenion, made by an employe of the government with the aid of large expenditures of the government, is said to be one of the most valuable and important inventions made of late years, especially in regard to an industry that at this time excites more interest among the people of the United States than any other industry, that is, the question how to utilize the sugar in the beet and in the cane-sorghum in the various forms. If this patent is allowed to stand in the way of the active experiments that are being made in that important process, it will prevent the planting of beets it will prevent the growth of sorghum; it will prevent further inquiry into the best means of making sugar from the various agricultural products which have been proposed; it will stop the experiments made by the government of the United States; and it is therefore not a slight thing. It is a matter of vital importance.
"I think we have the right, as the Senate of the United States, to direct the attention of the AttorneyGeneral to this matter; to inquire in the first place whether he has the power to test the validity of this patent without a law of Congress; and in the second place to give us such information upon the subject as will enable us to prepare a bill that will enable the government of the United States in honor to withdraw its patent in case it has been illegally or fraudulently obtained."

## Labor and Money.

The doctrine of the power of law to create monetary value degrades labor as its first effect, by fixing in the minds of the people the notion that labor is not the only source, perhaps not even the greatest source, of monetary value. It concedes to a rival power the domination of labor, by endowing that power with plenary potentiality to regulate the value and price of labor and all it produces. Hence labor would lower itself to a secondary rank in the production of values, whereas. it is, in a scientific view, the primary and sole creator of value. Labor must either be master or slave. It must acknowledge no equal, no rival, no usurping, interloping competitor in the creation of the values of the world. If it takes any other than the foremost position among its rivals, its cause is hopeless. It will be led by the nose, like an ox or an ass, it will work in the yoke its rivals contrive for it, and, as has been the case in all past history, it will be regarded by the "money power" in the light of hewers of wood and drawers of water.-Social Science Review.

## Lake Freight.

A marvelous record in lake marine annals was completed December 9 by the big propellers Jewett and Tioga, belonging to the Union Steamboat Company, when both came into port together, with flags flying and whistles blowing. They first left Buffalo together on the morning of April 26. Each had completed 25 round trips and sailed 46,000 miles, the Tioga having delivered 85.000 tons and the Jewett 75,000 tons of freight during the season. During the whole time neither has had to lie to for a single day for repairs.

## The End of Another Year.

During the year now closing, our mail subscribers have received gratis an extra number of the Scientific american. The present volume closes with 27 numbers, thus giving the subscriber, at considerable cost to the publishers, 53 numbers for the year 1887, in place of 72. We hope our mail subscribers will recognize our It berality in presenting them with the extra number, and favor us with a renewal of their subscription promptly. And if any one can influence a friend to join him, who is not acquainted with the value of our publications, it will be a good thing for both his friend and the publishers.

## HE SELF-REGISTERING BAROMETER

The accompanying illustration represents a self-registering barometer that has recently been put into the office of the Scientific American. Similar instruments are now in use in the Harvard Observatory, the Lick Observatory, Wellesley .College, Central Park Observatory, New York City, and the office of city engineer at Providence, and other. places. This instrument is of a very high grade, and gives a weekly record of the barometric changes.
Without any attention, it registers on a paper supported by a flat tablet the changes in pressure. To make the readings clear, the proportions are soadjusted as to magnify the variations three times. On the chart each tenth as marked really measures three-tenths of an inch in height. This provides also for any minor inaccuracies due to varying thickness of the line marked on the paper by the indicator.
In general principle it operates by weighing the mercury in a cylindrical glass tube, which forms the cistern. This tube is suspended from the frame of the apparatus by two long steel springs. When the column rises, mercury enters the tube from the cistern. The latter is reduced in weight and also rises. When the column falls, more mercury enters the cistern, which, under the increased weight, stretches the springs and descends. Thus it will be seen that the cistern moves up and down in the same direction as the actual column.
The ratio of its motion to the true variation is adjustable by varying the strength of the springs. In some instruments a ratio of $2: 1$ is provided, but the larger rate seems the preferable. Thus, on the Scientific American instrument the hundredths diyisions are so large that they can readily be fractioned.
For marker, a glass tube charged with red ink is adopted. This is carried in a hori zontal position, attached rigidly to the cistern, and moving up and down with it. At one end it is drawn down to a small orifice. The ink forms a species of film between it and the paper, and a strong red line is traced on the chart.

Two features of interest characterize the chart and its way of application. It covers the period of seven days. Thus the paper has to be replaced only once a week. This may seem a minor point, but it is far from being suen,- as It saves much trouble and the necessity for daily attendance at a specific hour. The other feature is the position of the chart. When receiving the curve o heights, the paper is stretched over a flat tablet that moves horizontally. Thus ar ranged, all the readings for the week, or for whatever portion way have elapsed, are visible. This arrangement is a great improvement over the cylinder or disk systems, neither of which is easily read for any neither of which is easily read for any mechanism.
The adjustment for temperature is arranged by a system of compensation. As the temperature rises and the mercury decreases in specific gravity, normally the movements of the cistern would be affected. The changes in elasticity of the springs, under alterations in temperature, are mainly relied on to correct this. The expansion and contraction of the frame is also allowed for in the adjustment. The consequence is that the apparatus is self-correcting for changes of temperature.
The frame is of heavy cast iron; the working parts are of brass, and generally nickel plated. The tablet is moved by a cord which is carried once around a druin that is rotated by the clockwork. The tablet is suspended from two grooved wheels that move along a horizontal track.
This interesting instrument has now been at work for several weeks in the office of this paper, and has given a consecutive record of all changes, day and night, for that period. Owing to the use of ink, the curve is as well defined as if made by a drawing pen, and the old trouble incident to former types of recording instruments of endeavoring to follow a gray and obscure pencil mark is avoided.
The instrument was constructed hy the Draper Manufacturing Company, of 152 Front Street, this city The same firm also make other registering meteorological instruments, rain gauges, anemometers, etc., following, as far as may be, the same line of construction. The accuracy attained in some of their instruments is very remarkable. In one of their registering barometers no error exceeding three one-thousandths of an inch has, it is said, been observed.

AN impervious enamel for paper, wood, etc., is a solution of shellac in methylated spirit. A cóating of this is applied, and then another coating laid at a high temperature and under great pressure.


THE SELF-REGISTERING BAROMETER.
carried out by previously existing American railroad companies, possessing a more or less solid and sub stantial credit, and fairly well able in consequence to sustain for a time the consequences of a check similar to that which we have witnessed during the last few months. In other words, the American railroad situation of 1887 bears the impress of far more respectability than was observable in the panic of 1873 . We must take account still further of the consideration that since 1873 the United States have materially advanced in wealth and population, so that there has been far mqre real justification for the new railroads undertaken in the West, Southwest, and Northwest than could possibly be found in the "wildcat" projections of 1873.

It is in such considerations as these that we may find some explanation of the better prospect which appears to be now happily opening for the American railroad interest and for American iron in 1888. Cheaper capital, less costly materiel, greatly enlarged population, general industrial progress, and much more ac cumulated wealth-these are the supports upon which the American railroad interest and the American iron trade can happily now rely. It is probably a fact that the Americans are becoming a more industrial people than at any former period in their history. The United States are still par excellence the great industrial quarter of the world, since cotton growing is quite as much an agricultural pursuit as the raising of cereals or the grazing of live stock. But it is a happy characteristic of the natural resources of the great republic that they are surprisingly varied and comprehensive, and that they afford scope for the development of human industry in well nigh every form. This, it appears to us, is a point of material importance in connec tion with the future of the United States A country which has only one industry mus always be more or less in a precarious posi tion, while a country with a multiplicity of ndustries is less exposed to climatic va garies and commercial vicissitudes.
It is quite possible-indeed, it is extremely probable-that 1888 will witness a material contraction in American railroad construction. No nation in the world can go on building 10,000 or 12,000 miles of new line every year for an indefinite period; and, therefore, some check in American railroad establishment was inevitable. But, at the same time, it will be highly satisfactory if the shock which it was apprehended that the American iron trade would experience in 1888 in a severe form loses something of its intensity.

## Good Material for Successful Engineers.

The Railway Review says: A number of our leading railway shops are taking in "engineering students," bright young men who come from the technical schools to learn the practical side of railway mechanics, and who enter as apprentices. They receive slightly more pay than the ordinary apprentices, but their wages are still merely nominal. The experience has been that when engineering students have been thus received, the benefit is mutual. These young men come into the shops fresh from their mathematics and their drawing tables, and while they absorb all that they can of the
in too many cases these projectors of the "'wildcat" schemes had little or no serious intention of fulfilling the engagements into which they entered. The inevitable result was a very serious collapse of American railroad credit, affecting alike all American railroad property, good, bad, and indifferent. From this collapse the recovery was so slow and painful that the ground lost can scarcely be said to have been recovered much before 1878.
When we endeavor to analyze the American railroad situation of 1887 , we find a very different state of afairs happily existing. It is true that with their usual impetuosity American railroad men have somewhat overbuilt themselves in 1887, and that American railroad credit has been strained, to a certain extent, in consequence. But it must be borne in mind that American railroad companies have profited materially from the fall in the value of money which has taken place throughout the United States since 1873, while the work of railroad establishment has also been rendered easier by the great decline in the price of rails and rolling stock. Yet another distinction between the panic of 1873 and the depression of 1887 will be ound in the fact that the new lines undertaken in the United States during the last three years have been of a more bona fide character than many of those projected in 1872 and 1873, while the capital required for the railroad works undertaken in 188i, 1886, and 1887 has been principally provided by the Americans themtablish. A large extent of the new railroad mileage es tablished in the United States since 1884 has also been
practicalities of their chosen work, they are found to be very useful by their employing officers, because of their familiarity with mechanical theory and drawing. There are not a few master mechanics in the country who are invaluable in their places-first class men in every respect-but who, in early life, had not the advantages of education which this younger generation of students has had, and they find many directions in which these educated young fellows are made useful. Especially useful are these students as a detail for special work of investigation. They are well equipped for such work, and they know how to make a good report on the same.

## A New Tanning Agent.

By digesting coal dust with caustic soda at a boil and neutralizing this liquor with hydrochloricacid, the author obtains a new tanning agent, which he names pyrofuscine. He considers that the new process is more complicated than the usual tanning processes, but that it is 50 per cent cheaper than the bark process and 20 to 30 per cent cheaper than the alum process.-P. $F$. Reisch, in Dingler.'s Ployt. Journal.

A Practical Suggestion.
We know of no better way in which an employer of intelligent men can invest $\$ 3$ than by subscribing for the Scientific American for a trusty superintendent, foreman, or other employe whose services for faithfulness he wishes to recognize. It would be a weekly reminder of the donor's generosity.


ALTERATIONS AND ADDITIONS TO A COUNTRY HOUSE AT POMFRET, CONN.-HOWARD HOPPIN, ARCHITEC'T.

## A REMODELED House.

It frequently happens in the experience of the architect that he is called upon to enlarge or remodel a dwelling. Sometimes it is only required to add one or more rooms, while in other cases it is sought to improve the appearance of the exterior. Such problems often severely tax his ingenuity, for it becomes difficult to considerably improve the appearance of a building while substantially maintaining its original outlines.
As illustrating what may be done in this direction, we present to our readers a set of drawings, showing the ingenious and clever method of treatment adopted by Architect Howard Hoppin in dealing with the residence of Mrs. R. M. Clark, at Pomfret, Conn. This house, before alteration, presented the appearance of a comfortable, plain, country dwelling, as represented in the view in the upper right hand corner of our plate. The imposing appearance of it as it now stands can be seen from the large perspective view.
The alterations, although apparently so extensive, were in fact, few beyond the addition of towers, the stone lining to some of the walls, and the new piazza. Scarcely a feature of the original house has been removed. It has simply been added to, and this in such a manner as to throw but little weight upon the old work.
The March, 1887 , number of the Architects and Builders Edition of the Scientific American, from which this engraving is taken, contains detail drawings and a complete specification of the work, which cost about $\$ 7,000$ to carry out.
*From the Architect and Builders Edition of the Scientific American of October, 1886, in which the ground and chambers plan are given. This or any other numbers of the Architects and Builders Edition (26 ready for delivery) may be had by remitting 25 cents to the
office of this paper.


## A THIRTY-FIVE HUNDRED DOLLAR COTTAGE.*

Want of pluck has killed many an enterprise that had all the elements of success in it. The projectors joined the great ranks of the "unappreciated" after a few good strokes and fell out of the race, when a little more snap and "hang on" would have brought them into smoother sailing.
There is no battle call more stirring than "Up, guards, and at them!" and that must be the motto of every young man everywhere-we say the young man, because if the old has not learned it, it is too late for him to make the knowledge available.
"You don't know how hard it is to start a new bus ness," said a friend the other day, at the head of a large and well-appointed concern; to which we made no reply though we might have given a few appropriate remarks on the subject from our own experience.

Those who fancy that success depends upon luck or good fortune, or anything short of energetic, persistent hard work, will be undeceived if they embark in trade, and expect to have business roll in on them.
Want of capital is a drawback, but want of work is like a countermine to a mine, destroying the best plans and intentions.
The faint heart says, "There is no chance; there are so many in business al ready ; the field is occupied," etc. In proportion to demand the field is no more occupied to-daythan it was forty years ago, and if men have good wares, sell them at a fair price, deal honestly by all, world by storm! Doubtless there are many such who ${ }^{\text {and }}$ perform what they promise, their future is cerlanguish for want of opportunity, but the incipient tain. The world owes every man a living, and will genius must not wait for something to turn up. He pay it if it is worked for.
J. Persoz finds that wool, if previously saturated with a 10 per cent solution of glycerin, car bear a prelonged exposure to $130^{\circ}$ to $140^{\circ}$ without injury.

