

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


NEW YORK, JANUARY 18, 1890.


A. Riverside Park. B. Morningside Park. C. Cathedral site. D. Bloomingdale Asylum. E. Elevated railway. F. Northerly end of Central Park. G. General Grant's tomb.

# §rieutific glmericu. 

## ESTABLISHED 1845.

MUNN \& CO., Editors and Proprietors. published weekly at
No. 361 BROADWAY, NEW YORK.
O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.
 ${ }_{3}{ }_{3} 80$
 The Scientific American Supplement

 Bullding Edition.





Spanish Edition of the Scientific American.



 NEW YORK, SATURDAY, JANUARY 18,1890 .

## Contents.



TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT

## NO. 733.

For the Week Ending January 18, 1890.






 $2 i l l$
V. MECHANICAL ENGINEERRNG.-COmbined ENgine and My-


 Pacist Coast steam schononers. 1 illustratriton.





 Cement Wash for đoód and ìrò:
X. SANTTATION.-Reeves' Ssstem of Semaee Treatment.-4 illus.

new york as a site for the world's fair. A recent number of Engineering, of London, con tains a racy article, by its New York correspondent upon the comparative merits of New York and Chicago as locations for the great fair of 1892. Our limited space compels us to confine our abstract to a few of the points presented in favor of this metropolis, a follows :

When the writer was asked to give reasons why the world's fair should be held in New York City in 1892 his first impulse was to decline on the ground, well known to beginners in mathematics, that "an axiom was a self-evident proposition." One might as well ask why London was the clearing house of the world, and the answer would be couched very much in terms of the proposition that a draft on London was negotiable everywhere. But the reflection that all Eng-lish-speaking people are not perhaps as familiar with the reasons so plain to Americans has led to this article.
New York has, up to the present time, raised with very little effort $\$ 5.200,000$. This has been done simply by sending around subscription books handed to the proper persons with no remarks by the solicitor. If a party subscribed $\$ 100$ he was not asked to make it $\$ 200$ The subscriptions have appeared in the daily paper and are all bonafide.
New York City has a population of $1,600,000$. Brook lyn, connected with it by the East River bridge, num bers 900,000 ; Jersey City and Hoboken, on the opposite banks of the Hudson River, contain 300,000 ; while but 9 miles distant is Newark, N. J., with a population of 200,000 . Moreover, within a radius of 25 miles around New York, not counting any of these places named, are many suburban towns, numbering in their population hundreds of thousands. Take, for example, 3 miles from Newark are the Oranges, with over 30,070 , and all along the Hudson River are towns of similar numbers, for New York lies in the midst of a thickly settled dis trict.
Eighty miles from New York is Philadelphia with a population of $1,200,000$, and 75 miles the other side is New Haven. Boston is 225 miles, Baltimore 170 miles, and Washington 215 miles, not to name numerous large cities lying between, such as Providence, R. I., Spring field, Mass., Trenton, N. J., and many others. So that the immediate section lying around New York, from which it has largely to draw upon for its visitors, is thickly populated.
New York is situate on the Atlantic Ocean, and is the seaport of the United States. Many of the places named are accessible by water. The shores of the Hudson and of Long Island, and the Sound of New Jersey are dotted with towns and teeming with inhabitants while the location of the fair is such as to be readily reached by boat. Many boats will be run at short in tervals from all places within a suitable distance, and from other places there is no doubt that boats with staterooms will be plying, so as to furnish sleeping ac commodation for their patrons in transit.
A party of Cook's tourists start from Li verpool to see the fair and the metropolis of the United States, for a round trip, with a limited ticket, and having but a short time at their disposal. On reaching New York their steamer goes to the fair wharf and drops inchor in a convenient place. After seeing the fair they return to their steamer and live on board, without bother of transfer of baggage or any of the annoyances of an hotel. The nights, even in the hottest months, are cooled by the breezes of the Atlantic, and they return home in equal comfort.
As to the site chosen, New York has selected a beautiful one, easy of access, with fine views of the bay and sound, and in every respect an ideal and picturesque ocation.
New York is perhaps the most attractively located city in the world. Situated on an island with rocky scenery on the New York side, and hills on the Long Island, at the head of a bay which is said by many to equal the celebrated one at Naples, and with an im mense body of water on either side, what greater natu ral advantages could be desired?
New York is the social, the literary, the commercial and the moneyed center of the United States, and there it will remain. Here is where all nations flock and it must be so, as long as the channels of trade run in this direction. Naturally, the brains of a country find support at its mercantile center, and they will just as naturally gather there."

## TORPEDO BOAT TESTS

The tests of the eight new first-class torpedo gun boats recently built for the British navy show that even at this late day, such designing is only in its experimental stage, and that, though the maximum weight of structure to buoyancy is readily determined, the point beyond which power for driving may not be increased remains unsettled. The Rattlesnake fur nished the model for these craft. Wisely chosen, it would seem, for she has shown herself to be a fairly good sea boat, a rare quality among her type, and, yet lief that she could withstand any ordinaryattack. But
she is not speedy, that is to say, not sufficiently so fo a craft which, because of the very nature of her work, might be greatly exposed. It was sought to combine in the new boats all her best qualities and the additional one of high speed. Though only of 735 tons, they were fitted with engines of the relatively enormous horse power of 4,500 . Even the Sea Gull, which seems to be, all things considered, the staunchest of the lot could not stand anything like the full development of her engines under forced draught.
At the trials at Portsmouth, with engines showing an energy of 3,033 horse power, the vibration was ter rific, bolts starting and the seams on the deck fluting opening. After a trial of scarce two hours, only a por tion of the time with engines indicating 3,000 horse power, it was decided unsafe to continue. Just before the order to stop was given, the main air pressure in he stoke hold was $2 \cdot 3$ inches, mean revolutions 245, and mean speed close upon 20 knots. The boilersthey are of the locomotive type-were found to be leaking, and the hull incapable of enduring the strain of forced draught.
As a proof of the impracticability of the plans, none of the contractors-there were seven of them-succeed ed in producing a craft able to meet the expectations of the naval designers. It may be said for these vessels, however, that though not "improved" Rattlesnakes, as was intended they should be, they showed themselves, with one exception, to be good sea boats that is to say, as good as short, heavy gun boats could airly be expected to prove. But, under normal draught, they did not do better than 17 knots, which the Rattlesnake, under so much forced draught as she is capable of enduring, can beat.

## NOTES.

Shipbuilding on the Maine coast was more active during the past year than it has been since the palmy days before the war, when the fleet had the pick of the carrying trade. Yards which for years scarcely paid expenses are doing a thriving business, and others for long deserted echo with strokes of adz and caulking nallet. Three-masted schooners of enormous size have been built in large numbers, four-masters, too, and now and again a noble five-master leaves the shore and blocks, and glides out into the open sea. It is not so long ago that a 1,000 ton schooner was considered normous. Now, a 1,500 tonner is scarcely remarked They are built up to 1,700 tons, and the keel of one which is to measure 1,800 tons was laid some time since $t$ Bath. The advantage of the fore-and-aft rig is that it can be handled by a small force, the aid of steam winches being, of course, required to set the sails. All these big craft carry steam engines, used not only for hoisting sail and cargo, but as well for pumping and setting anchors. The Maine tonnage for 1889 was Bangor, 401 ; Bath, 24,586 89 ; Belfast, 4,599 66 ; Cas tine, 114.41 ; Frenchman's Bay, 50.05 ; Machias, $3,861 \cdot 34$; Portland, 1,296 05 ; Waldoboro, 3,482.00 York, 99 ; Total, 39,548.04. The outlook for this year is still more encouraging.