## Telephonic Communication at Sea.

Mr. H. F. Boyer, of H.M.S. Malabar, has rėcently made a number of experiments in this direction with an apparatus of his own invention. Previous attempts of the same general character by some Aruerican electricians were described in our issues of October 7 and November 4. The follow ing description is given of the arrangement :
The source of sound consists of a large gong or flat bell supported against the side of the vessel below the water line. A straight tube leads from this gong to the "bridge" of the ship, and in its interior is a rod fitted with a handle at its upper end, by which the hammer of the gong can be worked, and the gong struck at will. The striking of the gong may, of course, be done in keeping with a code of signals, such as the Morse code used in ordinary telegraphy. In the center of the gong is fixed a modified Bell telephone with a large and sensitive diaphragm. The telephone is connected by means of wires running up the tube to a second telephone on the bridge, within reach of the observer there. This forms the receiving part of the apparatus. If we suppose two ships fitted with this combination, it is only necessary for one to rap out her message by striking the gong and for the other to receive it on her telephone. The sound waves from the transmitting gong traverse the intervening water and vibrate the diaphragm of the submerged telephone at a distance. These vibrations excite currents in the latter, which, in traversing the second or observing telephone, reproduce the original sounds of the gong. Small explosions of gun cotton under water have also been used by Mr. Boyer in place of the gong; and an ounce of gun cottón can in this way give a signal which is distinctly heard a mile off under water

Such signals under the sea are independent of fogs or stormy weather; and they hold out the possibility of
lighthouses and lightships being able to signal vessels
ever, it will be remembered that Prof. Blake uses a microphone in circuit with the deck telephone as a receiver. With this arrangement, Prof. Blake has been able to transmit subaqueous signals from a locomotive bell through a mile and a half of the Wabash River,


## JERSEY BULL DIAVOLO.

reported to have signaled through a mile of the Caloosahatchie River, in Florida, during the present year. His system has not been fully disclosed, but it appears to be similar to those described. . It is to be hoped that this new development of telephony will be pushed as far as possible.-Electrician.

## Oyster-Opening Monkey.

Mr. Alfred Carpenter, of the Marine Survey Office, Bombay, has observed Macacus monkeys on the island off South Burma opening oysters with a stone. They bring the stones from high water mark down to low water, selecting such stones as they can easily grasp. They effect the opening by striking the base of the upper valve until it dislocates and breaks up. They then

## FINE TYPES OF PRIZE CATTLE.

The Jersey bull Diavolo, represented herewith, receired the first prize in the yearling class at the New York State Fair in 1880, and was at that time the property of Hon. Erastus Corning, of Albany.
The Dutch belted cow Lady Aldine, shown in our engraving, is now owned by Mr. H. B. Richards, of Easton, Pa. She took the first prize in her class at the New Jersey State Fair, held at Waverly last September.
The Aldine family, of which our portrait is a good representation, have become famous as prize winners. The Dutch belted or blanket breed of cows are natives of Holland, and have not been brought to this country in large numbers. They antedate the seventeenth century, when the cattle interests in Holland were in the most thrifty condition, and this type and color were established by scientific breeding. The historian Motley well said: "These are the most wonderful cattle of the world."
In their native country they are owned and controlled by the nobility, and present a very novel feature in the landscape, graz ing in the lowlands in Holland. In color they are black, with a continuous white belt around their body, the white being pure white, the black jet, making a beautiful and iniposing contrast. Their form is-usually very fine, and they are very productive as milkers.
The owner of Locust Grove farm, Michael Rosney nanager, on Orange Mountain, N. J., has a small herd of the Dutch belted cattle. His stock is comprised of both the Aldine and Arnout breeds, five of which number received first and second premiums, according to their ages, at the State Fair where was awarded the first prize for Lady Aldine:
The Holstein cow Clothilde, owned by Smiths, Powell \& Lamb, Syracuse, íN. Y., has made herself famous by making a milk record of 28,021 pounds in
one year.


DUTCH BELTED LADY ALDINE.
at all times. Moreover, ships, in addition to signaling each other, could also signal lightships, or announce their number to Lloyd's stations, if the system prove successfül. Mr. Boyer's plan, which so far has given encouraging results, is somewhat similar to that of Prof. Lucien J. Blake, of the Rose Polytechnic Institute, United States, which was described in our issue of November 4. Instead of a submerged telephone, how-
ally putting the mouth straight to the broken shell. The way they have chosen is the easiest to open the shell.

Amalgams present many peculiarities. Thus iron, antimony, sodium, silver, and gold will dissolve in mercury ; but if antimony amalgam be mixed with sodium amalgam, the antimony is thrown out-iron'also.

She was exhibited at the New York Dairy and Cattle Show, where all the dairy breeds were shown, and the number of Jerseys exhibited was largely in excess of the number of Holstein-Friesians, and she won the sweepstakes prize for making the most butter in twenty-four consecutive hours, and according to a statement made to us by her owners, she has since given 101 lb. 2 oz . of milk in a day, and made 28 lb . $21 / 4 \mathrm{oz}$. of

butter in a week, which record there is probably no ca, were finally dispersed by auction in 1873, when Tenth is, if from overweight a car breaks down in transit, | cow likely to dispute. | $\begin{array}{l}\text { Duchess of. Geneva was bought by Mr. Berwick for the } \\ \text { The other fine portrait is of a celebrated shorthorn } \\ \text { Earl of Bective at } \$ 35,000 \text {. She had bred in America the responsibility may fall upon the shipper, or the }\end{array}$ |
| :--- | :--- |
| the |  | cow, Tenth Duchess of Geneva, whose personal and the bulls Third Duke of Oneida, Sixth Duke of Oneida, lagent who permitted the loading. One thing is certain,



CLOTHILDE.
family history is some what remarkable. Tradition as cribes the origin of the family to a breed of cattle pos sessed for centuries by the family of the Duke of Northumberland, but the actual records commence in the last century, when an ancestress of this cow passed into the possession of Mr. C. Colling, of Ketton, Durham, who was one of the founders of the shorthorn as a distinct and highly improved breed. In 1804 Mr . T. Bates, of Kirklevington, Yorkshire, purchased one of the Duchess cows, and recognizing in her excellence and that of her male offspring the superiority of the family over the shorthorns he had previously owned, he determined to secure more of the sort, and at Mr. Colling's great sale, in 1810, when forty-seven animals of both sexes and all ages, from eleven years downward, made the then un: precedented average of $\$ 732.84$, he gave $\$ 929.64$ for the two year old heifer Young Duchess, afterward called First Duchess, a daughter of Comet (sold on the same occasion for $\$ 5,080$ ), and grand-daughter of the cow he had first purchased. From that heifer in the female line direct sprang those Duchesses which have at different periods won the chief honors of the Royal Agricultural Society of England, and for many years past have commanded the highest prices at public and private sales. Mr. Bates, while practicing to a considerable extent the system of in-and-in breeding, crossed his Duchesses at different times with other approved shorthorn families, notably with those of Mr. Colling's Red Rose and Princess, thus combining. what he considered three of the oldest and best shorthorn families in the kingdom. In 1853, at the Tortworth sale (after the death of Earl Ducie), Sixty-sixth Duchess was bought by Messrs. Becar \& Morris, of New York, for $\$ 3,557.40$.
Her descendants, having changed owners in Ameri-


THE SHORT-HORNED COW TENTH DUCHESS OF GENEVA.
this view of such business is not unthought of by rail road officials, and some day it may be sprung on an individual who least expects it.
Referring to the above, we are reminded of numerous instances where the stock is piled to the very top of the car on one side, and within six inches of the top on the other: $=$ When this is donre, it beconnes imposstble to unload the car only from one side, and it is a species of luck, when the car arrives at its destination, that the only side from which it can be unloaded is on the opposite side from the dealer's shed or from the $t \left\lvert\, \begin{aligned} & \text { t }\end{aligned}\right.$ buyer to lose the use of a team and one or more employes for perhaps half a day in the labor of "starting a car load," simply to accommodate a shipper in his desire to ship, say, 500 eet more lumber in a car than there is any reason for.-N. W. Lumberman.

## Our New Nayy.

The Marine'Journalsays As a bit of a warning to those of our Washington authorities who would blindly follow the lines laid down by foreign builders of war ships and great guns, it is well to note that the English papers state that the machinery trials of the new steel armor plated cruiser Narcissus have "again proved unsuccessful." Viewed in the light of Captain Bunce's late report on the defects of the Atlanta, and its sis ter ship, the Boston. built on the same lines, yet untested, th is information shows that absolute perfection is not yet assured by following foreign models. And it is also interesting to note that American shipbuilders foretold a number of the defects in the Atlanta demonstrated by the late trials. Would it not be well to build one.war ship on a thoroughly American model, untrammeled by foreign precedents where counter to our own ideas?

## THE NEW PHONOGRAPH.

(Continued from first page.)
other well known inventions. He has recently devoted much time to the phonograph, and has not only perfected the instrument itself, but has established a factory provided with special tools for its manufacture, in which phonographs are to be turned out in large numbers, with interchangeable parts.
The original instrument above referred to is shown in one of our cuts, which is a reproduction of the engraving published in this journal just ten years ago, in the issue of December 22, 1877. This instrument consists of three principal parts-the mouthpiece, A. into which speech is uttered; the spirally grooved cylinder, B, carrying a sheet of tin foil which receives the record of the movements of the diaphragm in the mouthpiece, A; and a mouthpiece, D, by which the speech recorded on the cylinder is reproduced. In this instrument the shaft of the cylinder, $\mathbf{B}$, is provided with a thread of the same pitch as the spiral on the surface of the cylinder, so that the needle of the receiving mouthpiece is enabled to traverse the surface of the tin foil opposite the groove of the cylinder. By careful adjustment this instrument was made to reproduce familiar words and sentences, so that they would be recognized and understood by the listener ; but in general, in the early phonographs, it was necessary that the listener should hear the sounds uttered into the receiving mouthpiece of the phonograph to positively understand the words uttered by the instrument.
In the later instruments, such as were exhibited throughout the country and the world, the same difficulty obtained, and perfection of articulation was sacrificed to volume of sound. This was necessary, as the instruments were exhibited before large audiences, where, it goes without saying, the instrument to be entertaining had to be heard. These instruments had but one mouthpiece and one diaphragm, which answered the double purpose of receiving the sound and of giving it out again. Strangely enough, the recently improved phonograph is more like the original one than any of the others. It is provided with two mouthpieces, one for receiving and one for speaking.
The new phonograph, which forms the subject of the larger illustration, is of about the size of an ordinary sewing machine. In its construction, it is something like a very small engine lathe; the main spindle is threaded between its bearings, and is prolouged at one end to receive the hardened wax cylinder upon which the sound record is made. Behind the spindle and the cylinder is a rod upon wh ich is arranged a slide, having at one end an arm adapted to engage the screw of the spindle, and at the opposite end an arm carrying a pivoted head, provided with two diaphragms, whose positions may be instantly interchanged when desirable. One of these diaphragms is turned into the position of use when it is desired to talk to the phonograph, and when the speech is to be reproduced, the other diaphragm takes its place. The diaphragm which receives the speech and makes the impressions upon the cylinder is shown at 3 in one of the small cuts. cylinder is shown at 3 in one of the small cuts.
The needle by which the impressions are made in the wax is attached to the center of the diaphragm, and pivotally connected to a spring arm attached to the side of the diaphragm cell. The device by which the speech is reproduced is shown in section at 4. The cell contains a delicate diaphragm of gold beater's skin, to the center of which is secured a stud connected with a small curved steel wire, one end of which is attached to the diaphragm cell. The spindle of the phonograph is rotated regularly by an electric motor in the base of the machine, which is driven by a current from one or two cells of battery. The motor is provided with a sensitive governor which causes it to maintain a very uniform speed. Motion is transmitted from the motor to the spindle by beveled friction wheels. The arm which carries the diaphragms is provided with a turning tool for smoothing the wax cylinder preparatory to receiving the sound record.
The first operation in the use of the machine is to bring the turning tool into action and cause it to traverse the cylinder. The turning tool is then thrown out, the carriage bearing the diaphragms is returned to the position of starting, the receiving diaphragm is placed in the position of use, and as the wax cylinder revolves, the diaphragm is vibrated by the sound waves, thus moving the needle so as to cause it to cut into the wax cylinder and produce indentations which correspond to the movements of the diaphragin. After the record is made, the carriage is again returned to the point of starting, the receiving diaphragm is replaced by the speaking diaphragm, and the carriage is again moved forward by the screw, as the cylinder

perfection-upon the regularity of its speed, the susceptibility of the wax cylinder to the impressions of the needle, and to the delicacy of the speaking diaphragm. No attempt is made in this instrument to secure loud speaking-distinct articulation and perfect intonation have been the principal ends sought.
A highly magnified section of the phonograph cylin. der, showing the indentations, is illustrated ; A representing a section of the face of the cylinder, B a transverse section of a portion of the cylindrical wax shell, and C showing a less magnified face view of a small portion of the cylinder.
The new phonograph is to be used for taking dictation, for taking testimony in court, for reporting speeches, for the reproduction of vocal music, for teaching languages, for correspondence, for civil and military orders, for reading to the sick in hospitals, and for various other purposes too numerous to mention.
Imagine a lawyer dictating his brief to one of these little machines; he may talk as rapidly as he chooses, every word and syllable will be caught upon the delicate wax cylinder, and after his brief is complete he may transfer the wax cylinder to the phonograph of a copyist, who may listen to the words of the phonograph and write out the manuscript. The instrument may be stopped and started at pleasure, and if any portion of the speech is not understood by the transcriber, it may be repeated as often as necessary.
In a similar manner a compositor may set his type directly from the dictation of the machine, without the necessity of "copy," as it is now known.
Mr. Edison informs us that the whole of Nicholas Nickleby could be recorded upon four cylinders each 4 inches in diameter and 8 inches long, so that one of 4 inches in diameter and 8 inches long, so that one of
these instruments in a private circle or in a hospital could be made to read a book to a number of persons. The multiple earpiece by which this is accomplished is shown in one of our engravings.
The little wax cylinders upon which the record is made are provided with a rigid backing and the cylinders are made in different lengths; the shortest-1 inch long-having a capacity of 200 words, the next in size 400 words, and so on. These cylinders are very light, and a mailing case has been devised which will admit of mailing the cylinders as readily as lettersare now mailed. The recipient of the cylinder will place it on his own phonograph and listen to the phonogram -in which he will not only get the sense of the words of the sender, but will recognize his expression, which will of course have much to do with the interpretation of the true meaning of the sender of the phonogram.
A very interesting and popular use of the phono graph will be the distribution of the songs of great singers, sermons, and speeches, the words of great men and women, music of many parts, the voices of animals, etc., so that the owner of a phonograph may enjoy these things with little expense.
It may even be pressed into the detective service and used as an unimpeachable witness. It will have but one story to tell, and cross examination cannot confuse it.