A Frenchengineer, in a recently published pamphlet, uggests a permanent flooding of the interior of the Isthmus of Panama as a means of solving the canal project that M. De Lesseps and his company have had such ill success with. M. Sautereau, whose idea it is, would dam the River Chagres at a point about fifteen miles from Colon, the Atlantic terminus, building a high level lock there and another on the Pacific side where the River Grande would be similarly dammed. Thus, with both ends of the canal already fairly completed, and a great artificial lake lying between, only ne obstacle, Culebra, would remain to be dealt with This he would cut through at the floating line.
Whoever may have seen the Chagres in its wild noods, when, swelled by mountain torrents, it floods forty square miles of its valley, sometimes to a depth of sixteen feet, or has seen the furious inrush of the waters of the Caribbean Sea, will wonder at the temerity of the engineer who could suggest such a scheme. Even he seems not altogether satisfied of the practicability of building locks 88 feet in height. Yet smaller ones would not suffice

The claim a wholesale grosery house of St. Louis reently made against the South Shore Railroad brought to light the fact that, at least in some quarters, dirt under the name of terra alba is being used in candy to an almost incredible extent. It was a half dozen barrels of lozenges made by a Boston house that had been shipped, the claim being that they had been damaged in transit. The railroad company sent samples of the lozenges to a chemist, who discovered them to consist "entirely of terra alba bound together with a little gelatine or gum." Investigation showed them to yet require dipping in sirups flavored with peppermint, wintergreen, sassafras, and the like, before being ready for infantile consumption. Now, terra alba is a mineral utterly insoluble in the saliva or gastric juice-a dangerous compound to put within even a healthy stomach ; and when the railroad company learned this they refused pay any damages, and the grocery house,
fearing exposure, ceased to press the claim. The the body. In five days after this they refuse all vegeBoard of Trade Journal of Portland, Me., says that 6,000 tons of terra alba were recently imported though the port of New York alone.

A company has been incorporated under the laws of Virginia to build railroads in South America and steamer lines to connect the same with United States ports. The project, as described by its promoters, is " to construct a line of railroad from some point near the mouth of the Magdalena River, which empties into the Caribbean Sea, in the United States of Colombia, south wardly along the eastern flank of the Andes and the headwaters of the Amazon to points in Peru, thence to connect with the Peruvian and Argentinian system of railroads, at present in operation or under construc tion. From the mouth of the Magdalena River steamships will be run to the southern point of Florida and to New Orleans, whence will extend railroad connec to New Orleans, whence will extend
tions to our own chain of railroads."

Both the Anglo-American and the Bennett-Mackay cable companies are beginning to deliver messages in typewriting, the operators taking them from the lines directly upon the typewriter.

## Electrical.

1. How strong a current is used to send a message over an Atlantic cable? A. Thirty cells of battery only, equal to thirty volts.
2. What is the longest distance over which conver sation by telephone is daily maintained? A. About 750 miles, from Portland, Maine, to Buffalo, New York.
3. What is the fastest time made by an electric rail way? A. A mile a minute, by a small experimental car. Twenty miles an hour on street railway system.
4. How many miles of submarine cable are there in operation? A. Over 100,000 miles, or enough to girdle the earth four times.
5. What is the maximum power generate 1 by an electric motor? A. Seventy-five horse power. Expe riments indicate that 100 horse power will soon be reached.
6. How is a break in a subınarine cable located? A By measuring the electricity needed to charge the re maining unbroken part.
7. How many miles of telegraph wire in operation in the United States? A. Over a million, or enough to encircle the globe forty times.
8. How many messages can be transmitted over a wire at one time? A. Four, by the quadruplex system wire at one ti
9. How is telegraphing from a moving train accom plished? A. Through a circuit from the car roof, in ducing a current in the wire on poles along the track
10. What are the most widely separated points be tween which it is possible to send a telegram? A British Columbia and New Zealand, via America and Europe.
11. How many miles of telephone wire in operation in the United States? A. More than 170,000, over which $1,055,000$ messages are sent daily.
12. What is the greatest candle power of are light used in a lighthouse? A. Two million, in the light house at Houstholm, Denmark.
13. How many persons in the United States are engaged in business depending solely on electricity? A Estimated 250,000 .
14. How long does it take to transport a message from San Francisco to Hong Kong? A. About fifteen minutes, via New York, Canso, Penzance, Aden, Bombay, Madras, Penang, and Singapore.
15. What is the fastest time made by an operator sending messages by the Morse system? A. About forty-two words a minute.
16. How many telephones are in use in the United States? A. About 300,000 .
17. What war vessel has the most complete electrica plant? A. United States man-of-war Chicago.
18. What is the average cost per mile of a trausatlantic submarine cable? A. About $\$ 1,000$.
19. How many miles of electric railway are there in operation in the United States? A. About 400 miles, and much more under construction.
20. What strength of current is dangerous to human life? A. Five hundred volts, but depending largely on physical conditions.-Age of Steel.

## Frog Farming.

A new industry has sprung up latterly, which prom ises, we are told, profitable results. It is frog raising. A farm for this purpose at Menasha, Wis., is in full operation and stocked with 2,000 females, which are capable of producing from 600 to 1,000 egys at a time. The owner of the farm gives some other interesting facts relative to the frog's habits which are not generally known. He says :
In ninety-one days the eggs hatch. The thirty-ninth day the little animals begin to have motion. In a few days they assume the tadpole form. When ninety-two days old, two small feet are seen beginning to sprout near the tail, and the head appears to be separate from

## table food. Soon thereafter the animal assumes a per

 fect form. Next spring 25,000 , at 20 cents per dozen, will be my reward. Figure it yourself, says the enthusiastic frog farmer, and see if there is any money in batrachia, alias frogs.A Modified westminster Abbey for Washington. In the Senate, recently, Mr. Dolph offered the fol owing resolution
Resolved, That the Committee on the Library be directed to inquire into the advisability of the erection by the government of the United States, at the city of Washington, of a memorial hall, at which shall be received and preserved such statues and portraits of public men and eminent citizens of the United States and such historic paintings and other works of art a may be provided by law ; and to report by bill o otherwise
"I have offered this resolution," said the senator, for the purpose of directing the attention of the Committee on the Library to the subject covered by it. It seems to me that a moment's reflection will satisfy any one that the erection of such a hall by the government at the capital and the making of such a collection of statues and portraits is not only appropriate but is important. Suppose at the beginning of this
government, a century ago, such provision had been government, a century ago, such provision had been
made and there had been collected the portraits of the men who signed the Declaration of Independence, o of those who composed the Constitutional Convention, of the fathers of the country, those members of the cabinet and of the Senate and of the supreme bench who laid the foundations of our present greatness, what an object of interest it would be to the hundreds of thousands of citizens who visit the capital every year; and I see no reason to believe, if such provision should be now made, if we should now enter upon this work, that one hundred years hence such a collection might not be of equal interest.

But there is another view of this subject which ought to be taken into consideration. We already need such a hall for the collection we have. The hall in this capitol which is devoted to the reception of statues of eminent men from the States is already flled, and when the States not already represented there shall have exercised their privilege of sending to statues of their eminent citizens, it will be over crowded; and the room is already needed for other
purposes. "Then, the portraits of the presidents of the United States are becoming so numerous that they cannot be
hung to advantage in the presidential mansion, and if the practice of securing the portraits of the heads of departments shall continue, as it probably will, those in charge of the department buildings will not know what to do with them.

So, I say such a hall is already needed. England has her Westminster ; other nations have their edifices where their citizens can make pilgrimages to the tombs of their poets and philosophers and lawyers and states men and kings, or can look upon their likenesses chis eled in enduring marble or painted by eminent artist upon canvas. Let the United States have a hall, no national capital in coming generations may look upon the forms or pictures of the eminent men of the republic, whom a great and free people delight to honor on account of their patriotic services to the country."

## Proper Care of Carriages.

There is no varnish made that will hold its brilliancy nore than six months. A carriage should be revar nished every six months to keep it exactly in fine order. If revarnished once a year, it will preserve the undercoats from damage. But there are circumstance that render revarnishing necessary at more frequent intervals. If one has not a suitable carriage house separate from the stable, the ammonia from the stalls or the manure pile, or perhaps from decaying vegeta bles, has united with the oil in the varnish and gradu ally dissolved it or burnt it. We have known it done in one night, so that the whole surface exposed to the ammonia was shriveled up in small brown, crisp rolls We knew a case where a gentleman left his horse and buggy standing in front of a distillery for half an hour and when he returned one side of his buggy was com pletely covered with what looked like rust, but which was simply the remains of the decayed varnish. The oil had been consumed, leaving only the gum crumbled up in burnt crisp flakes. Some people do not take the pains to wash the mud from a carriage soon enough after using, but permit it to dry, when the mud acts like a sponge and absorbs the oil from the varnish Some people wash the carriage with soap, and we have even known hot water used. For such acts of stupidity there are no words to express disgust. Some people seem to regard varnish as a kind of high polish, put on by hard rubbing, and the more rubbing it gets the brighter it ought to look. The number of people who are absolutely ignorant about varnish is some thing astonishing.-T'he Stable.