Extensive preparations for the manufacture of the phonograph have been made, and it is probable that within a short time these instruments will be as common and as indispensable as the sewing machine or the type writer.

## The Trial of the Chicago.

This new war steamer lately went on her first trial up Long Island Sound. Capt. Robeson, commanding the Chicago, and Mr. Thomson, her chief engineer, report that the trial was successful; that her engines worked easily and with no sign of weakness, and that she made an average of fifteen knots per hour, reckoning on the resistance of the tides, in a trial of six consecutive hours. The pounding and thumping of six consecutive hours. The pounding and thumping
noticed in the first dock trial of her engines disappeared noticed in the first dock trial of her engines disappeared
with the alteration of the valves; there was no need of resorting to forced draught; her steering capacity was all that could be desired ; she was steady and free from immoderate vibrations.
In the Chicago's trial on the Sound the horse power developed has not yet been officially made known, but it is believed to be less, on an average, than the 5,000 which the contract calls for. The average speed secured is also somewhat less than was expected, as it was thought that this might be near sixteen knots. Still, on the whole, the results are thought satisfactory. The type of engines used is wholly experimental in war vessels, though known to a small extent on mer-chant-steamships.

A very useful polishing powder for metals and glass is made of very finely ground glass mixed with a small proportion of dried soda ash.

## FILM PHOTOGRAPHY

The desire of amateur and professional photographers to employ a substitute for glass in photography, on account of its excessive weight and liability to break, has led to the introduction of paper as support for the sensitive film and to the manufacture of improved and new apparatus especially designed for operating the paper.

A negative on paper answers all the requirements of one on glass, except that it requires a trifle longer time


Fig. 1.-EASTMAN CAMERA WITH ROLL HOLDER ATTACHED.
to print from; but quite recently this objection has been overcome by the production of a specially prepared film, which may be readily separated from its paper support after exposure and development, and afterward transferred to a transparent, flexible gelatine support, thereby making a negative equal in every respect to glass, and also superior to it from the fact that it is non-breakable, more compact, more durable, and can be printed from on both sides, adapting it readily for photogravure purposes, for which reversed negatives are required.

For the civil engineer, geologist, mining engineer, and tourist the film is especially useful, since the weight of glass is avoided, and supplies may easily beobtained through the mails

We illustrate a new form of camera, adapted for use with a special roll holder or with the ordinary plate holder, as the operator may wish.
Fig. 1 represents a perspective view of the improved Eastman interchangeable camera, in which are to be seen the valuable points desirable in a camera : a front focus, an excellent double rising front, a novel yet sinple means of obtaining a horizontal swing, a device for making a side swing, a peculiar but practical pian of attaching the ground glass to the back, by means of which it is instantly adaptable for focusing when either a roll holder or a plate holder is employed, a reversible back, enabling the operator to take pictures upright or horizontally, and a special construction of the bed, which permits the entire back and bellows to be removed and replaced with another back and bellows of larger or smaller dimensions. In addition to all these merits, the camera is made of the very best mahogany, is highly finished, extremely strong, very compact, light, and rigid.
In Fig. 2 is seen the back removed from the bed of


Fig. 2.-CAMERA WITH BACK REMOVED.
the camera, and how different sized backs may be adapted to one bed.
The bottom piece of the back is clamped to the bed by means of two thumb screws. Slots are made in the two side plates on the bed to permit the vertical side swing of the bottom plate.
Fig. 3 illustrates the advantages the camera possesses in having a double rising front and a swing backward of the front frame. It also shows the way in which the back of the camera swings on the pivot at the end of
raised upward through the slotted side uprights and clamped, then the lens board on the front may also be pushed upward as shown. This feature is of great usefulness in photographing objects of great altitude, such


## Fig. 3.-THE DOUBLE RISING FRONT.

as high buildings, church steeples, etc., enabling the operator to get pictures without distortion of lines.
In Fig. 4 is seen the new construction of the ground glass frame, and the peculiar mode of fastening it to the reversible back frame of the camera.
The curved metal end pieces at the bottom are attached by a short link. When used for focusing, this link is pushed in ward, which allows the ground glass to shut up tightly against the frame, as shown in Fig. 5. The curved slotted spring catches at the top, when pushed outward: slip over a pin on the end of the ground glass frame, and lock it as in Fig. 5.


## Fig. 4.-THE ADJUSTABLE GROUND GLASS.

After focusing, if an ordinary plate holder is to be used, the ground glass frame is pulled outward, as in Fig. 6, and the holder pushed in between it and the back and clamped thereto. When the thicker roll holder is employed, the ground glass hangs down, as in Figs. 1 and 4.
Fig. 7 shows an exterior perspective view of the improved Eastman-Walker roll holder, adapted for holding a spool of sensitive paper behind the camera.
In Fig. 8 may be seen the special improvements recently perfected. Formerly the working mechanism for transfering the paper from one spool to the other


Fig. 5.


Fig. 6.
was supported on a metal frame attached to the removable back board. Now this frame is dispensed with and the spools instead are secured directly to and between the two wood sides of the box, while the front is covered by a removable frame holding the dark slide, plainly seen in the lower view in Fig. 8. Besides these
for indicating the number of exposures that are made. The changes have made the holder much lighter, more accessible, and more complete.
It has been the study of the manufacturers to invent methods and apparatus which will prevent failures and insure the successful working of the improved film.
We have described but a few of the devices that have been devised. The simplicity of the film, its certainty, and easy handling make it a most useful article for the photographer.


## Fir. 7.-IMPROVED ROLL HOLDER.

We understand the Eastman Dry Plate and Film Co., of Rochester, N. Y., the manufacturers of the above mentioned apparatus, are prepared to furıish complete outfits and all accessories to any wishing in-


Fig. 8.-INTERIOR AND SLIDE FRONT OF THE ROLL HOLDER.
formation, and will send, on application, a descriptive catalogue, and for two 2 cent stamps a sample film negative made by their process.

## Engraving with Mercury and its Salts.

It is known that when mercury is deposited on a metal, fatty lithographic ink will not "take" upon it when an inking roller is passed over it, and that the black adheres to the untouched parts of the metal. If a well polished and olean plate of zine is taken, and a design is traced thereon with mercury, the design will appear in brilliant white uponthe gray backsign will appear in brilliant white upon the gray back-
ground of the zinc. After tracing the design an intaglio plate can be obtained by plunging the plate, without being coated with varnish, into a bath containing 100, parts of water and two parts at least of nitric acid. The action of the acid is very rapid, and for a long time only attacks the parts touched by the mercury. When deep enough, it can be used for lithographic work. If, instead of nitric, hydrochloric acid is used, the contrary effect takes place. The unaffected zinc is strongly attacked, and the traces of the mer cury give a relief plate which can be used for ordinary typographical work.
If the operator does not wish to draw upon zinc, the design can be traced upon paper with a salt of mercury. The sheet of paper being then applied for two hours to a plate of zinc, the drawing is sharply reproduced in white lines of amalgam on the gray surface of the metal, just as if it had been traced directly. The same result is obtained if the design is traced upon paper with a sticky substance (ink containing gum or sugar), and if it is dusted over with a mercury salt in fine powder. On dusting off the surplus and applying the sheet containing the design to a plate of metal, the same result is obtained. The same result is obtained if a newly printed proof is used, and is dusted with mercury salt while the ink is still wet and sticky. All the lines thus reproduced are chemically engraved, as has been described above. The same results are obtained by dusting with mercury salts a photographic carbon print containing a gummy substance, and the effect of half tints is even secured.
Biniodide of mercury is the salt to use.-Memorial Industrielle.

## Mutually Benefited.

Some employers are in the habit of presenting their employes with books treating upon such subjects as pertain to the class of business in which they are engaged. It is a good idea, as both the giver and recipient are thus mutually benefited. Other employers furnish a library of well selected books and a reading room, to which all their help have access, which is a still better scheme. A catalogue comprising more than one hundred pages, containing a list of several hundred books, useful and practical, in every department of science, engineering, mechanics, architecture, optics, etc., has been prepared with great care by the editors of this paper, and will be mailed free to all applicants. The catalogue states the price by mail for each book or series of works.

## A COMBINED HAY RAKE AND TEDDER.

A machine which may be changed, at will, either to rake or ted hay, which is also light-running, without cog gearing, springs, and other unnecessary parts, and which the driver can change, as desired, from one service to the other without leaving his seat, has been patented by Messrs. Israel L. Landis and Albert and Anthony Iske, and is shown in the accompanying illustrations, one view representing the work of tedding, and the other of raking hay. The frame or truck has hangers in which is journaled the main axle, one of its wheels having a pawl lever engaging a ratchet of its wheels having a pawl lever engaging a ratchet
on the shaft, to rotate it when the machine is moving forward, but allow the shaft to remain idle when backing, to prevent unnecessary turning of the tedding teeth The pawl lever is allowed to spring laterally, and is moved back of a pin fixed to one of the spokes of the wheel to disengage the pawl when the machine is used as a rake, and adjusted front of the pin when used as a tedder. The tedding or rake teeth are arranged in sets, clamped between heads, preferably made of cast metal and semi-cylindrically recessed to set over a parallel shaft having bearings in the main frame, and turn partially thereon independent of each other. The lower portions of the heads have rearward cam projections and forwardly projecting lips, the cam extensions on the heads engaging arms on the main shaft to operate the sections alternately when the machine is employed as a tedder, but clearing the arms when the machine is doing raking duty. The main shaft has an adjustable collar, by means of which the longitudinal movement of the frame may be limited so as to bring the tappet arms into range with the respective cams, this being accomplished by a lever near the front of the main frame, while a foot rest or lock frame is provided with detents by which the lever is held in position, as the machine may be used for a rake or tedder. A lever with its handle near the driver's seat can be operated to raise the rake teeth, being connected with a longitudinal bar to hold the rake teeth to move simultaneously when desired, the bar having a weighted lever under control of the driver by which it may be operated to set and unset the rakes. A transverse bar carries clearing arms which extend rearwardly between the rake teeth, and this bar may be clamped to hold the clearing fingers at any desired inclination. The driver's seat is pivoted, and has a slotted shank which is adjustably secured to an inclined standard. The operating hand lever is used for raising and depressing the rake teeth, to gather the hay on the forks and deposit it in windrows, and in the upper head of each rake or tedder section is a spring to keep the rake teeth yieldingly down to their work. As a ted der, the machine is design ed to slowly and effectually turn the hay over, separat ing the bunches so as to permit a free circulation of air through all parts, and facilitate its proper drying.

For further information relative to this invention address Mr. Israel L. Landis, Lancaster, Pa .

A Horse in Spectacles.
In the last issue of lthe Scientific American we published an account of the experiment of fitting spectacles to a short-sighted horse, in England, which had proved satisfactory, and now we have to record a similar experiment by a farmer up in Connecticut. A contemporary thus describes it
A horse with goggles was one of the attractions at Bridgeport, Conn., a short time ago. The Manlius farmer who owned him said he discovered recently


## LANDIS COMBINED RAKE AND TEDDER-TEDDING THE HAY

in comparison with steel that the newaluminum copper alloy may be adopted in the construction of machinery for the vessels of the navy. While it is true that the cost per pound of the bronze exceeds that of steel, the fact that intricate castings can be made from it counter balances the item of greater first cost. The expense in cident to forging and shaping steel will be largely saved. But it is not only for machinery that there is an outlook for the bronze. It may yet prove the solver of the problems involved in the construction of large cannon In spite of the work done by Krupp, Armstrong, Whit worth, and De Bange, the construction of heavy ord nance has not yet been brought to perfection The tendency is to construct built-up cannon. But these inevitably in volve elements of weak ness. The jars and heating to which they are subject ed strain their many joints. In service, large pieces of this construction have al ways proved wanting. A cast metal gun, if the metal possessed the proper quali ties, would seem the per fection of ordnance.
In aluminum bronze it is possible that this metal may be found. It was the ubject of a recent lectur at Annapolis, by Mr. A. H. Cowles. He began by aluding to experiments with ordinary bronze for can non, as recently conducted in Austria. He said that for gun manufacture he would start with an alumi num compound of $70,000 \mathrm{lb}$ tensile strength per square inch. Its elastic limit should be 23000 lb . per square inch. This means that, if such a stress was applied to it, it would, on goggles on him, and he was so glad that he rubbed my $\mid$ being released, return perfectly to its original con shoulders with his nose. Then he kicked up his heels tour without permanent deformation. Having cast and danced down to the pasture. You ought to have the gun, he would next force mandrels through the seen him. I hate to let him wear specs all the time, though, for fear he will break them.'