## PHOTOGRAPHIC NOTES

Gelatine Lantern Slides.-For architecture, plans, diagrams, engravings or part of an engraving, a rough and ready way of preparing a transparency for the antern is as follows :
Procure a sheet of colorless gelatine about the sub stance of thick writing paper, and place it directly over the subject to be copied. Fix the corners with drawing pins to prevent any slipping, and then go over all the lines with a sharp-pointed tracer. A large needle fixed in a wooden handle will do, but the point should be lightly ground on a stone to take off the polish. Now take a small quantity of black lead or lamp black on the tip of the finger and rub over the tracing, and you will then have an exact copy of the original. It may, if necessary, be colored with moist water colors, using the transparent ones only. The gelatine should be then mounted between two glass plates.
By coating a piece of glass with dissolved gelatine the same effects may be obtained, but the subject to be copied and the surface to be traced being a greater distance apart, you may not get so truthful a tran script. Instead of using a tracing needle a copying ink pencil will answer, or a very fine-pointed pen, with Indian ink or lamp black (water color), strong in pigment. This last is perhaps the most satisfactory as regards intensity.-Joseph Phillips in The Optical Magic Lantern Journal and Photographic Enlarger.
A New Toning Bath for Gelatino-Chloride Printing out Paper.-Herr A. Stieglitz recommends, in Liese rang's "Amateur Photograph," the following toning bath for aristo paper, giving quickly beautiful blackish bath for
tones:

## Chloride of gold... <br> Nitrate of uranium. <br> Bicarbonate of soda

The bath should be used at once, because it does not keep. The pictures should be printed very deeply, and before toning they should be washed in at least six changes of water. Fixing is done in

> Hyposulphite of soda. 1 part.
> Ammon


Photomicrography. - At present, according to Dr Zettnow, green sensitized erythrosin plates are used for photomicrography, a green colored screen being inserted between illuminant and microscope. Dr. Zettnow uses erythrosin plates and a solution of

> Nitrate of copper.
> Chromic acid...
> 160 grammes.
> $\begin{aligned} & 14 \mathrm{c} . \mathrm{c} . \\ & 250 \text { " }\end{aligned}$

With this solution a plane parallel glass vessel, with about one-half inch distance of the glass sides, is filled. Professor Eder uses eoside of silver plates for the same purpose. These are prepared by soaking ordinary gelatino-bromide plates for two minutes in the following solution :

Solution of crystallized eosin ( $1: 1000$ )
Solution of
Ammonia
Water


The green colored screen consists of a mixture of indigo, sulphuric acid, and picric acid, the development being by preference carried out with the well known mixture of pyrogallic acid and soda. The erythroside of silver is prepared by Dr. Zettnow as follows: 1 gramme of the coloring matter is dissolved in 200 c . c. of water, the solution heated up to $60^{\circ}$ or $80^{\circ} \mathrm{C}$., and then is added a solution of 1 gramme of silver nitrate in $10 \mathrm{c} . \mathrm{c}$. of water. The precipitate is allowed to settle, and, after cooling, the solution is filtered. The washing of the precipitate on the filter is continued until the filtered liquid appears colorless. Then the filter is pierced, the precipitate being sputtered off and so much diluted with water that its volume amounts to 250 c. c.; 1 c. c. of the well shaken liquid, in which the finely divided silver compound has been evenly swelled, being therefore equal to 4 milligrammes of the originally taken coloring matter.
An Excellent Gold Bath for Albumenized Paper.The following toning bath is recommended by E. Kiewning, an experienced professional photographer, as absolutely certain, giving brown to bluish tones, according to the degree of its concentration and the time the prints are allowed to remain in it :

$$
\begin{aligned}
& \text { Water. } \\
& \text { Chloride of gold } \\
& \begin{array}{c}
600 \mathrm{c} . \mathrm{c} . \\
4 \text { gramm }
\end{array} \\
& { }_{60}^{4}{ }^{4} \text { grammes. }
\end{aligned}
$$

This having been made up, add
Shaved, chem. pure chalk (carbonate of lime).. 20
The mixture is allowed to ripen for three or four days in the dark, and with occasional shaking; it is then ready for use. To tone one sheet of albumen paper, 10 c. c. of this solution are diluted with 200 c. c. of water. If it is desirable to tone quicker, only 150 c. c. of water are added. The bath tones well and evenly to the last drop, especially in summer at high temperature, where the use of carbonate of soda in the gold bath seems not to be recommendable on account of its rapid decomposition. The above toning bath will prove to be very useful.-H. E. Gunther in Photo. News.

THE SUBMERGED RAILWAY OF ONTON ON THE COAST OF SPAIN.
The mines of Onton, near Bilbao, north Spain, have long been celebrated for their richness in the yield of iron ores suitable for the manufacture of steel, but great trouble has heretofore been experienced in the shipment of the mineral on account of the difficulty of placing it on board of the ships. England and the Continent are the great markets for this product. The coast adjacent to these mines is high and rocky, exposed to the full force of the sea, there being no harbors in the immediate vicinity. At the foot of the rocks there is a sloping shore which extends out to a considerable distance, with an even grade. It is upon this incline that the remarkable railway we are about to describe has been constructed.
The roadbed of the railway has a length of about 650 feet and a width of 20 feet, upon which two sets of parallel tracks, each $31 / 4$ feet wide, are placed, constituting a four-rail railway. The grade is five feet to the hundred. 'The car which traverses this railway, and upon which the ore is conveyed from the cliffs to the ships, consists of a high metallic tower made in the
the tower, by its own gravity, begins to move down the inclined railway, and the gate of the chute automatically closes. The tower continues to glide down the inclined railway through the water, until it reaches the side of the ship, which is anchored fore and aft, and then by the throw of a lever, the platform of the tower being inclined, the whole load upon the platform is almost instantly deposited upon the ship, going down through suitable slides into the hold thereof. As soon as the discharge of the load takes place, the counterbalancing cars begin to draw the tower inward again
toward the shore, and thus the operation of moving the tower back and forth automatically, and automatically loading and discharging itself, is carried on with the greatest success.
It is said this railway operates even when the sea is extremely rough. It certainly is a bold undertaking, and reflects the greatest credit upon its constructor, Mr. D. M. Alberto de Palacio. The platform carries for its load one hundred tons of ore. It is said that 5,000 tons of ore per day can be put on shipboard by means of this apparatus, the total cost of which was means of th
only $\$ 18,000$.
by vast tracts of country, were nevertheless carrying n au active correspondence. But a greater surprise was yet to come. Not only did the kings of Assyria and Babylonia correspond with the Egyptian monarch in the language and writing of their own country, but continuous literary intercourse in the same language and writing was being carried on throughout the whole length and breadth of Western Asia; in short, the whole civilized world of the past was as closely knit ogether in literary intercourse as they were in these wodern days of the penny post. Nothing could happen n the distant world or far Orient without its being immediately communicated to the Egyptian court

## corrosion.

The purest water often is the most active in corroding and pitting plates, and this makes it probable that the active substance, in some cases at least, is air. It is well known that water is capable of dissolving a considerable amount of air, in fact, it is this dissolved air that enables fish to breathe. It this dissolved air that enables fish to breathe. It
is not so widely known, however, that the oxygen of is not so widely known, however, that the oxygen of
the air is more soluble than the nitrogen. lf a small


THE SUBMERGED RAILWAY OF ONTON, ON THE COAST OF SPAIN.
form of a pyramid having a wide triangular base. The tower is mounted on wheels, which run upon the quadruple railway track before mentioned. The platform of the tower, upon which the load of mineral is placed, is about 70 feet high from the track, a height which is sufficient to rise above the decks of ordinary vessels when the tower is run alongside thereof; and from the platform the discharge of the ore is made directly into the holds of the vessels. This great rolling tower is operated automatically. It is connected to the shore by means of a strong wirecable, which passes over pulleys fastened to the rocks. At the landward end of the cable there are attached some weighted cars that move up and down upon an incline, as shown in our engraving. These form a counterbalancing weight for pulling the tower when empty in toward the shore.

The mineral to be loaded upon the vessels is brought from the mines, which are not far distant from the coast, upon rope railways mounted upon posts, as seen in our engraving. From the mineral dumps upon the rocky heights the mineral is conveyed part way down the cliff through a chute, the end of which projects be yond the cliff, and when the empty tower is drawn to shore by the weighted cars before mentioned, it automatically opens an end gate in the chute and allows the mineral to drop upon the platform in a continuous stream until a weight of ore sufficient to overcome that of the counterbalancing weight or weighted cars has fallen upon the platform : and when this takes place,

We are indebted for our engraving to La Ilustracion Espanola.

## Curious Tablets in clay.

Professor Sayce, lecturing at Manchester recently said a marveluus discovery had lately been made in Egypt. They had been suddenly brought face to face with the civilized world as it existed in the days when he Israelites were groaning under the burdens of their Egyptian taskmasters. They could handle the very etters that were written by the princes and governor of Canaan when as yet Joshua was unborn, and they could trace the course of events that led to the mission of Moses and the exodus of Israel out of Egypt. On he eastern banks of the Nile was a big line of mounds, known to the natives under the name of Tel-el-Amarna. About two years ago some natives, while going on with their work of disinterment, discovered among the fonndations a number of clay tablets covered with characters the like of which had not previously been seen in the land of Egypt. He was able to see some that were half obliterated, and found that they con sisted of letters and dispatches written in Babylonian characters and in the language of Babylon. Some of the letters showed that they must have been written about 1430 B.C., or about a hundred years earlier than the date assigned by Egyptologists to the Exodus. It was sufficiently startling to learn that at this early period of history the chief sovereigns of the civilized world, separated though they were from one another
quantity of water be shaken up in a bottle, it dis quantity of water be shaken up in a bottle, it dis-
solves some of the inclosed air, and when this is afterward driven off by boiling, and analyzed, it is found to consist of oxygen and nitrogen in the proportion of 1 to 1887 , instead of 1 to 4 , as in the natural air. Thus the dissolved air, being more than twice as rich in oxygen as common air is, and being brought into more intimate contact with the metal by means of the water that holds it in solution, exerts a correspondingly more noticeable effect. It is probable, too, that water plays some other important action in connection with the oxidation of metals, for it has been found by recent experiments that pure oxygen will not combine with things that it has the greatest affinity for, provided it is perfectly dry. Even the metal sodium, which has an intense affinity for oxygen, may be heated in it to a very high temperature without combination, provided sufficient precautions are taken to exclude the slightest trace of moisture. It appears, therefore, that water plays a most important part in the oxidation of metals by air-a part, indeed, that we cannot explain, and that we really know but little about.-The Locomotive.

The United States squadron, consisting of the war ships Chicago, Boston, Atlanta, and Yorktown, reached Lisbon recently, after a very satisfactory passage from onical in fuel when run good sea boats and eco Lisbon the squadron goes up the Mediterranean.

## IMPROVED PORTABLE LAMP

Father Di Marzo's portable lamp resembles the German student's lamp; but it is based on an entirely new principle. The former is actuated by pneumatic pressure, whereas Di Marzo's lamp is actuated by an auto-


## OIL LAMP CHANDELIER.

matic valve, which by itself opens and closes as the lamp is lighted or extinguished. This lamp dispenses with the sliding cylinder; it has an opening on the top of the oil chamber, and the oil is poured into it, the same as in an ordinary lamp; thus doing away with the inconvenience of having to pull out the cylinder, fill it, shut it, replace it, and open it to let the oil to the burner. The upper cut shows a suspension lamp; it has an elevated oil chamber in the shape of an ornamental vase, capable of containing from two to five gallons of oil. These lamps can be made with two, three, or any number of burners, and are susceptible of all the forms of gas chandeliers; their illuminating power varies from fifty to two thousand candle power. Owing to the immense proportions which central draught burners have obtained, this lamp is called upon to play a great role in the system of illumination. Herttofore, burners of large proportion presented an insurmountable barrier to their sucsess, by the fact that, consuming a large quantity of oil, the level in the lamp soon lowered, and consequently the flame would lower also but in this system, the oil is kept constantly near to the burner, and in measur as it is consumed by the flame it is immediately sup planted by a fresh supply. By this means the burner no matter how large, will give al ways a brilliant light but by far the most important advantage which this system offers is its safety. In most lamps, when the level of the oil is lowered, the metal or glass itself becomes a conductor of heat, which by its action trans forms the oil into gas, and if there be no means of escape, when it has accumulated in sufficient quantity, it will break the vessel, and an explosion will follow The small supply tube used in this system prevents this from occurring. For further particulars, address the patentee, Father Vincent di Marzo, Lonisville, Ky.

## AN IMPROVED CARPET EXHIBITOR.

A display rack for carpets, oil cloth, shade cloth, etc., in salesrooms, by means of which the materia

traver's carpet exhibitor.
may be drawn from the roll as required for display or sale, and automatically rewound when desired, is illus trated herewith, and has been patented by Mr. New ton H. Traver, of No. 99 Pitcher Street, Detroit, Mich. The standards are preferably made in girder shape or of I-bars, with ratchet notches upon one face in the edges of their flanges, the standards being introduced at the base into short sockets secured to the floor, and into long sockets attached to the ceiling, whereby the standards may be readily adjusted to rooms of varying heights. Upon the flanges of each standard a bracket is held to slide, by means of lugs and a key, so that the brackets may be expeditiously and conveniently detached whenever desirable, while the brackets are locked to the standards at various points in the height of the latter by pawls which enter the notches in the standards. In the upper edges of the left hand bracket is a recess adapted for the reception of one end of a reel shaft, a spring-controlled lock lever act ing as a brake to prevent the revolution of the reel shaft when not desired. Upon the reel shaft, between the brackets at the right hand end, is a spur wheel, and at each side of the center is an adjustably mounted disk, with pins on their inner faces, between which the roll of carpet, etc., is held, the pins entering be tween the folds. Upon a spindle secured to the inner face of the right hand bracket is loosely mounted a drum containing a coil spring, as shown in the small view, one end of the spring being attached to the spindle, aud the other end to the inner face of the drum. Upon the outer edge of the drum are teeth adapted to mesh with the spur wheel of the reel shaft, and upon the outer face of the drum is pivoted a pawl. Upon the inner face of a rear projection of the right hand bracket is formed an arc-shaped projection, the concave edge being upward, and having a series of ratchet teeth, with which the pawl of the drum containing the coiled spring contacts. The arrangemen is such that the carpet may be drawn downward, and thus held in locked position as desired by the operation of pawls, or be drawn further and released, when it will be rewound by the action of the drum spring To guide the carpet in rewinding, a guide shaft is journaled upon arms of the brackets, and provided with a movable sleeve. Two or more devices may be placed on each set of standards, one above the other, and when it is desired to unroll quite a length of ma terial, the drum may be readily thrown out of gear with the reel shaft

## Steamship Speed at Half Power

It has frequently been stated that a prominent ad vantage of twin screw steamers is their security against complete disablement in case one of the engines breaks down, added to the fact that with one engine the ves sel can be propelled at about three-quarters of the usual speed. A good illustration of these statements has recently been furnished by the Inman steamer City of New York, which broke one of the crank pins of the port engine on her last eastward trip, and fin ished the voyage with her starboard engine. A comparison of the daily runs under these circumstances with three daily runs of the preceding eastward trip gives the following results

Ratio.

The above table further illustrates the enormuus cos which ocean racers pay to produce their fin obtained by doubling the propelling power.

## a leak stopper for vessels.

A device adapted for closing openings below the water line in the hull of a vessel, and specially fitted for closing such openings made by a shot, is shown in the accompanying illustration, and has been patented by Mr. William Winchester, Fig. 1 showing the device in section as applied on the hull of a vessel, and Fig. 2 showing it suspended before a break in the vessel. A head, consisting of two circular pieces of rubber or other flexible material, is attached to the outer end of a threaded shaft to form a spaced npper and lower wall, between which the outer ends of spaced ribs are secured, the free inner ends of the ribs being pivoted in a hub on the outer end of the shaft, the head thus partaking of the form of an umbrella with concealed ribs. At the outer end of the shaft is a plate to limit the outward spread of the head, and an eye to receive one end of a rope, there being also another eye for a rope at the inner end of the shaft, by weans of which it is suspended in horizontal position. A sleeve is held to slide loosely upon the shaft, and in this sleeve are longitudinal recesses in which are pivoted the inner ends of stretcher bars, adapred to extend outward to within a suitable distance of the head, the stretcher bars being normally held partially extended by springs in the
sleeve. A locknut is screwed upon the inner end of the shaft, to which also a float is attached by a short rope When the shaft is lowered horizontally over the side
of a vessei in proximity to a leak, the water passing through the opening draws the float into the hull, and the stretcher arms close upon the shaft sufficiently for them to pass in with it through the opening until the head is brought in contact with the outer surface of the hull, when the stretcher arms expand and engage with the inner surface of the hull. The inner suspension rope being then disengaged the lock nut is screwed forward from the inside oi the vessel against the sleeve, drawing the head tightly against the out side of the hull around the opening.