Aluminum Bronze for Cannons and Machinery
The extraordinary properties possessed by the alum inum alloys has for upward of a year been a subject of frequent comment. It has been suggested as a ma terial for structures in which lightness was to be com bined with streng.th. Recently some tests under government auspices have been made at the Watertown arsenal by the testing machine illustrated in our last issue. The alloy tested was aluminum bronze, a compound characterized by the presence of copper and aluminum. The former metal forms by far the largest portion. The tests were applied to the grade known as A 3. One sample cast in sand gave a tensile strength of $53,000 \mathrm{lb}$. to the square inch, and an elongation of 6.2 per cent before breaking. Another sample of the same metal cast in chilled moulds resisted a strain of $67,000 \mathrm{lb}$. before giving way. The elongation was 13 per cent.
These very extraordinary figures appear so favorable


LANDIS COMBINED RAKE AND TEDDER-RAKING THE HAY.
bore to compress the metal near it, which would in crease the strength of the critical layer of metal that first receives the strain of the explosion to $100,000 \mathrm{lb}$. per square inch. The elastic limit would be thus increased for the same layer of metal to 60,000 or 70,000 lb. Such a gun, the lecturer believed, would stand four times the strain that can be endured by a built-up gun. There is no question that there is food for much thought in the suggestion, and that the new metal should be critically experimented with. The ordnance of Europe is far from perfect, as we have said. If it was ascertained that the bronze was all that it seems to be, if it was found that it was manageable for large castings, and was not subject to erosion in the bore the government of this country could at one step become the equal of other lands in artillery. In using a metal that can be cast, and that is benefited by chilling, the plant would be simplified and a rapid produc tion of guns would be insured.

Metallic Derivatives of Acetyl-acetone
The author has shown in former memoirs that the hydrogen atoms of the central chain, $\mathrm{CH}_{2}$, charac teristic of acetyl-acetone present remarkable analogies with the hydrogens of the acid hydroxyls. They are not attacked by the di rect action of chlorine, and they can be easily substi tuted by sodium. He now shows that acetyl-acetone and its homologues act upon metallic salts like true strong acids, and that we may thus obtain with all the metals a new class of definite crystalline com pounds, the acetyl-aceton ates, answering to the ge neral formula ( $\mathrm{C}_{5} \mathrm{H}_{3} \mathrm{O}_{2}$ ) $n \mathrm{M}$, M being a metal of $n$ atom-icity.-Alphonse Combes.

Vanillin is not a satis factory substitute for vanilla, according to several American pharmacists. Even when coumarin is added to the essence, the flavor gradually becomes weaker.

## ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Fred Tiedt, Sr., of Euclid, Minn. It is a double
cou pler designed to automatically couple with an op posing coupler of like pattern, and with provision for changing the links or interfering with the arrangemen of the improvement.
A lubricator has been patented by Mr. Patrick Brownley, of St. John, New Brunswick, Canada. It is adapted for use in connection with the steam
chests of locomotive, hoisting and other engines, and is made not to depend upon suction or the formation or a vacuum for the proper operation of the lubricator

A car coupling attachment has been patented by Mr. Stephen D. Smith, of Spotswood, N. . It consists of a folding frame carrying a lever, a nose being pivotally mounted within the frame, and ar
ranged to support the free end of the outer couphing link and be held in position by the lever, making a
"three link coupling," which may be coupled without trainmen going between the cars.

## agricultural invention.

A planter and drill has been patented hy Mr. Russell Brock, of Gladstone, Ohio. This inven tion relates to a corn planter designed to open a furrow.
clear the soil of weeds in advance of the shovel, provide means for dropping the seed at regular intervale and co.ver the seed when dropped.

## MISCELLANEOUS INVENTIONS.

A faucet has been patented by Mr . George W. Aldrich, of Brooklyn, N. Y. It has a loose iike or open work construction, within the adjustable elastic ball valve, preferably of rubber.
A key hole guard has been patented by Mr. Alfred J. Urlin, of Missoula, Montana Ter. seeing through the keyhole, or the admission of cold air, etc., and also preventing the key from being t.
from the outside, or from falling out of the lock.
An explosive compound has been paented by Mr. Lucien G. Heusschen, of Paris, France tt is made with coal oil or naphthaline and glycerine, mixed with nitrate of potash or soda, suphuric acid and
sulphate of iron, together with carbonaceous matter, as carbonized tan or sawdust, and also sulphur.
A reel has been patented Mr. Frederick Eitapenc, of Oneonta, N. Y. It is intended more particularly for holding lead pipe in coiled condition,
and safe from injury during transportation or shipment the invention covering certain novel features of contruction and combinations of parts.
A jail window has been patented by Donald McDonald, of Louisville, Ky. Combined with gratings set in grooved stones is a hinged or swinging
sash, with connecting rod and operating cord, to presash, with connecting rod and operating cord, to pre-
vent tools and other things being handed in to prisoners, while providing for the admission of light and air.
A tablet binder has been patented by Mr. William B. Pearson, of Jacksonville, Ill. Com connected to the back and formed with a lug or ear. folding clip and side clips, it being feasible to use inge binder for a numbar of tablets in aucese
An oven door has been patented by Mr. John R. Conrad, of Long Pine, Neb. It has a T shaped opening covered with graduated transparent material, a securing plate and a socket in which is thermometer, for accurately indicating the heat of the
oven, and for inspecting its contents without opening oven, and
the door.
A pegging jack has been patented by Mr. Nathaniel Kinney, of Amity, Democracy P. O.
Ohio. It is made in sections so connected that the upper section carrying the shoe clamp may be raised upper section carrying the shoe clamp may be raised
and lowered to adapt it to different heights, the invention covering various novel features of construction and tion covering various
A longitudinally expanding roller has een patented by Mr. Arnold W. Schlichte, of New Yor's City. It hąs sheathing plates arranged to be
moved backward and forward upon the face of the roller, the plates being gradually drawn outward as the
roller moves forward, and rapidly forced inward as roller moves forward, and rapidly forced inward a hey arrive at a certain predetermined poin
An elevator gate has been patented by Mr. Eugene F. Hardin, of Lircoln, Neb. It is fitted to slide in vertical guides fixed to the side posts at the shaft opening, these posts being hollow to receive weights, making a simple and effective safety gat which will be opened automatically by the rising car
riage, and closed automatically as the carriage farther riage, and closed aut
ascends or descends.
A gate has been patented by Mr. Gus H. Ingersoll, of Franktown, Col. It is adapted to b opened and closed by the wheels of passing vehicles, of ing either way toward the and and be atonati cally closed behind the vehicle, the invention coverin various novel features for the making of a simple and An egg , beater and mixer combined beck, N. Y. It is so made that as a crank shaft is re beck, N. Y. It is so made that as a crank shaft is re and agitate the material in the body of the receptacle elevating it also from the bottom toward the top, the action of the apparatus being suck that it not only beat the material, but thoroughly mixes it at the same time.
A numbering head for printing presses has been patented by Mr. John G. Sauer, of New York City. It is made with a main casing and inner frame
carrying the nambering disks, arranged to receive an
out and in movement in the main casing from coutact with the platen of the press, thus turning the number they are printed.
A shutter fastener has been patented Mr. James B. Kelly, of Canton, Miss. It is an effective fastening both for the blinds and the window, when the biinds are thrown open the device swings with the blinds out of the way, while by it the blinds may be held closed in a convenient ma
the window is raised and when closed.
A mouthpiece for speaking tubes has been patented by. Mr. Patrick McGunnigle, of New York City. It is composed of two main parts connected together back of the bell by a lap joint, in such way hat the shaft and whistle have their axis at the dia meter of the mouthpiece, and thus avoid hinges and
other details of construction of the ordinary form of onthpiece.
A machine for sharpening and gumming saws has been patented by Mr. George P. Saltenberer, of Hamburg, Ark. It is for use with gin saws,
and has reciprocating files which operate simultaneously and are drawn back out of contact with the saw eeth at the moment when the saws are being turned, the device being readily changed from a saw sharpener to a saw gummer, and being very rapid and efficient in operation.
A wagon brake lever has been patented by Mr. George J. Riblet, Sr., of Shinnston, West Va. A lever is fulcrumed on the brake hand lever, engaging with one end a fixed segment, a spring lever fulcrumed on the brake hand lever, provided with a segmental gear
wheel arm, meshing into a segmental gear wheel arm wheel arm, meshing into a segmental gear wheel arm
formed on the other lever, making a lock for the lever of a wagon brake in which the lever is firmly held in lace when the brakes are applied.

## SCIENTIFIC AMERICAN

BUILDING EDITION

## december number.

table of contents.
Elegant Plate in Colors of a Suburban Dwelling
costing about Nine Thousand Two Hundred costing aabut Nine Thousand Two Hundred
and Fifty Dollars, with foor plans, specifica-
tions, sheet of details, Plate in Colors of a Dwelling erected near
Wareham, Mass., at a cost of Twenty-eight
Hundred Dollars with full Hureham, Mass,, at a cost of Twenty-eight
Hundred Dollars, with full.specifications, Hoor
3. The Shakespeare Memorial at Stratford-upon-
4. Perspective view and floor plans of a Residence
to cost Eight Thousand Dollars.

Engravings of Five Tasteful Residences recent-
ly erected at Glenridge. N. J., varying in cost
from Four Thousand to Six' Thousand Five from Four Thousand to Six' Thousand Five
Hundred Dollars. 6. Perspective view, detail drawings, specifica-
tions, roof, and floor plans of a TW Theousand
Five Hundred Dollar California House. Engravings showing interior and front view of
Chateau of Castelnaudary. M. Aubry, Archi3. Lea Hurst, Derbyshire, the home of Miss Flo-
9. Elevations and floor plans of Homes of Factory
Operatives at Willimantic, Conn.
10. Bathing House and Saloon at Vittel. Built by
Charlies Garnier, Architect, of Paris. 11. Floor plans and perspective sketch for a Cot-
tage costing about Five Thousand Five Hun-
dred Dollars.
12. Perspective view and floor plans of a Cottage
costing Four Thousand Two Hundred Dollars.
13. Front and rear perspectives, with plans, for a
Handsome Stable being erected in Brouklyn,
N. Y. Cost, Five Thousand Five Hundred
14. Perspective view and floor plans of a Residence
for Five Thousand Dollars. Perspective view and plans of a Neat Dwelling
costing Four Thousand Two Hundred Dol16. Half page engraving of the John Crouse Memo-
rial College for Women, Syracuse University,
Syracuse 17. Plans for a French Cottage, Hotel de Peintre,
Meudon.



## Special.

## A NEW MINISTERIAL EXPERIENCE.

One year ago last December the pastor of a church
Philadelphia was forced to surrender his pulpit. an acting on his physician's advice, with his young wife
sought the warmer climate of Floridu sought the warmer climate of Florida. Both were con-
sumptive, and when it became evident that the young sumptive, and when it became evident that the youn
minister must relinquish a future that promised so much he was broken (in spirit. Together these two afllicted persons traveled toward the milder latitudes. It seemed
a journey to death. Nothing more pathetic has been a journey to death. Nothing more pathetic has been and with tearful eyes, toward the madhouse to which they had self-condemned themselves. The parting from
their friends and parishioners at the railroad station was affecting in the highest degree. Several long, wear months followed, in which the hoped-for improvement
was awaited. It came not. Both man and wife gradually grew weaker. The little cottage they had taken a Jacksonville finally began to lack necessary comforts. A small negro servant had to be discharged because she could no longer be paid. Then the despairing young wife took to her bed, and rapidly grew worse. One good
ady assumed that death was inevitable, and hoped only to make the end as painless as possible. In her mission
of kindness she encountered a hale old gentleman who. fter he had given her a ten dollar note, added- "I will do more. I will send that unfortunate woman my comcolds or throat affections. even in desperate cases." In a few minutes he was ready, and accompanied the noble hearted lady to the
house of suffering. Hot water was .readily. procurable Compound $O x y e n$, evolved from one of Dhaling th Palen's Home Treatments. At the end of a week notable mprovement in the woman's condition set in. The en of another week's treatment found her seated in a chair
on the porch, and she was soon after able to walk about Meanwhile full advice had been received from Dr. Starkey as to the Compound Oxygen, two Home Treatments
had arrived, and the minister began to give some attenhad arrived, and the minister began to give some atten-
tion to his own case. Friends gathered around them tion to his own case. Friends gathered around them
amid the Land of Oranges, and now they are both in a pulpit and his good wife the care of her own home. A valuable and interesting pamphlet on the method of manufacture and of treatment by Compound Oxygen
is sent free to all who desire it, by Drs. Starkey \& Palen, is sent free to all who desire it,
1529 Arch Street, Philadel phia.

## Special 2 Notice.

The following is a copy of a testimonial received by
the Star Machine Co., of Buffalo, N. Y.:
Navy Yard, New York, July 5, 1887.
SIR:-In obedience to your order of the 9th of June (a copy hereunto attached), to make a careful and thor ougn test of the Star Machine Co.'s Improved Portable
Forge, the Board met on June 28 and proceeded to carry out said order.
Forge No. 8,
hosen for trius iter circular appended, was the one the cognizance of the Bureau of Steam Engineering, fo ise on board of vessels.
After a flre had been well under way, two pieces of
ron, $t$ wo inches in diameter, were brought to a weldin heat in five (5) minutes and a clean, smooth weld made
The blast is excellent The blast is excellent and continuous; the frame o
the forge weil braced, and set screws are so arranged a to take up the lost motion of the shaft and other parts. In conclusion, we beg to state that it is the best Port
able Forge that has come under our notice, and w able Forge that has come under our notice, and we
therefore recommend it for use in the Naval Service.
[Signed] JOHN L. D. Bothwick,
Very respectfully
JOHN L. D. J. J. barry, Chief Engineer, U. S. N Passed Ass't Engineer, U. S. $N$,
F. C. BOWERS,

Bancrnt Gherardi. U. S. Navy,
Commanding U.S. Navy Yard,
No U.S. Na York.
A copy of the original report can be seen at our office,
Nos.'198 and 200 Terrace, Buffalo, N. Y.

## $\mathfrak{B u s i n e s s}$ and Personal.

The charge for Insertion under thes head is One Dollar a linejor each insertion, about eight words to a line
Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

## Manufacturers' Advertising

Manufacturing, Scientitic, and Commercial Papers America and Foreign Countries at combination rates.
General newspaper work in all its branches.
Manufacturers' Advertising Bureau and Press Agency
111.Liberty Street, New York.
Benj. R. Western, 'Treasurer. Best of re

The Sturtevant Mill (a rock crusher and pulverize combined) is specially adapted to grinding phosphate
rock, cement, ores, and all kinds of refractory material, and is meeting with ready sale in this country and in Europe. Full information, with circulars, etc., can be
had by addressing Sturtevant Mill Co., 89 Mason Build ing, Boston, Mass.
Engine lathes, chucks, planers, drills, shapers, press es, shears, etc. Machine and blacksmith shop equipment
a specialty. Send for special prices and cuts, stating exactly what is required. W. E. Mch. Co., Manchester, N. H.
Air compressor, rock drills. Jas. Clayton, 43 Dey St.,
New York.
Link Belting (malleable iron, detachable).-Used for transmission of power and in improved appliances
for handling any material in bulk or package. Send for catalogue. Link Belt Machinery Co., Chicago. 2y/ H. P. engine, $\$ 75.00 . \begin{aligned} & \text { 2 H. P. engine and boiler } \\ & \text { complete. } \$ 135.00 .2 \text { to } 50 \text { H. P. engines and boilers a }\end{aligned}$ specialty. American Machinery Co.. Cleveland, o .
Viery thick walrus, hippopotamus, giraffe, elephan and buffalo leather for polishing metals. Greene, Tweed Co., 3 Chambers
The Milwaukee Cement Co., Milwaukee, Wisconsin, have recently erected a $20^{\prime \prime}$ Sturtevant Mill for grinding
their cement, which is doing wonderful work. Full information, with circulars, etc.., can be had by addressin
Sturtevant Mill Co., 99 Mwson Building, Boston, Mass.

Woodworking machinery, planers and matchers.
oulders, scroll and band saws, tenoners. mortisers, saw. ciapboars, scrond shing band mills, saws, tenoneners, morting, shaftisting, sawd
cill supplies. Send for catalogues and obtain our mill supplies. Send for catalogues and obtain our
prices. W. E. Drew. agt., S. C. Forsaith Mch. Co., Man-
Among the fertilizer works using the Sturtevant Mill Paciffc Guano Co., Woods Holl, Mass.; Walton \& Whann Co., Wilmington, Del.; Etiwan Phosphate Co., Charleston, S. C.: Bowker Fertilizer Co., Flizabethport.
N. J., all of whom are greatly pleased with the work one, and consider it th
cess that can be adopte
Large and small punch presses and machine tools . M. York, Cleveland, $\mathbf{O}$.

## Saw 381.

Wanted by a Brick Manufacturing Co.-A good draughtsman. Also a first class mechanic as foreman. Silver Plating without a battery.-Silver held in solution. No acids, no quicksilver. Quick, sure, cheap.
Send for circular. R. T. Ladd, 46 Beekman St., New York. For combination lathe chucks, with bodies and jaws reaming centers of shafts $3^{\prime \prime}$ ' and less diameter ${ }^{\text {tops }}$ dies, thread tools, small bench drills, for amateurs and machinists: and for reliable automatic grain weighers,
ddress the Pratt \& Whitney Cu., Hartford, Conn machinis
address
U. S. A.
Latest

Latest Success ! Marion Waltz. Send for copy. Price,

> The American Enginee
> $\begin{aligned} & \text { Gaff Bullding, } \\ & \text { Chicago, Ill. }\end{aligned}$
> $\begin{aligned} & \text { Send forsample copy } \\ & \text { and premium list for } 1888 .\end{aligned}$

Manufacturing establishments desiring a Chicago u:chasing agent for machinery and supplies should Engines and boilers, port. and sta., hor. and vert. ny power required. Send fordbid, stating exactly your dollar in this line. W. E. Drew, agt., S. C. Forsaith ch. Co., Manchester, N. H.
The Kansas Coal and Mining. Co., Kansas City, Mo., have recently erected a $12^{\prime \prime}$ Sturtevant Mill for grinding with it, considering it the best machine made for this

A tried business man, one familiar with the sale of machinery, is wanted to take entire charge of a large and rowing business in a thriving city on the Pacific coast.
An applicant possessed of capital would be offered an An applicant possessed of capital would be offered an
interest in the house. The position will be given to a nterest in the house. The position will be given to a
suitable person without capital if such a one applies. ddress, with references and full statement of qualifiYork.
Boilermakers' tools. Hand and foot power machinery. red. A. Rich, 23 South Canal St., Chicago.
Working drawings of mach'y and factory plants, buildings included. Indicator tests of steam and gas
engines. J. H. Muller, eng., 319 B'dway, room 10 , N. Y. Nickel Plating:-Manufacturers of pure nickel anLittle Wondere" salts, polishing compositions, etc. $\$ 100$ gents of the new Dip lacquer Kristaline. Complete utft for plating, etc. Hanson, Van Winkle \& Co., New-
Burnham's New Improved Turbine. Sold at cost of
manufacturing and advertising. Address York, Pa. The St. Louis Smelting and Refining Co., St. Louis, Mo., are using a $12^{\prime \prime}$ Sturtevant Mill for grinding their en tons per hour from the mill to pass a 10 -mesh

Lacquers.-Zapon, Brilliantine, Brassoline, Opaline, and other lacquers and special varnishes. Brilliant, hemical Co., Short Hills, N. J. N. Y. agent, Horace
Wanted-A foreman for a foundry job shop. About moulders employed. Address, stating age, refererce,
nd salary expected, Foundry, box No. 3143, Boston, hass.
Perforated metals of all kinds for all purposes. The
Robert Aitchison Perforated Metal Co., Chicago, Ill. For the latest improved diamond prospecting drills, ddress the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, 111
The Railroad Gazette, handsomely illustrated, pubished weekly, at 73 Broadway, New York. Specimen
copies free. Send for catalogue of railroad bonks. The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue. in which are many new and im-
proved forms of Pumping Machinery of the single and proved forms of Pumping Machinery of the single and
duplex, steam and power type. This catalogue will be duplex, steam and power type. This
mailed free of charge on application.
Link Belting and Wheels. Link Belt M. Co., Chicago. Presses \& Dies. Ferracute Mach. Co., Bridgeton, N.J. Iron Planer, Lathe, Drill, and other machine tools of Supplen. NHan, Supplement Catalogue.-Persons in pursuit of infortiflc subject, can have catalogue of contents of the ScIentific American Supplement sent to them free.
The SUPPLEMENT contains lengthy articles embracing The SUPPLEMENT contains lengthy artices embracing cience. Address Munn \& Co.. Publishers. New York. The Holly Manufacturning Co., of Lockport, N. Y., will send their pamphlet, describing water works ma-
chinery, and containing reports of tests, on application. Curtis Pressure Regulator and Steam Trap. See p. 364 Billings' Patent Breech-loading Single Barrel Shot-

We are sole manufacturers of the Fibrous Asbestos
Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co. 19 and 421 East 8th Street, New York.
Unversal \& Independent 2Jaw Chucks for brass work, Th The Improved Hydraulic Jacks, Punches, and Tube Friction Clutch Pulleys. D. Frisbie \& Co., N.Y.city. Tight and Slack Barrel Machinery a specialty. John
Greenwood \& Co., Rochester, N.Y. See illus. adv., p.28.

Graphite Lubricating Co., Jersey City, N. J. GraphQuints' patent automatic steam engine governor Quints' patent automatic steam engine governor
Correspondence solicited from manufacturers of throttle governor engines. Leonard \& McCoy, 118 Liberty
Street, New Yurk. Street, New Yurk.

Catarrh Cured.
A clergyman, after years of suffering from that loath remedy, at last found a prescription which completely cured and saved him from death. Any sufferer from this dreadful disease sending a self-addressed stamped
envelope to Prof. J. A. Lawrence, 212 East 9 Sth St., New York, will receive the recipe free of charge.
Lathes for cutting irregular forms a specialty. See Graphite Bushings.-Put them on all loose pulleys. Band saws, with tipping table. All kinds woodwork Planing and Matching Machines. All kinds Wood Working Machinery. C. B. Rogers \& Co.. Norwich, Conn Leather link belting is the most reliable for dynamos and swift running machinery. For particulars
Talcott's belt hooks. Best made. Providence, R. I. Send for new and complete catalogue of Scientific Books for sale
on application.

## NEW BOOKS AND PUBLICATIONS

a Practical Treatise on animal and Vegetable Fats and OILs. By Henry Carey Baird \& Co. 244 en-
gravings. 1 vol., $8 \mathrm{vo}, 739$ pages. Price $\$ 7.50$.

We have here one of the most useful, as well as th most creditable, contributions which have ever been made to the technical literature of this country. Not only is it thorough and complete, but it stands almos of the kind in our literature which dues anything more than dip here and there into this highly and widely important subject. The want of such a book has been long and severely felt; and this eminent house, which has done so much for the diversified industrie of this country, in its publications, has, we venture to say, never done a better sarvice than by the publica tion of this treatise. The great work of Dr. Karl to technologists and other chemists as the most com to technologists and other chemists as the most comand mineral, published in Europe; but Mr. Brannt, the accomplished American editor, has added largely to the work of Dr. Schaedler, especially in the department of volatile oils and lubricants. The matter of Mr Brannt has been collected from widely extended sources and treats very thoroughly those olls which are pecu-
iarly American, whether fixed or volatile, more espe cially cotton seed, lard, peppermint, sassafras, birch etc. The title of this volume conveys a fair idea of with each of their new and important publications a circular giving the full table of contents and speci-
mens of the illustrations. Such a circular of this book can be had on application to Messrs. Henry Care Baird \& Co. There is one especial feature in the pub-
lications of this house to be highly commended, and it lications of this house to be highly commended, and it
is worthy of imitation by other publishers. We refer is worthy of imitation by other publishers. We refer
to their full tables of contents and to their ample indexes, which render all important subjects in any of dexes, which render all imp
their books easy of reference.

## 


(1) A. L. J. asks : 1. What will take rust from finely polished steel, such as drawing instru of tin putty, 8 of prepared buck's horn, and 25 of alco hol to a paste. Cleanse the article with this,-and finally rub with soft blotting paper. 2. What will prevent their rusting? A. You can preserve them by a coat of and keep them so? A. The gun can be cleaned by shaking will clean up the barrel. Then coat with par affine. 4. A good cement for leather for patching shoes A. Make a rubber cement. See Scientific Americas SUPPLEMENT, No. 158, under " Cements."
(2) W. H. H. asks: 1, Are pumpkins a good milk-producing food for cows, and have pumpkin seed a tendency to dry up milch cows? A. Pumpkins not so much as with other kinds of food. They have a drying tendency, and should not be made an exclusive diet under any circumstances. Plenty of hay, a little bran or meal, and a little pumpkin is a good receipt for late fall and winter fodder. 2. What is the best plant
for stopping the washing of the banks of a stream or stopping the washing of the banks of a strean
where the soil is light and sandy? A. Willow, and plenty of it. 3. Is there any good grass for pasture that will thrive on sandy and gravelly bottom land, where native blue grass will burn out in August? A. Try timo thy and clover mised.
(3) J. E. desires a recoipt for making a qood blue black copying ink. Take of Aleppo galls,
bruised, 9 ounces, bruised cloves 2 drachms, cold 30 ounces, sulphate of iron 3 ounces, sulphuric acid 70 minims, sulphate of indigo, thin paste, 4 drachms. Place the gall with the cloves in a gallon bottle, pour apon them the water and digest, shaking often, for a ortnight. Press and filter through paper into another gallon bottte. Next put in the sulphate of iron, disolve it, add the acid, and shake briskly. Lastly add e indigo, mix well, and alter again through paper
(4) J. A. P.-We are not acquainted with the special variety of cough drops mentioned by you, but we would sugaest the following as an excel incture of opium and tincture of tolu, of cach 14 ounce nine of of opium and tinct $1 /$ ounce wila, of each 14 ounce ras 3 drops, and of anise seed oil, 2 drops. The above mixture is to be put into 5 pounds of candy which is just ready to take from the fire, and continue the boiling a little longer.
(5) S. O. H. asks whether the killing of aligators is an industry, if the hides are tanned and sed to any great extent, and what per cent of so-called pation of quite a number, in many places along o southern coast, and, although the supply of skins varie much, a great many thousand are tanned every year mitation skins are, however, much more numerous,
being made largely of sheepskins and limitedly of split ow hides. A great deal of tough paper stock is made of alligator leathe
(6) T. M. S. asks : 1. What can I put on my watch face to make it luminous, so that the
time can be readin the dark? A. Coat it with luminous paint. See the articles on the paint in Scientific
merican Supplement, Nos lution will remove ink stains from carpets and blots rom paper? A. Use a solution of oxalic or citric acid, ollowed.in the case of the carpet, with coplous washings
ith cold water. 3. How can I make a good, hard walk with cold water. 3. How can I make a good, hard walk t small cost, in the conntry? A. See the article on
Foot Walk Pavements," in Scientific American Foot Walk Pavene
(7) J. H. D. asks for a receipt to remove paint from a wood carving without damaging the wood, burning or scraping would ruinit. A. Mix 1 part by eight of pearlash with 3 parts quick stone lime by sh, making the mixture and then adaing the pearl Lay the above over the whole of the work required to e cleaned, with an old brush; let it remain 14 or 16 ours, when the paint can easily be scraped off.
(8) E. P. M. asks: What amount of oxygen, hydrogen, and carbon is there in steel? A. seel contains no oxygen, save in the rust there
may be upon the outside, and only a possibility of a minute portion of hydrogen. The elements of steel vary much to meet its special qualities. It contains carbon to the amount of from 0.1 of 1 per cent in soft or Bessemer to 2 per cent in high grade eels. In addition to the variations in carbon, it may have silicon and sulphur to the extent of one-tenth of pr cent A grade called munganese tel may hav er cent. A grade called manganese steel may hav
bout $11 / 4$ per cent of manganese. All iron and steel is subject to rust from exposure to snow and rain. unless especially protected.
(9) W. C. P. asks: 1. Does paint or black japan injure the sound of a whistle or gong? A. se to thoroughly remove paint or black japan on whistle or gong which cannot be taken down, and can only be reached by means of a ladder? A. If you can
get atithe whistle to clean it, you certainly can take off the bell by unscrewing the nut on top, which will enble you also to unscrew the bell from the stud. Boil the bell in caustic soda or potash, which will
grate the varnish and allow it to be rubbed off.
(10) R. R. W. writes : I wish to move large building over ice which freezes from 2 to $31 / 2$ feet. Will it be safe? A. Ice 8 inches thick will support heavy wagons and artillery. The crushing strength A ice varies from 327 to 1,000 pounds per square inch.
At the lowest figures this is 23 tons to a square footThis does not represent the bearing power of the ice covering water, in which case it becomes elastic under pressure, and may give way without crushing. A building of moderate weight may readily be moved
over ice 3 feet thick, if properly set on runners of large earing a and moved arong at a fair pace. The only difficulty in such work arises from suspe..sion of the work, when the weight might press the ice down in the hood the de bressed surface and possibly ceuse dis
(11) H. R. E. writes : I have a fine Arkansas oil stone which refuses to work properly after several years of constant use. My tools slide over it
without being sharpened. How can I make it cut? A. Soak the stone in turpentine or naphtha for a few ays, when it will cut as new
(12) C. H. S. asks (1) how to make a ing first fill the pores of the wood with thin glue and let it dry; then clean off, and glue it at the joint with strong glue. 2. How to make a good hard oil finish. A. Take of linseed oil 1 pint, rectified spirits, 4 ounces, il of turpentine $1 / 2$ pint, powdered resin $11 / 2$ ounces. ose pink 1 2 ounce: mix. 3. A good cheap wood filler? A. Boiled linseed oil 1 quart, turpentine 3 quarts, cor arch 5 pounds, japan 1 quart, calcined magnesia
ounces; mix thoroughly. You can buy better pre pared fillers than you can make.
(13) C. A. D., Virginius, Col., writes : I would like to know the relative speed of an air coma Rand drill compressor, running at the rate of 30 revolutions per minnte at sea level. Wonld it have to run faster at this altitude, it being 12,600 feet above sea two-thirds the density of the air at the sea level. Pumps
should run, at a speed of 45 revolutions per $m$. fo
the volume of comprossed air as computed for the se
(14) G. H. W. asks in what way he can bye a battery to run a single bell $21 /$ inches diameter deep, and $172 / 4$ inches long. A. Place a layer of. black oxide of copper at the bottom of the iron vessel, fill with strong caustic potash solution, and suspend in i
horizontally a good sized zinc, preferably a thick plat 4 inches by 14 inches or thereabouts in size. Connect one wire to the zinc, the other to the ir