WINCHESTER'S LEAK STOPPER FOR vEsSELS.
For further information relative to this invention address Mr. William Winchester, in care of United States Navy Pay Office, San Francisco, Cal.

## AN IMPROVED STRAW-BURNING STOVE

A stove especially designed to burn straw, stubble, or barn refuse, in which there are no pipes liable to easily clog with soot, and the free escape of the ashe is provided for, is represented in the accompanying illustration, and has been patented by Mrs. Martha A. E. Myers, of Albia, Kansas. The base plate has a hookshaped flange to receive the marginal lip on the upper edge of a removable ash pan, which has a front lip projecting beyond the fuel magazine, and covered by a damper, by removing which a shovel may be used to damper, by removing which a shovel may be used to
take out the ashes. There are also holes in the rear take out the ashes. There are also holes in the rear
wall of the ash pan to give draught to the stove from below, and the base plate projects rearward from the fuel magazine sufficiently to support a hot water heater next the magazine, the heater being readily attached or removed. The main corner standards are bolted to the base plate and to the plate above the fuel magazine. The base plate has an upwardly extending flange to hold the fuel magazine in position after it has been pushed to place between the front standards, a vertical ly movable ring above the magazine being adjustable to make a tight joint therewith and confine the products of combustion, except as they are allowed to escape through passages provided by the dampers. Two magr azines are supplied with each stove, to allow one to be filled with straw or other light fuel while the other


MYERS' STRAW-BURNING STOVE.
magazine is in use in the stove, the magazine being made principally of sheet metal, and having at the cener of its bottom a draught opening operated by a stem or handle extending through the front wall of the mag zine, with other dampers in its side walls. The oven above is narrower than the stove body, and has an arched top, providing a hot air chamber around the ides and top of the oven, such chamber having com munication with the fuel magazine through openings controlled by dampers, and having an outlet to any suitable chimney flue or to the atmosphere.

THE SITE FOR THE WORLD'S FAIR IN NEW YORK. The view we give to-day of the Hudson River front of the noble site selected by the New York World's Fair committee affords a good representation of he alnost ideal beauty of the location and from sixty to seventy feet deep, close up to the shore, and nearly a mile wide. The unsurpassed waterway and nearly a mile wide. The unsurpassed waterway Witt Clinton to the building of the Erie Canal, whereby the agricultural productions of the West were first brought practically within reach of the markets of the world. The plateau to the right has an average elevation of about 100 feet, and, according to the plans of the site committee, some 250 of the 993 acres to be included in the area devoted to the exposition are upon this plateau, the front of which upon the river is defined by the magnificent Riverside Drive, than which there is probably no more picturesque avenue in the world, so near to the heart of a great city, although yet but slightly built upon. Anywhere here one cannot help but feel himself in immediate personal touch with life at one of the world's centers, for he is, in fact, almost in the midst of it, and can at the same time enjoy views and scenery which will equal the most lovely reaches of the Rhine. In truth, it is the elevation of the surface and the rare beauty of this portion of the city that has so exalted its pecuniary value as thus far to preserve it from the march of building improvement, and made it possible to locate the great fair upon the choicest portion of Manhattan Island.
In addition to this splendid plateau, more than 100 acres of land to the north and east of Central Park are included in the proposed site, all entirely level, and of the grade of the city streets, the whole space it is thu far intended to occupy amounting to 393 acres. The total area of the Champ de Mars, in which the late Paris exposition was held, is only 325 acres, and of this area only 125 acres were occupied by the buidigs to
the exposition. But the site is by no means limited to the exposition. 393 acres it is now definitely intended to occupy, the it is easy to see, on looking at a map of the lands, that considerably more might be taken without much additional cost, the plans of the committee thus far covering only the lands most readily available, for which consents have been mainly obtained, and on which there are now but few and inexpensive structures.

The bill which the New York State legislature is asked to pass, and to which there is no likelihood of serious opposition, places the world's fair in New York City, for the first time, on a solid financial basis, and one which needs only the appropriate national legislation to render it morally certain that the project will be creditably carried out, short as is the time for preparation. The city is to issue its bonds for ten million dollars for fair purposes and for the completion of the Metropolitan and National History museums, which will be most important adjuncts, thus making, with the five million dollars already subscribed, a sum of fifteen million dollars practically at once available. Prompt work is indispensable, but, with ample means at hand, great things can be done by the right men in a short time, and there is no reason to doubt even this amount of money would be doubled were it necessary for the attainment of the highest success. The bill which the legislature is asked to pass also provides for the temporary closing of streets as may be deemed expedient, for the diversion to other routes of railway lines at present running through the proposed grounds, for bridging streets or avenues as may be needed, and for especial means of so connecting our two great museums with the fair that they will be a part of the whole.
To have the fair in New York, however, it is necessary the government should indorse the project, al-
though New York asks no financial aid from Washington. To obtain the desired participation of exhi bitors from other nations, the fair must have an international character, such as can be given to it only by an act of Congress. Other cities have come forward, by their representatives, asking Congress to designate other localities than New York for the fair, but it is no disparagement to the claims of any of them to point out the unequaled advantages afforded by New York City for its financial success, and its value as a promoter of our export and manufacturing trade, in connection with the incomparable location which has been selected as its site. As Mr. Depew said before the Senate committee, the exhibition must be so comprehensive as to fitly present all that we have and all that we can do, and so broadly national and hospitable as to invite and secure the attendance of every other nation; it must impress upon the world the fact that nation; it must impress upon the world the fact that
we can supply the articles needed foritsnecessities and its luxuries, as well and as artistically made, and a eheaply sold, as they can be purchased anywhere else.
The attendance of a large number of foreigners, and their free participation as exhibitors, as well as examiners of the products of American industries, is to the last degree desirable, and it will not be contended that any other place affords the advantages of New York in
visitors, who are expected not only to pay the expense of the exhibition, but whose very presence is necessary to insure its success, there is nowhere else on the conand would assemble and be so comfortably taken car of as at the site selected.
At the Paris exposition the largest attendance at any one time was on the closing day, when 400,000 people visited the great show, but 200,000 visitors in a single day was a frequent occurrence. At the Philadelphia exhibition of 1876 the largest attendance on any one occasion was on "Pennsylvania day," when 186,000 visitors passed the turnstiles. But the grounds selected for the fair in New York even surpass those on which the great exposition was held in Paris for accessibility by large crowds of people. The convenience of access by the river front, as shown in our view, will be at once recognized, but every New Yorker will as quickly remember the signs exhibited in all the elevated railway trains, stating that they carry 500,000 passengers a day. The fact is that they now carry considerably more than this every day, in trains which go through
the fair site itself or close to it. Then there are the trunk lines of railroad on either side-the main track of the old Hudson River road at the water's edge, and the four-track partially sunk roadway to the Grand Central Depot forming the eastern boundary, with railway connections to every point in the United States, and with convenient points for turncuts and stations sufficient to accommodate any possible number of pas sengers. In addition to these facilities, to speak of the horse cars, and the many thousands which they now carry daily past the fair site, is but to suggest again the main fact of all, that there are more than one million residents within easy walking distance of the grounds and quite three millions within a distance the walking of which could not be counted a hardship.
There are no inconsiderable natural difficulties, bu there are also wonderful possibilities, in the site itsel selected by the New York world's fair committee. It is in every way worthy of the greatest exhibition the world has yet seen, is so situated that it will probably command a larger attendance than would be possible anywhere else, and it will need to be a very good exhi bition of art and industry which will not look poorly in comparison with what nature itself offers in thi most favored location.