## T0 INVENTORS

An experience of forty years, and the preparation of
more than one hundred thousand applications for tents at home and abroad, enable us to understand the iaws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. foreign countries may be had on application, and person contemplating the securing of patents, either at home o abroad, are invited to write to this office for prices which are low. in accordance with the times and our ex ensive facilities for conducting the business. Addres
MUNN \& CO., office Scientipic Ambrican, 361 Broad way, New York.

## INDEX OF INVENTIONS <br> which Letters Patent of the

December 13, 1887,
AND EACH BEARING THAT DATE.

## [See note at end of list about copies of these patents]

 Adjustable chair. E. Pynchon........... ........... ${ }^{3 \pi}$Ammonia from manure, etc., obtaining, w. F.

## Armature, H. B. Slater............................... Armature, dycamo, E. N. Bliss

Auger, hollow, W. Bradford
Auger, hollow, W. Brad.
Axles, machine for forming wagon, A. Paterson
Bag. See Mail bag.
Baling press, H. Weddle.
 tery.
Bed spri
Bed spring, M. H. Collom............................. 374,658
Bed fastener m.
Bea, fastener, machine, H. Bramm.................. 374, 348
Belt shifter and brake, J. Stewart............... 344,6i8
Binder, tablet, w. B. Pearson............. 374,75
Bit. See Bride bit.
Blotter, ink, I. S. Smith.
Boat. See Steamboat.
Boiler. See Steam boiler. Steam or hot wate
boiler.
Boilers, purifying water for, $\mathbf{c}$. Elliot....
Bolt. See Elevating bolt.
Book clasp, A. C. Hafely
Book clasp, A. C. Hafely.
Boot or shoe stretcher, L. Nottingham
Boots and shoes, seam rubber for, C. H. Carr.
Box. See Fare box. Miter box. Paper box Box. See Fare box.
Box, w. H. Butler.
Box strapping, metallic, C. H. Dana... .......
Brake. See Axle brake.
Brake, P. Everitt et al...
Brake, P. Everitt et
Bridge, T. Buckley
Bridge, T. Buckley........
Brige guard, C. C. Tozier
Broom rack, D. M. Kilme
Brooms, manufacture of whisk, E. I. Miller..
W. Peck ......................

Buckle, breeching, T. S. Vry...
Buckle, suspender, D. L. Smith.
Burnishing machine, E. B. Allen
Burnishing machine, E. B. Alle
Bustle, A. C. \& O. J. Decker...
Bustle, A. C. ©
Bustle, c. C. Shelby
Bustle, T. P T


Button mal
Hornich.
Button or stua,
Cable or stuping, Ge W. Prentism. A.e............
C. Whitton.
Cable track road and tightener for same,
Calk sharpening muchine
Calks, machine for making toe, J. C. Kelly
Cane stripper, T. C. Colling.
per.................................. . ..........
Cannon, e. J. Blood... ..........

Cant hook, C. Nygaard.
Car brake, H. James
374,877,
Car brake and starter, H. H. Olcott
Car coupling, T. W. Harriso
Car coupling, F. Tiedt, Sr
Car coupling, F. Tiedt, Sr
Car coupling attachment, S. D. Smith
Car heater, M. Wanner
Car heating apparatus, W. H. Penfield
Car, railwa, C.. . 1 olt
Car, railway, C. C. Holt..
Car, stock, G. D. Burton
Car, stock, N. Z. Seitz... ..................................
Cars. apparatus for heating railway, L. K. Cur
lett

Carrier. See Cash carrier.
Cart, road, B. S. \& C. W. Port
Case. See Show case.
Cash carrier, w. H. Koehler
Cash register and indicator, D. Davis............................................ 374, 374
Chain lock, I. A. Sherman...........
Chair. See Adjustable chair. Barber's chair

## Chopper. See Cotton ch

Chuck, B. F. Chappell.
Chick, L. D. Jones............
Cbuck, drill, ${ }^{\text {P. D. D. Goodell. }}$
Churn. W. W. Perkins...........
Circuit breaker, c. B. Bosworth
Clasp. See Book clasp.
Clasp, F. W. Tobey....
Cleaner. See Cloth cleaner.
Cluth cleaner. Wriction, H. W. Hill.

Coal elevator, T. G. Goodfellow
Cotree pot, W. A. Krap........
Coin operated lock, P. Everitt. ompass, beam, J. Strachan. onvertible chair, C. H. Meddin Core catcher and breaker, A. Ball 374,802
374,748 core catcher and breaker, A. Ball................... 374, 374819
Oodge \& weaver..................................
Whon chopper, B. C. Marshali...................... 34, 34,610
Kitson ........................................ ..... 374,899
Crane, Mason \& Shafer ..... $3 \pi 4,756$
$3 \pi 416.12$
374,99
Cuff holder, J. M. Bolton..
yclometer, C. E. W. Woo ..... 344,599
344,919
37,585
374605Dental flask,
Digger. See Potato digger.
Display frame, W. A. Aiken.
Distilling apoorat, A. Smith. ..... 374,724
374,838
Door hanger, J. ChristmannDor hanger, sliding, R. M. Wilson.

Drill channeling machine, A. Ball................. ..... | 374,818 |
| :--- |
| 374,06 |

Egg crates, material for, O. L. Parmenter... ..... $\mathbf{7 7 4 , 8 4 9}$
374,662
Electric circuits, safety strip for, Lange \& Shal-
lenberger ..................................

| 374,442 |
| :---: |
| 34,738 |Electric conductors, conduit for, E. E. Greene.......

Electric courrents, apice, P. Lange..........$^{374,843}$
Aron.........................................374,860,
Electric generator and motor, A. F. Congdon.....
Electric machine, dynamo, G. We estinghouse, Jr., ..... 374,788
lectric motor, w. Hochhausen. ..... 374,858
374,871
Patten. ..... 374,621
apparatus for
74,872
Electric motors, regulation of....................... ..... 344,910
344,92bergh.
lectro $m$374,883
374,747
lectro medical appara ..... 344,754Elevating bolt, F. Prinz...................................
Elevator. See Coal elevator. Hay elevator. Hodvator

Engines, compensating gear for road, J. G.
Downie............................................
Envelope, safety, L. P. Taylor

Explosire compound, L. G. He ..... | 37,973 |
| :--- |
| 74740 |

Extractor. See Nail extractor
Eyeglass holder or hook, w. J. ..... 374,702
Fans, machine for recording the revolutions

| 374,820 |
| :--- |
| 374725 |
| 374806 |

Faucet, II. Ogden........ ..... 374,781
374,551FEence post, H. E. LambertFirce, wire, D. Woodford....
Fire escape, w. H. Gray et al374,859
374,634
374,884
Fire escape, Shires \& Kennedy......................
Fire extinguisher, automatic, Swallow \& Keeny. ..... $34,4,63$
374,63
37,12
3
Fishing reel, A. Geils. ..... 374,745
374,357
Picture frame.
Fruit drier, C A. A. Pitkin, Sr
Fuel, artifcial, J. Irving ..... 374,698
374,679
Funnel, F. A. L. Lman.............
Fuse, electric. K. J. Sundstrom. ..... 374,679
374,875
374,640
alvanic batcery, J. A. Barret Galvanic battery. J. Serson ..... 374,863
374,669
374,6311
Game counter, E. Meise...............
Garment supporter, c. F. Sullivan.
Gas alarm burner, J. McDermott... ..... 34,803
347,715
344,614
Gas freplace,
Gas regulator and cut-off, Dally \& Richardson......
Gate. See Elevator gate. Sliding gate. Swinging ..... 374,501
344,779
$\xrightarrow[\text { Gate, G. } \mathrm{G} \text {. Ingersoll... }]{ }$ ..... 374,742
Globe, folding school, J. H. Frenc
love fastener, G. W. Mandrill


Spr
sia
Soring. A. see Beal, spring. .............................
tand
Stand. See Sewing machine stand. Wash stand.
stave machine, Riggs \& Gleason.
Steam boiler. N. Metz.
Steam boiler. N. Metz.:
Steam or hot water boile,
Steamboat, river, G. I. J. Simpson.

Stereot pee plates, clamp for secu
Stove, air heating, M. .. Green...
Stove pipe thimble, C. H. Tryon.
Stove pipe thimble, C. H. Hryon.... Try
Stove plate fastening, B. D. Ferris.

| Stove shelf. J. A. Price........ |
| :--- |
| Straw elevator, I. w. Adams. |


Suspending device, w..... Patten
Suspension or cable road switch
Suspension or cable road switch, C. Carr....
Suspenion or arble roads, track for, c. Car
swinging gate, adjustablale, w. . . Thomas.
Swing y gate, adjustabu, w. W. Thomas..........
switch. See Rail way switch. Suspension or cable
road switch.
road switch.

Surne
Tag for m
Tag for money bays, etc., A.
Taweler's. E. S. Burbank
Tap hole eloser, T. A. Taylor
Temperature controller, B . Newton
Temper
Temperaure ind

Thill coupling, F. F. M. Mussee
Thill coupling, P. E. Shirk

Tile for coping, Robbins $\&$ Bell.
Tongue support, G. A. A. Brce....
Tool, combination, J. L. Koontz
Tooth, artificial, . . . . Beale, Jr
Trap. See Mole trap.
Tube. See Prospectin.
Tube. See Prospecting or boring tube.
Tubes and rods, rolls for reducing

var, hame, J. B. s.tman.
Vave, gate, w. P. Panne.
Valve gear, G. M. Pelton.
V
Valve, safety, A. C. Meady
Valve, safery A.

Valve, slow closing tank, s.
Vaporizer, J. H. Falentine.
vehicle, two-wheeled.
Vehicle, two-wheeled, R. R. Jones.....
Veneers, machine ofr cutting, E. A. Ha
Waer bed

Wash stand, H. E. Braunfeld..........
Watch, stem winding, S.C. Smith.

cloth, ett., C. E. Haynes.,
Wheel. See Metallic wheel.
Wheel. see Metallic wheel
Whip socket, F. E. Benton
Windmill, H. Myers..
wire splicer, w. F. Batters.
Wire straining machine, J. Reid.
Wire stretcher, Flynn \& Kilburn.


Bade, pin,etc. C. C. Malliot.
Bed sprin, s. . . T. Turner ....
Boter front, steam. $\mathbf{G}$,
B.te, W. W. Lowrey
Carpet, w. Mccallum

Coat, Iittle gir's, M. V. Kavan
Costume, lad's's, E. Moran...
Costume, lad'y's, J. Sheils.
Dress, , Irl's, E . L. Jenkins.