Th
The Great Fair-the Transportation Facilities o
Having looked at the proposed site for the fair, let us turn now to inquire as to the possible attendance fair thus situated would attract, the facilities for housing those coming from a distance, and the rail road capacity for comfortably handling large masses of people.
The record of the Paris exposition shows the attend ance to have been $30,000,000$, of which only $3,000,000$ were strangers. Thus, $27,000,0 \%$ persons, or eightninths of the whole, came from Paris and its environs. From this it is evident that such an enterprise must look for its main reliance to its vicinage, that is to say to the district lying within convenient reach
At least 300,000 people live within walking distance of it, and there are about $1,400,000$ others who can reach the grounds for a 5 cent fare, and in not over
thirty minutes from the remotest part of the city. thirty minutes from the remotest part of the city.
Brooklyn, with a population of nearly $1,000,000$, is close at hand. Its people have only to cross the bridge and take the elevated road; cost, 8 cents; time, 30 to 40 minutes. All Long Island trains run to Long Island City. From this point the grounds are distant 25 minutes; fare, 8 cents. Jersey City, Hoboken, and the towns lying adjacent thereto are within from 15 to 25 minutes; fare, 3 or 5 cents. New England people can be landed at the grounds by the New York, New Haven,
and Hartford or New York City and Northern Rail. road. From New York State the West and Northwes and Canada can be brought direct to the grounds by steamboats from up river and from the rivers and coasts of many adjacent States by the New York Central, a spur running from the Park Avenue viaduct. So oo, with those coming in by the Baltimore and Ohio Erie, Delaware, Lackawanna and Western, New Jersey Central, New York, Susquehanna and Western, West Shore, and Ontario and Western railroads. Passengers have only to cross the ferry from the New
Jersey shore. It will appear from this, of all the great roads running into New York City, not one but could and its passengers upon the fair grounds without any increase of fare. Within a 100 miles radius of the metropolis is an enormous population; a recent estinate made by one familiar with this district goes to prove that between 50,000 and 60,000 excursionists diem might be expected from this source alone.
At the Paris exposition by far the largest business was done between $3 \mathrm{P} . \mathrm{M}$. and midnight. In this country even a greater part of the population is occupied during business hours, and because of the convenmportant class could visit the Fair after business hours. Throughout the land there is no site for a fair that can be compared with this, when convenience of
transportation for people and merchandise is consid ered.
The president of the New York Central Railroad estimates that, taking the present site as a center, and within a radius of 200 miles, and including the sec tions whence people may come in the morning and be back at night, there are $8,000,000$ people. There is not in all the country such another populous district.
Accessibility must be an important factor in the Accession of a fair site, and transportation facilitie another. The enormous advantage of New York in the first particular has already been shown. As to the second we will now inquire. The sameauthority says The transportation problem is the one on which rests more than any other the success of an exposition. It has been the experience of Paris and of other great fairs that, at the close of the day, the visitors want to get away all at once. There is a gala day, for instance and when the fair closes for the day there are 200,000 tired, hungry, cross people, many with infants clinging to them, and all wanting to get to their homes How are you to distribute these 200,000? An ordinary steam surface railway, in connection with other ap pliances, would be doing very well if it had a train of ten cars every five minutes and carried sixty persons in each car. But that would make only 7,000 an hour. A cable road would be doing very well if, with its other business, it carried 6,000 people an hour. A surface road would not do so well. Cabs and carriages are wholly beyond reach. So that 25,000 an hour, I venture to say, on any calculation is the largest num ber of persons that can be distributed, and it would take eight hours to distribute the whole 200,000 . The next day after that experience the fair would close."
Such an enormous assemblage as this, which he inti mates would utterly baffle the best efforts of the trans portation managers of any other American city and choke every line of travel, could be handled from the New York site, owing to its wonderful accessibility and its multiplicity of means of transit, even more expedi tiously than they were handled at the Champ de Mars.
It is interesting in this connection to have the test $i$ mony of the transportation managers given in recent interviews as to what their respective roads are capa ble of. Mr. E. B. Thomas, second vice-president of the New York, Lake Erie and Western, says: "We are always equal to the work of moving our proportidn of extra travel with promptness and safety. The Erie is now taking 260 passenger trains a day in and out of Jersey City. I presume the whole of North River fer ries will put on an extra service for a common discharge directly to the fair grounds in the vicinity of 110th Street. We can handle one hundred thousand now and over."
S. M. Williams, comptroller of the Ceniral Railroad of New Jersey, says that "a very considerable propor tion of the visitors to the fair would seek temporary lodging and hotel accommodation in New York. So hotel men and tradesmen will reap the main harvest. At the same time there will be a large addition to the daily traffic of leading rail way lines. These passengers will ask, expect, and receive from the New Jersey Cen ral reduced rates on the excursion basis. As for heir water transportation, my present idea is that we shall issue on our tickets coupons good for river serv ice on some one of the established up and down river ines thatare sure to spring into existence as a necessity of the exposition held on Manhattan Island.
"There will be several of these steamboat lines besides hundreds of little independent craft that will operate to keep prices down. Few have any idea as to how this fair will develop and illustrate our river facilities. I am inclined to think these larger river steamboat lines will accommodate the increased traffic of the New Jersey Central, the Pennsylvania, the Erie, the Delaware. Lackawanna and Western, and the West Shore better than any changes in their several present ferry systems.'
The superintendent of the Delaware, Lackawanna and Western Railroad Company says: "We will be ready to accommodate all the traffic that will present itself. We moved 28,000 passengers Centennial day, and will be equal to any emergency of the future."
H. W. Maxwell, of the Long Island Railroad, says The site as selected will be very convenient for Long Island, and many thousands of visitors may be depended upon to come to the fair with their families frequently. We have a very heavy train service to accommodate this class of travel. We are always ready to increase our facilities when required. The Long Island system, with its two ferries and Pine Street annex, is already prepared to transport immense numbers conveuiently either way.'
As to accommodations for visitors, it was pointed out at last week's hearing before the senatecommittee that while an influx of 100,000 strangers uncomfortably crowded the largest city outside of New York that has set up a claim for the fair, quite a million strangers were amply accommodated in the metropolis during the Washington Inaugural Centennial last April, their presence being scarcely noticed among the crowds that are a normal characteristic of its celebrations,

At Coney Island, Rockaway, Long Beach, Long Branch, and the hundreds of resorts within an hour's ride of the metropolis, a million strangers might readily find comfortable quarters amid the refreshing breezes of sea and sound and river, and in whatever direction they may be sojourning, find ready and direct transit to the site of the great fair.
From the foregoing it is obvious that New York is the most favorable, indeed, the only practicable, site for a world's fair. First, because possessing superior facilities for the comfortable housing and carriage of multitudes, and again because it is the only location where such an enterprise could be rendered truly inter national ; the record of all the world's fairs of modern times showing not a single instance where success was achieved outside of a metropolis.

The Great Fair-Addresses before the Senate Committee
On the 11th of January the first hearing before the senate committee took place in Washington, on which occasion the representatives from Chicago, St. Louis, and New York were present and made able addresses, in which the respective merits of the three cities were eloquently set forth. The deputation from New York consisted of a large number of leading citizens headed by Mayor Grant. Addresses on behalf of this city were made by Mr. Chauncey M. Depew, Mr. Bourke were made by Mr. Chauncey M. Depew, Mr. Bourke
Cockran, Mr. Warner Miller, and others. We make a Cockran, Mr. Warner Miller, and others.
brief abstract from Mr. Depew's address :
"No fair has ever been successful unless held in the metropolis of the nation which authorized the exhibition. When freed from sectional ambitions or jealousies at home, we view with impartial eye the situation abroad.
We all admit that exhibitions held for Great Britain at Liverpool or Manchester, for France at Lyons or Marseilles, for Italy at Florence or Naples, for Ger many at Dresden or Leipzig, would be failures; while it has $b$ cen demonstrated from past experience that exhibitions held at the metropolis of any country, like London or Paris, are successful in attracting all tha there is of the country in which the city is located, as well as all the $w$ rld beside.
I saw two years ago an attempted universal exhibition at Liverpool, and, while excellent in every way, it attracted little attention even in Great Britain ; while two local exhibitions held within the past three years in London, one called "The Healtheries" and the other called "The Italian," were almost equal to the French fair of last summer in attendance, in value and variety of exhibits, and in results.
No one will dispute that New York is the metropolis of this continent. Its population, its resources, the repres ntative character of its business, the fact that three-fourths of the imports of the country come into its harbor, all make it such.
There is not a cotton or woolen mill, a furnace, forge, or factory, a mine at work or projected in the United States, which does not have its principal office in the city of New York. The conventions of all the trades, which are annually held for mutual benefit, take place in New York, and are all closed with an an nual banquat, which I invariably attend.
A panic in New York is the paralysis of the country Prosperity in New York means immense freight upon the railways and enormous production from farm and factory and mine. New York simply records as the barometer the conditions of trade and production al over the country.
To make a fair successful, a population immediately in contact is absolutely necessary. The French fair in contact is absolutely necessary. The French fair
had its $30,000,000$ of visitors, and its 200,000 a day, be cause it was in the midst of a great resident population which, for a few cents, and with the least loss of time,
could repeatedly visit the exhibition. St. Louis and could repeatedly visit the exhibition. St. Louis and
Chicago present the most fallacious of arguments in their famous "circles of population."