Dress, , irr's, E. L. Lenkins...............
Horse blankes, fabric for, G. R. Ayres
Organ case, F. S. Votey.
Picture fame, w. Levin

TRADE MARKS.
Bolts and rivets, Welsh \& Lea....
Bread and breakfast cakes, self-
Boston brown, H. E. Pearson.

mike, and prepared da
anges of, T. Symington
Coffee, of corfee and chiccorry, and
coffee essence of, प. symington
coffee, essence of, chiccory, gymington..........................
Flour and corn meal, mixture of dry and uncooked
wheat, W. R. Lieb.


Ior......................................... 15,0
Medicateds soap, piils, ointments, salves, and den-
tal prevarations, Ichthyol Geselvshaft Cordes,

Medicunan Ram.
W. Radam
oil, illuminating, Scofeld, schurmer \& Teagle...... 15,0


Remedies for diseases. of the eliver. kiline...
stomach, and bowels, tonics, bitters, cough
sirup, liniments, pills. and pile ointment, A.
Cable............................
Salts, smelinn, w. s. Thomson
oultions for
Company.... ................................... 1
Whisky, M. O'Brien.
A Printed copy of the speciftcations and drawing of
A princed cop por foregoing list, also of any paten
issued since in 1866 , will be furnished from this ofice for
issued since 1s86, will be furnished from this office for
cents. In orderin please state the number and da
cent
of the patent desired, and remit to Munn \& co., en
Broadway, New York. We also furnish copies of patent
granted prion to 1866, wut at inereased cost, as the
grecifcations, not eeing printed, must be copied by
specifleations, not being printed, must be copied by
hand.
Cansdinn Patents may now be obtained by the
inventors for any of the inventions named in the fore-
going list, provided they are simple, .t. a cost of $* 40$
each. If complicated, the cost: will bea litule more. For


| ƏんDvertisements. | 216 LAKE ST. CHICAGO. |
| :---: | :---: |
|  |  |
| The above are charges per agate line-about eight |  |
|  |  |
| ment as the leter press. Advertisements must be received at pubitication office as early as Thursday morn- |  |

## Warren-Ehret Company,

 PREPARED ROOFING, ROOFING MATERIALS, Building \& Sheathing Papers. 428 Market Street,Philadelphia.
STANDARD ROCKINGAAND GRATE BARS


HAVE STOOD THE TEST! and have ECONOMICAI of fuel and Every leaf separate, but firmly adjusted to the main bar.
Cost of repairs at a minimum.
Entire bed of fuel shaken without opening any doors.
Adapted 10 any kind of fuel. Ail parts strong and durable.
NATIONAL IRON WORKS NATIONAL IRON WRUWICK, N. J. Send for special circular and estimates.
POND ENGINEERING CO., Agents, St.

## Eclipse Corliss Engine.

 Large Bearing and Wearing Surfaces, capader HIGH PRESSURE and HIGH SPEED.

Guaranteed FIRST-CLASS in every particular.
EDWARD P. HAMPSONN $\&$ CO

|  | MACHINISTS <br> ARE <br> Losing Money <br> By making their own STUB ENDS for Connecting Rods when they can buythem so much cheaper from contr of |
| :---: | :---: |
| To Electro-Platers. THEVICTRR OVAMOPLATINGAACHINES: <br>  Send for illustrated Catalogue. | 22 Cortlanid st. <br> NEW YORI. <br> 28 SIZES MADE. |
|  |  |
|  |  |
|  steel Pocket Troit bearing manufacturers address and invarialy aceeptabe. Millor Tock Co. mandfacturers, <br> 820 Cherry Street, Philadelphia, Pa. | HISTORY OF THE ELECTRICAL ART <br>  <br>  <br>  10 cents. dealers. |

## Ehret's ROOFINC

 (HEADY FOR UEB).Sheathing \& Building Papers M. Ehret. JR. \& CO.
$\underset{\text { CHICAGO: }}{\text { Dearborn St }}$




Electrical and Telegraphic Apparatus--Batteries, Dynamos, Motors,Telegraph Instruments, Electric Bells, Annunciators, Wires, magnets, and every description of Electrical Supplies. Large Illustrated Catalogue sent free by mail on application. J. H. BUNNELL \& CO., 106 \& 108 Liberty St., N. Y

Geo. V. Cresson, 18th \& HAMILTON STS., PHILA.

## SHAPTING

PULLEYS, \&c.
EVERY APPURTENANCE
For TRANSMISSION of STEAM POWER

## NOVELTY Mor FURNACES <br> expose an MMMens harei suaface

EXTRACT ALL THE HEAT FROM THE GASES.
FURNISH PURE WARM AIIR IN ABUNDANCE. Thirteen Years of Test. Universally Satisfactory.

Send for "Our Furnace Book."

## Abram Cox Stove Co.

 MAINUFACFURIRE, PHILADELPHIA and CHICACOFrom New Fork Tribune, December \%th, 188\%.

## \$1,000 CHALLENGE

## Remington Standard Typewriter.

We claim for our machine the following potnts of superiority: EASE OF MANIPULATION. DURABILITY,
and SPEED-the essential qualities in a writiug machine. Itsease of manipulation is 1 , To test its
wi cualimace ali otere whifing mabines toa sped test, as follows:
THE UMPILE TO BE SELECTED BY OUR COMPETITORS.
DEPOSIT. Each competitor to deposit with the umpire a certified check, payable to his order, for $\$ 1,000$ COMPETING MACHINES to write capitals and small letters.
Thische. Before March 1, 1888. The test to take place not earlier than one month after the first acceptance of PLACE. NE W YORK CITY. IN SOME CONVENIENT HALL, TO BE SELECTED BY OUR COMPETITORS
AND TO BE PAID FOR BY OURSELVES. NUMBER OF OPERATORS. Each competing machine to be represented by three ope
ment for each. The aggreeate time tor each temo to be considered in making the a ward.
MATTER TO BE WRITHEN. The Declaration of Independence. This may be committed to memory, or
written rom dictation. If dictated, each operator may select liis or her own reader.
TRIALS. Each operator to have the privilege of three trials.
DEDUCCTONS FOR ERRORS. A deduction of one second for every Omitted, misspelled or misplaced word.
A deduction of one-fift second for every omitted punctuation inark orcapital letter DISPOSAL OF PROCEEDS. 8500 to be equally divided among the operators of the winning team. The bal-
ance to be donated to the GiRANT MONUMENT FUND. WICKOFF, SEAMANS \& BENEDICT, 339 Broadway, New York

## LACQUER CONSUMERS.

Office, NEW YORK,
Western Union Building, Room 42. P. O. Box 273 .

JOHN A. BARTOW, President.
resident.
Newark, N. J., 1887. under our various patents to manufacture Lacquers and Transparent Varnishes from Pyroxyline. It having been brought to our notice that unauthorized persons have been and are making patent rights, wee desire, to respectfully notify all parties against manufacturing, seling, or using Several of the patents in question have already been sustained in the United States Courts, notably U. S. Patent No. 266, 343 , and we have commenenced suit against The Frederick Crane Chemi-
cal Company of Short Hills. New Jersey, for infrincement of same in the manufacture of the cal Company, of Short Hills, New Jersey, for infringement

CELLULOID MANUFACTURING CO.
M. C. LEFFERTS, Sec'y.


SODTHERN PACIFIC COMPANY,
OFICE OF THE MATER MEGANIO,
ALGIERS (Opoosite N. O.), LA., Dec. 7 , 1887.



 MAGNOLIA ANTI-FRICTION MIETAL CO., M.



The PRICE of your BOILER is a small item in the COST of your POWER.

The BOILER bill is paid only once. The COAL bill EVERY DAY. Repairs cost TIME, often more valuable than the WHOLE PRICE of your Steam Plant.

FOR ECONOMY, SAFETY AND DURABILITY, USE THE BABCOCK \& WILCOX WATER TUBE SAFETY COILER.

The Best for All Steam Power or Heating Purposes.
400,000 HORSE POWER in Service.


THE BABCOCK \& WILCOX CO.
30 CORTLANDT ST., NEW YORK, U. S. A.
107 Hope Șt., Glasgow, Scotland,
La Madeleine les Lille, France
Berlin. Germany.
send for valuable book on steam, free on application, as above on

BOSTON. MASS.. 8 Oliver St.
PHILADEL
CHICAGO. ILLL.. 64 Nouth sth St.
Canal St.
SAN FRANCISCO, CALIFORNIA, Chas. G. Ewing.
ROTTERDAM, HOLLAND, La Grange \& Co CHICAGO. ILL.. 64 South Canal St.
NEW ORLEANS. LA.. 57 Carondelet St. BASLE. SWITZERLAND. G. Peltzer Teache

BAHIA, BRLZIL, Manoel Coimbra. MANCHESTER, ENGLAND, 3 Victoria Building.

MOSCOW. RUSSIA. Alexander Bary.
GENOA, ITALY, Enrico Wel. PARIS, FRANCE. 20 Boulevard Voltaire.
HAVANA, CUBA, W. L.a $1161 / 2$ Calle de la Habaina. ANA, CUBA, W. L. $11161 / 2$ Calle de
SYDNEY, N. S. W. .3 Spring St.

BOLOGNA, ITALY, Alfredo Edimann,
OGNA, ITALY. Alfredo Edimann,
BARCELONA, SPAIN, Alfonso Flaquer
THE DUNNING PATENT WROUGHT IRON BOILER,
 New voltalc batteries,

位
PARTZ ELECTRIC BATTERY CO, PHILADELPHIA, PA., U. s. A. ACID GRAVITY BATTERT, WITH POROUS CUP.-E. adaped
often used Teleqhone Tines, Local Telekraph Circuits, ete or
The onjet The object of this battery is to produce a current of high
intensity and moderate quantity with the least number of
and

 from 3 to over 6 amperes. ESpecialy adaptod for Dertal
Mallets, surgical Lamps, Electro plating, Ruhmkorff Coils,
Laboratory Work, ett.p SULPHO-CH1ROMCC SALT, for use in acid gravity bat-
teries, and for making electropoion fluid, in two-pound jars,
at 80 cents per jar.


PHOTOGRAPHC OUTFITS






 sure. Catalogue of 180 pages with complete instruc-
tilons of How to make Pictures, sent on receipt
of 20 cents for postage. Address T4BWest Fourth Street, Cincinnati, ohio.

 The most economical in use. Over 100 different kinds
Suitable eor Families. Hotels. Restaurants. and Public



## FIRE BRICK

CHARLES D. COLSON, 20 WEST LAKE STREET, 1874 CHICAGO, ILL. 1887 AIR BRUSH. Received hithest Gold Medal A ward or
Frantlon instite asa legitimate art tool Fanklinh in treas a aleghtimate art too
 AIR BRUSH MFC. CO. , 6 y Nassau St., Rockford, Ills.
 SAMUEL HARRIS \& CO.
$41 \& 43$. Canal St. Chicago. Mfrs of Malleable Iron Thitaumb
 DELAFIELDSS PATENT SAW CLAMMP.


SAYER \& CO. 37 DEY STREET, N. Y. HYPNOTISM IN FRANCEE-A N IN-
 PLERMEV, No. 613 . Price 10 ce
oftee and from all newsdealers.

atosm Finginos. Four-Driver Traction Engines WOOD, TABER \& MORER, Eaton, Madison CO., N. Y. GRANT PATENTCOMBINATION


The Boomer \& Boschert Presses set
 BOOMER \& BOSCHERT PRESS CO.,

155 WEST WATER STREET,
SYRACUSE, N. Y., U. S. A.
send for catalogue.
ICE AND REERIGERATING MACHINERY,
(YORK PATENT.) adapted for use in
Breweries, Slaughter Houses, packing Public Euildings, Hos $\underset{\text { wherever refrigerating by artificial }}{\text { pitals, Public Buildings, and }}$ means can be made practicable. The best of testimonials furnished from those already using them.

Manufactured by
YORK MANUFACTURING CO., York, Pa., U.S. A.

THE PENNSYLVANIA GLOBE GAS LIGHT CO.,

 Bench Drill Well constructed for
quick drilling up to
halt inch, and to Incandescent Lights, Battery Cords, etC. are absolutely Water and Acid proof, and the most
durable and most flexible cords in market.

Bjohod Gidta Porcha Co.s 424 East 25 th St., N. Y. PROPULSION OF STREET CARS.A paper by A.W. Wright. in which an endeavor is mad
to solve the probiem to theamount of power requred
to start a street car and keep ittoun in motion under

Wh WW Drop forgeo fiom bap stel The BEST IMACHINISTS' WRENCH on the MARKET
The Sliding Jaw will not yield a hair under the greatest strain, but remains as firmly fixed as if welded to the bar. Made of NORW AY IRON and STEEL, case hardened
QUICK ACTING, DURABLE, and THOROUGHLY RELIABLE. By its quick adjustment and unyielding slide it saves dealer or to UTIIITY WRENCH CO., Limited, New York City. For sale by H. T. Patterson \& Co., 146 to 150 Centre St., New York. Montgomery \& Co., 105 Fulton St., New hromatic TPlesconde Send for list of Popular Scientific Specialties. G. S. woolman, 116 Fulton Street, New York.


Standard Tool Co. Machininists' Find Tools, ATHOL, MASS., U. S. A. Send for Price List and Discou
CAPILLARY TUBES, SPONTANEOUS

 ed in solextifio ambrioan supplement, No. 538.
Price 10 cents. To be had at this oftiee and from ail
newsdealers.


OUTLINES OF A NEW ATOMIC



## Lacquers.

To the consumers of the new Dip Lacquers.-We again
beg to callattention to the notice of the Celiuloid Mfg.
Co published in this issue tin


 Celluloid Varnish Co.. New wirk, N. J., Manufacturers of
Kristaline, Lustrine, etc. Piease send for circulars.


(6)
 The Punch will punch 34 inch hole
through
Price in. plate, 24 in. from edge.