A circle about St. Louis, of 500 miles to the Gulf o Mexico and the Atlantic Ocean, may have $27,000,000$. A similar circle about Chicago, to the North Pole and the Paciffc Ocean, may have $25,000,000$. A similar circle about New York may have $22,000,000$.
A similar circle about Washington may have $20,000,000$, and without much difficulty we shall have for the purposes of this fair, within these circles, three or four hundred millions of people, and yet not include over one-half of the present located population of the United States.
A similar circle drawn with Peekskill as a center-a village upon the Hudson where I was born-takes in the Hudson River and the Mohawk valleys, with their continuous villages and cities and unequaled scenery, includes Boston and Philadelphia, and presents a compact population which in wealth, in ability to travel, in appreciation of exhibitions and determination $t$ visit them, is unequaled anywhere in the country.
But then Peekskill is deficient in hotel accommodations and in internal lines of travel necessary to carry vast masses to a fair ground and to take them conn-
fortably away. The success of an exhibition is in fortably away. The success of an exhibition is in populations in contact with the fair.
Take a point centrally located at Jersey City, and
draw about it a radius of equal diameter and extent to a line drawn from a point on Lake Michigan
around the boundaries of Chicago, and you have a around the boundaries of Chicago, and you have a You cross the river by ferry and ycu have on the island of Manhattan the city of New York, with 600,000 more people than there are in Chicago. You cross to Long Island by the Brooklyn Bridge. and a circle again thrown out, covering the same territory on Iong Island as is included in the boundaries of Chicago, has more population than there is in Chicago.
So that, within what might properly be called the city of New York, there are three Chicagos and a half Then, if you take Central Park as a center, and within a radius of 200 miles, including the distance where people can come in the morning and go back at night, there are $8,000,000$ of people. The lunch basket and dinner pail brigade, who are the real supporters of a fair, and can get there for a minimum of five cents and a maximum of $\$ 2$, to the number of not less than $8,000,000$, are tributary to the New York exhibition. That of itself makes it a phenomenal success, and can be met by no similar fact from any other place on the American continent.
New York is situated, fortunately for such a purpose on an island-a narrow island. From the fair grounds to the river on either side is a walk of fifteen minutes, or a ride of ten minutes in an electric car that is to be provided. And then, along the water front, there is a mile on either side of docks and piers where the largest ships can come up and transfer their products coming rom abroad, and where visitors will find steamboats that will take them up the Hudson River, or over to Staten Island, or to Long Island, or down the East River; where ferryboats will carry them to Jersey City and there deliver them to the network of railroads cen tering in Jersey City, and distribute them all over the United States. So that by the river on either side, in such close propinquity to the center of population, by the methods of travel already provided and those which will be provided, these 200,000 people can be distributed more rapidly than they were distributed from the Champ de Mars
Now, beyond all other things in the world, it is money that makes a fair a success; it is the lack of money that makes it a failure. A fair cannot go on credit. It is too diffuse. It is not like a corporation that can sell its assets when it has no assets (laughter) that can sell its bonds, because everybody under tands what it is.
In New York we have $\$ 5,000,000$ of subscriptions The subscriptions are on a contract binding on the estates of the subscribers, and enforceable. The conract has been looked over by the most careful financiers of the city of New York, and the solvency of the subscribers tested. Those who were not completely solvent (to the extent of several hundreds) have been wiped off, and there is still a bona fide and collectibl assessment of about $\$ 5,300,000$.
The committee on legislation have unanimously adopted a bill asking the legislature to authorize the city of New York to expend $\$ 10,000,000$ in buildings and grounds. There is no doubt about this authoriza ion.
It has been alleged against New York that she has no local pride. That is true. London has no loca pride. Paris has no local pride. Immense aggrega tions of people from different parts of the country, and largely representative of different sections, do not have local pride. But the people of New York do know (with their large views) what the exhibition should be and we are here to urge the selection of New York, ot because we are New Yorkers, but because we wan the fair to be a phenomenal national success. (Ap plause.) Washington is unequaled in its avenues, in its
public buildings, and we admit it. St. Louis has age, she has also an unequaled position in the great valley of the Mississippi, and we admit what she is and what she promises to be. Chicago is the most phenomena development of urban progress that the world has ever seen, and we admit it. Not only in all that constitutes a great central and commercial metropolis, but also in the arts, and in culture, she has, in her fort years, gone forward with unequaled and immeasura ble strides. All this we admit, and still we claim tha New York is the great center, New York is the great
metropolis, New York is the great representative city of America. New York has no sectionalism, New York has no jealousies.
If the government should to-day appropriate to every family in the United States the money which would carry them to one place, with the distinct understanding that they could select no other, the vote, with a nanimity unequaled in the expression of desire, from
Maine to the Gulf, from the Atlantic to the Pacific, among farmers, ranchmen, minemen, merchants, arti sans, professional men, journalists, artists, would be, Take me to New York.' ${ }^{\prime}$
Mr. W. Bourke Cockran said: "The greatest exhibit that we can offer are two millions of human beings leaving their homes in the morning and returning to them at night after days of labor which result in an
exhibit can be offered right at the gateway of the com merce of this country. And it will be offered to him who visits the country, not as New York's exhibit, no as a source of gratification to our pride, but as an in stance of what this vast country which lies behind us has done in building up the commercial metropolis of the country. It is for these reasons that we ask this exposition, not as a claim of the city, but as a submission on the part of the city of such facts as the committee should have in mind in deciding a question of such vast importance to the people of this country, and of such vast importance to the people of the whole civilized world.
We show beyond all that the broad avenues on which are the magnificent rows of buildings devoted to commerce and industry; beyond that the splendid temples devoted to worship; beyond that the palaces that line the residential quarters of our cities, in which opulence and wealth are housed; beyond that the wharves crowded with vessels from all cities of the world and where the flags of every nation rise and fall with every breeze; beyond that the banks with their accumulated treasure in their vaults; beyond every type and sign of wealth, we have that liberty which forms and opens up the sole avenue to wealth which mankind can afford to keep open. That city rises on the borders of the sea that Columbus conquered, and no exposition can carry out this great event in a place not in sight of that ocean over which he won his victory, as well as in the presence of the and which he opened up to civilization, and which as been the cradle of liberty."
Chicago was most ably advocated by Mayor Cregier, Mr. T. B. Bryan, and Mr. E. T. Jeffrey.
He filed a sworn certificate of the treasurer of the guarantee fund that it amounted to $\$ 5,000,000$ of bona fide subscriptions. To show the possible sites for the fair and the facilities for transportation, Mr. Jeffrey displayed the large map, on which he pointed out the ive parks-Jackson, Washington, Humboldt, Garfield nd Douglas-containing over two thousand acres, in addition to the lake front park, any one of which would accommodate the exposition buildings. The lake front would permit the display of a marine ex hibit which could include a reproduction of Columbus squadron of 400 years ago, a great object lesson. The railroad transportation of the city is unequaled by that of any city of the world, comprising as it does the terminals of twenty-four railroads, with their network of connecting and belt tracks. On this point Mr. Jeffrey said he spoke from personal knowledge and observa tion.

He then gave the committee figures showing the marvelous growth of Chicago in every development of business. Mr. Jefrey stated that an estimate he had nade showed that the rail and water lines of Chicago as they now exist, but with increased equipment, could handle 162,095 passengers per hour-an unequaled showing, as far as rail facilities are concerned.