 Blake's Belt Stud. M


PATENTED JULT 31, 1883
 mitations. None genuine without this trade mark and
picture on the package. GREEAE TWEED © CO.
Manufacturers, 83 Chambers Street, Wew York.


## LEGS AND ARMS

WITH RUBBER FEET AND HANDS.
Thirty-fiveyears of the most extensiveexperience,
with the most satisfactory results, of any manu facturer in the worlac. Frattering commendations
from all parts of the world attest the superiority of


The illustrations representa young man who lost both legs by a rairoad accident. He is able to
Skate (ice or roller), Ride a Bicycle, Dance or Play Ball writheot, any assistance except his artifi
cial limbs with rubber feet ARMS restore the appeearance and assist greatly
in the performance of labor. Parties who live at a distance, or who would be
inconvenjenced by a journey to our place, can inconven nienced by a journey to our place, can supply measurements on our formula, and
secure good results. Thousands are thus treated in Canada. Mexico, Central and South America, Europe. and our own States and Territories.
III. Pamphlet and Copyright F.ormula sent free A. A. MARKS,
gor Broadway, New York.


SHIELDS \& BROWN CO


Steam, Gas and Water Pipes, Drums, Heaters, etc The Best Non-COnductor of Heat \& Cold in the World.



STEAM ENGINES.
Predging, Machinery, Flint Mill Machinery, Tur
bine Water Nheels,
York Mfg Co., York, Pa. U.S.A

## PATENTS.

 In this line of busness they have had forty-on - years
experience. and now nave unequaled facilities for the

 A pamphlet sent free of charge, on application. eon

 MUNN \& CO., Solicitors of Patents,

To Business Men.



RULE TRAMMEL POINTS.


FOOT POWER


SCROLL SAWS!
CIRCOLAR SAWS, Lathes, Mortisers, \&c., For Workshop USE.
Sold on Trial, if desired. New Catalogue free eneca Falls Mfg. Co. 666 Water Street, SEVERN AND MERSEY TUNNELS-



## ARTESIAN

by cons oiract and Gany Wells, drilled
 able Horse Power and Mounted
Steam Driling Machines for 10 oto
coo ft. Send 6 cents for illustrated
. catalogue.
Pierce WellExcavatorCo.
New York.
WATCHMAN'S IMPROVED
TIME DETECTOR,
 E. IMinA USER, 206 Broadway, New York PANAMA CANAL.-A PAPER BY DR. W. Nelson on some of the difficulties to be orercome in
the prosecution of this work. Damming the CCagres
River. Extent of the earth cutting. Ocean tides. The


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

TABASHEER, RELATION OF TO MIN-



Two-Horse Power Engine. \$75.


NOTES ON THE PANAMA CANALL--A

 ffie and from ali newsde

## 

for most successin Lubricator
for 0 Ose Pulleysin use.
 Highly recommended by those who
have used theen
vears. Price



## OILE E E E ECTRIC LICHT

## SCIENTIFIC BOOK

 CATALOCUE,Our new catalogue containing over 100 pages, includ-
ng works on more than fifty different subjects. Will be MUNN \& CO. Pubshers ancation 361 Broadway, New York. AC-SIMILE copies obtained to an unlimited extent in CQUE $\begin{gathered}\text { copying apparatus, equal to the the } \\ \text { finestithographic work. } \\ \text { Specimens free. }\end{gathered}$

TO AMERICAN MANUFACTURERS
 100 PER PROFIT \& SAMPLES FREE es, etc. Lady agents wanted for Electric, Corsete. ©uich
sales. Write at once for terms. Dr. Scutt, 842 B 'way, N. Y.


ELECTRIC LIGHT AND POWER dco System of Arc and Incandescent Lighting.
or in connection with the torage Batteries
of the Electrical Accumulater
 Electro-Dynamic Conical Suph, 24 Carter St., Philadelphia

## NEW AND IMPORTANT Terbnilical \& Scientific Books.


 volum Book.", IIIlustrated by 244 engravings. In one
Prici $\$ 7.50$, by maiges. mail. free of postage, to any address in the
 OEBORN.-A Practical Manual of Minerals, Mines,



 SLOA N E.- Home Experiments in Science for Old and
Young A Repertory of Simple Experiment with
Home-made Apparatus, including Mechanice, General





RECENTLY PUBLISHED

##       Pot The above or any of our Books sent by mail free of wortag., at the publication prices, to any adaress in the   <br> HENRY CAREY BAIRD• \& CO. $\mathbf{8 1 0}$ Walnut St., Philadelphia, I'a.. U. S. A. <br> HoNe Management Spons' Housenold Manual: a treasury of Domestic Re- ceipts. With full instruations for the most healthfu and economical arrangement of every department. An every-day book for the careful housewife. 998 pa es, ith 230 illustrations. Price $\$ 3.00$

## USEFUL BOOKS,

anufacturers, Agriculturists, Chemists, Engineers, Me-
chanics, Builders, men of leisure, and professional
men, of all classes, need good books in the line of
their respective callings. Our post office department
permits the transmission of books through the mails
at very small cost. A comprehensive catalogue of
useful books by different authors, on more than fifty
different subjects, has recently been published for
free circulation at the office of this paper. Subjects
classified with names of author. Persons desiring
a copy, have only to ask for it, and it will be mailed
to them. Address,
MUNN $\mathbf{E}$ CO., $\mathbf{3 6 1}$ Broadway, New York.


SUPPLIES FROM
HYDRANT PRESSURE
the chapest powerknown,
Invaiuable for biowing
Churc






## 



## NEWSPAPER FILE

The Koch Patent File for preserving newspapers

## 

 MUNN \& CO.,

## CONSUMPTION, throat and bronchia

irections for hom treatment. Give express office.
DR. WM. F. G. NOETLING $\mathbb{C O O}$., $\mathbf{E}$.




## CHARTERTS GAS ENEINE.

Indest, most reliable and economical Motor in


Williams \& Orton Mfg. Co.
$\frac{\text { P. } 0 . \text { Box } 148 . \text {. STERLING, ILL }}{\text { MACIC LANTERNS. }}$


FIRE-BRICK-BY R. A. COOK, A.M An interesting description of the mining of fre, clay and
the manufacture of frie brick at Mit savas, Marlan.
here





GOLD MINING MACHINERY. - DE




PHOTO-ENGRAV VING PROCESSES.-

GAS GNGINTG:


 ECONOMIC GAS ENGINE COMPANY,

## Steam! Steam!

We build Automatic Engines from 2 to A Large Lot of 2, 3 and 4-H. Engines B. W. PAYNE \& SONS, Box 15,

## MALLEABLE

WATERBURY MALLEABLE IRON COMPANY, WATERBURY, CONN. MALLEABLE
and GRAY iron CASTINGS.
FITTINGS for STEAM, GAS \& WATER.

gclanvilute
oll lamps have no equal
VIEWS ofall SUBJE(TS



 momam

M





PULLEYS, HANGERS,
FRICTION CLUTCHES.


A PAIR OF SHOES costing ten dollars is a god thing, but a pair of JAMES MEANS
S 4 SHOES and SIX EXTRA DOLLARS in your pocket are better. These Shoes are sold by wideawake retailers in all parts of the country.


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

 Proposals for Machine Tools for the Ordnance D. C. November 2, 1887 -Sealed prop osyls will be re: nd place they will be opened in the presence of bid-
derrs, for turnishing the neessary materian and labor
and constructing eleven (11) 6 -inch gun lathes and one and sloter, and for the delivery and eerection of the same
in the Navy Yasd, Washingon, D. in accordee
 froposals must be made in duphicate, in accordance with
forms which will be furnished on appliatation to the
Bureau of ordnance, and encosed in envelopen marked
 serves the right to reject any or an bids, as, in his
judgment, the interest of the Goverment may require.
D. B. HARMONY, Acting Secretary of the Navy.
Proposals for Machine Tools for the Ordnance

 Waskry and erection of the same in the Navy Yard,
Washington, D. C , in acordance with plans and specit,
cations, conies of which, together with all other infor-

 ny or ament may, require. LEAD SMELTTNG.-A FULL DESCRIP-

The Scientific American
PUBILCATIONS FOR 1888.

RATES BY Mall.
The Scientiflc American (weekly), one year . $\$ 3.00$ year.
The Scientific
one year,
American, Export Edition (monthly) ${ }_{5.00}^{500}$


## COMBINED RATES.

The Scientific American and Supplement, . . $\$ 7.00$
ers Edition American and Architects and Build-
.
ene Scientiffc American, supplement, and Archi-
Secientific AAmerican, Supplement, and Archi- 9.00
tects and Bilders Edition,
This includes postage, which we pay, Remit by postal
orexpress money order, or draft to order of
MUNN \& CO., 361 Broadway, New York.



Bargains in Belting． I have a large lot of Rubber Belting that $I$ am eelling at $771 / 2$
per cent．discount from regular ist prices；write for sizes． JOHN W．BUCKLEY，
 156 South Street，－－NEW YORK．
 TOOLS．ROOT POWER



 CTATE RIGHTS FOR SALE Lock bise ivis，Yotis，pa

## WIRE ROPE


 WORKING MODELS Ard Reperimotal Nachnorv，Meta or

## MAMMOTH RUBEER BELTS



## New York Belting and Packing Co．

 JOHN H．ChEEVER，Treas．15 PARK ROW，New York． PIPE COVERINGS． revpredils FIRE－PROOF NON－CONDUCTING STEAM PIPES，BOILERS AND ALL HOT SURFACES． Made in sections three feet long．Easy to apply；llght and cheap．
Asbestos Specialties，Fibre，Braided Packing，Mill Board，Sheathing，and Cement． CHALMERS＝SPENCE CO．， 419 to 425 Eighth St．，New York． Branches：BOSTON，PITTSBURCH，PHILADELPHIA，CHICACO．





SAWS Kantod souw sumyers and SAW S




SPMCIAITIFS IN PAINTS For ENGINES，TOOLS and General Machinery， PECORA PAINT CO． 150 North 4th Street， PHILADELPHIA，PA． SEND FOR CIRCULAR A．

$\overline{\text { NATIONAL STE Cleaulng Boller Tubee．}}$



## H．W．JOHNS

## TASHESTHOS

COVERINGS
For Furnaces，Hot－Air Pipes，otc． FIRE－PROOF．NON－CONDUCTING． 33\％of Fuel Saved．Has no Odor． Al1 of the heat is carried to points desired and
not wasted in cellars and flues． H．W．JOHNS M＇F＇G CO．， 87 MAIDEN LANE，NEW YORK．


 GEO．B．GRANT， 68 Beverly St．，Boston，Mass． ICROSCOPES，OPERA GLASSES，SPECTACLES PHOTOGRAPHIC OUTFITS
Catalogues FREE．
 PHILADELPHIA．
PRIMTIING INKS； THE＂ECientific American＂is printed with CHAS

THE M．T．DAVIDSON IMPROVED STEAM PUMP
 Davidson Steam PuMp Co． principal office，no． $7 \%$ liberty street，new york． ADAMANTINE SHOES and DIES for STAMP MILLS They will not＂Cup＂or Break at shamk．CHROME STEEL WORKS
 THE ORIGINAL SOLID VULCANITE TIMEETRES Run Easy and Safe，Cool and True，is more Durable，hence Cheaper，
A Trial will convince you of this． ew Tark Belting and Packing C

THE＂FISHKILL＂CORLISS ENGINE， Fishkill Landing Machine Co．，Fishkilloon－Hudson，N．Y．


ROOTS NEW WATER－TUBE STEAM BOLIER Recently adopted by the BRUSH ELECTRIC LIGHT CO．
at Louisville；the EDISON ELECTRIC LIGHT CO．， Detroit；and the COLUMBUS EDISON ELEC－ TRIC LIGHT CO．，Columbus，Ohio． For Illustrated Catalogue of New Boiler，address ABENDROTH \＆ROOT MANUFG，CO， 28 Cliff Street，New York．

## RUBBER MATS，PERFORATEDAND RUBBER MATTING



Also，RUBBER STAIR TREADS． Avoid Imitations． Perforated rdbber office mats，with safety Initals New York Belting and Packing Co． 15 PARK ROW，NEW YOR


的然綡
 HYDROSTATIC PRESSES， Engines，Bollers．Castings， ICE－MAKING MACHINERY， WM．TAYLOR \＆EONS，

## THE PENBERTHY INJECTOR．

 As every injector is tested by the manufacturers before it leaves the factory，weknow that，if properly connected and instructions are carried out，they cannot fail know that，if properly．connected and instructions are carried out，they cannot fail
to work．The manutacturers offer to pay the expenses of any man to go to
their factory，and $\$ 10$ per day while there，if the injector does not work， their factory，and bee per ased．JENKINS BROS．， 71 John St．，N．Y．；
provided it has not been Milk
Street，Boston； 13 South Fourth Street，Philadelphia； 54 Dearborn Street，Chicago ROCK BREAKERS AND ORE CRUSHERS．
 Maid the superintendence of MMr．Marsen，who for the past twenty years，has been connected with
the manufacture of Blake Crushers in this，country and England．
FARREL FOUNDRY AND MACHINE CO，Manufrs．，Ansonin，Conn．
COPELAND \＆BACON，Agents，NEW YOIRI and PHILADELSPHIA．

## IMPROVED HOISTING ENGINES

Specially Adapted for Hoisting，General Manufacturing and Mining
Purposes．300 Styles and Sizes，and over 4，000 in use． LIDGERWOOD MANUF＇G CO． 96 Liberty Street，New York．
 P


## F感 Also SUPERIOR BOILERS．

 MACHINISTS＇SUPPLIES．s．AGENT MO
THE DUC ELEVATOR BUCKET．
FULL ROUND AND PARTIAL STRAICHT FRONTS．
IRON CLAD MFG，CO．， 22 Cliff St．，New York．