## Novel Mode of Warfare

A New Jersey inventor thinks he has hit upon a method of establishing peace permanently upon the earth by means of electricity. He does not propose to emodel human nature, but expects to make warfare so deadly that it will be sheer madness for one nation to attack another. According to his plan, warfare would result in the substantial extermination of all who ventured to engage in it. The inventor describes his idea thus: "In a word, my scheme is to produce artificial lightning. Thus far the experiments have been conflned within narrow limits, but with the use of a small dynamo attached to my invention a slight shock can be produced, effective enough to kill the flies in a $20 \times 20$ room. I claim, with the use of powerful dynamos, under my plan, a flash of lightning can be directed against an army a mile or more away and without injury to the party operating the gun, scattering death and consternation among the troops. With powerful dynamos thousands of soldiers can be killed at a flash, and a number of flashes are enough to destroy an army. It can be used at any time except on rainy or damp days. If the effect of giving this discovery would be, as I hope, to put an end to war, I
should feel repaid, but I dread to think of electricity being used in war under my plan. The consequences would be enormous. It means nothing less than extermination to the opposingarmy. Before going any further with it, $I$ would ask your opinion as to the ffect upon war of ais Anstrument such as I have hinted at. Would it retard or facilitate war ?"-Western Electrician.

## dvertisers' Directory.

J. Walter Thomson, 38 Park Row, New York, has just issued an attractive manual for advertisers. It is illustrated with full page photo-engravings of the first page of the principal trade journals and other publications, devoted to special subjects, including agricultural, medical, mining, lumber, etc. The electrical papers occupy a number of pages, and the Scientific AmeriCAN publications are not omitted. The volume com. prises 250 pages, and is useful to advertiseng

The world on Wheels.
In every sense of the word we are living in an age of locomotion. A very large proportion of the people are on wheels the greatest part of their time, and travel to an extent undreamed of by those who lived but a generation ago. If, at any given hour of the day or night, on any day in the year, every train of cars, every surface car in our cities, and every vessel on the oceans, lakes, and rivers in the world could be stopped and a census taken of the people on board, and if to this number were added those who were waiting at depots or docks to get on board, there would be found enough people to populate a nation. This is truly a remarkable state of things; and it means the intercourse, the intermingling of the members of the human family to an extent that has probably never been contemplated by any one who has written the history of our race. Who, then, can possibly estimate the effects
are many ollicr factories for the production of the various parts and requisites, such as wheels, axles, springs, gears, bodies, bolts, varnish, etc. A large proportion of these parts is required for new work in factories, while a large proportion is also required for the repair shops, to keep pace with the ceaseless require ments of wear and tear.
To obtain some idea of the magnitude of these associated industries, we may state that in this country alone there are many large wheel factories, some of which produce from 50,000 to 80,000 sets of wheels every year; while anong the list of large axle factories, one, at least, advertises an annual output of 400,000 sets while many others produce from 75,000 to 120,000 sets per year. The spring makers and those engaged in kindred lines of trade are, of course, keepiug pace with the wheel and axle makers. Notwithstanding its


Fig. 1.-LONDON ELECTRIC SUPPLY CO.-THE FORTY-GROOVED PULLEY OF ONE OF THE GREAT DYNAMOS.
which this state of things is destined to produce upon the future condition of mankind? It is certainly one of the most potential factors in the formative forces now at work in mapping out the future relationships of humanity. Its effects cannot be transitory nor local, but will certainly be permanent, widespread, universal.
One effect, however, of direct and personal interest to the readers of this journal is that this spirit and habit of travel has, in its tourn, created a demand for an immense number of vehicles for personal use. The past thirty or forty years, at the most, have shown a production of these vehicles in numbers which are unprecedented, and which would have seemed simply fabulous to those who lived a half century ago. A large number of carriage factories are at this moment in operation, some of which annually produce from 20,000 to 30,000 new vehicles; and besides these large establishments, innumerable smaller factories and shops are to be found throughout our cities and villages. In addition to these immense workshops for tarning out complete vehicles of all descriptions, there
up mainly in the past twenty-five or thirty years, and seems to be increasing and still increasing. It goes without saying that the growth of so vast an industry has called into action, or rather developed the place for, an immense array of skilled artisans of a very high order of ability, and has, also, to a remarkable degree, incited the inventive genius, and caused the producion of an endless list of devices for the improvemen of vehicles and all their various parts. The vehicle of o-day, whether a pleasure carriage or a heavy truck or business purposes in our great cities, is in striking contrast with those in use but a few decades ago Some of the most decided improvements in the art of carriage making have been developed within the past five or ten years, and some of these indeed are but jus beginning to meet with that recognition which their value demands.-The Hub.

DANDRUFF.-The application of chloral hydrate in solution of five grains to the ounce of water, is said to clear the head of dandruff and prevent falling of the hair from the latter cause.
rather flat copper strip, built up on a central support of brass, flat brass rods separated by an asbestos and sulphur inisture. These coils are screwed radially into the flange of the big drum, and are surrounded by the double ring of field magnets, which cover the whole of that end of the pulley which has no grooves. Fig. 2 shows the dynamos completed. Fig. 3 shows the arrangement of a pair of the dynamos and driving engines. Fig. 4 represents the exterior of the building in which these gigantic machines with their enormous engines and boilers are housed.
The company began practically through Sir Coutts Lindsay undertaking, in November, 1884, to light the Grosvenor gallery with electricity. He received offers from neighbors to supply them with the light, and the work was made much larger than was originally intended. The demand kept on increasing till, in October, 1887 , it was found necessary to move. The promoters extended their company and adopted the name " "The London."
The construction of the great works at Deptford, with their powerful machinery, was begun in April,



Fig. 2.-THE GREAT FERRANTI DYNAMO.


Fig. 3.-ENGINES AND DYNAMOS.

5,000 horse power each. The boiler power we have put |approached before in electrical work. We bring up continuous chains of lakes form a vast body of fresh down is 14,000 horse power. We found, when we in- our mains to distributing stations, where the tension quired as to the construction of these dynamos, that is reduced from 10,000 to 2,400 volts. Then it is sent there were no tools big enough to deal with them, except a few in arsenals and private works. We tried Krupp, in-Germany, and the Creusot works, in France, and neither of them would contract to deliver under three years. As it did not suit our purpose to wait so long, we put up machinery ourselves, and we shall be able to complete these dynamos in a year. They are of unprecedented size.

The lathe required to turn the main shaft is of the same dimensions as that used for turning the 100 ton gun at Wool wich. The shafts are 36 inches in diameter, and in the rough weighed 70 tons. They were the largest castings of steel ever made in Scotland The dynamos are 42 feet in diameter at the armature. As to their lighting power, the dynamos working now at Deptford will supply 25,000 lights, and the two being constructed will rise to 100,000 each. These new ones are devised so that, as the demand arises, we can the demand arises, we can each dynamo of 5,000 horse power, so that each will be up to 10,000 horse power. making them 200,000 lights each nominally. We are also manufacturing the mains ourselves, and four machines are turning them out in 20 foot lengths. This is all that we require for 100,000 lights. The largest of our mains will be $21 / 4$ inches over all, and the smallest $1 \frac{1}{4}$ inches. There is no cable, but a tube of copper, having a quarter of an inch sectional area, through which the current is sent out. This has a cover of insulating material, and a second copper rial, and a second copper
tube is compressed round tube is compressed round
that for the return curthat for the return cur-
rent. Another thin layer of insulating material is used, and over all is placed an iron tube, also made tight for protection against pickaxes in the street.

- With this main we require no box or brickwork in the streets, as it is put naked into the earth. The outer tube is wrought iron a quarter of an inch thick, |due course to make use of. We have also running | and is sufficiently flexible to bend at right angles with- |
| :--- | :--- |
| out breaking, while strong enough to resistany weight | \(\begin{aligned} \& powers over the District Underground for these mains. <br>

\& Eventually we shall have eight or ten stations to\end{aligned}\) that may go over it without damage. There will be a distribute the light from, and at the present we have joint for 'service' at each twenty feet, so that every practically six, including the Grosvenor, from which house can have the light if required. A main on this the machinery will be removed later on."


Fig. 4.-THE LONDON ELECTRIC SUPPLY CORPORATION'S WORKS AT DEPTFORD.
water, and when its area is increased by this ship canal and the lakes in the interior of the State thereby connected, these inland waters will afford to the United States naval stations in fresh water of unexampled ad States naval stationd vantage, extent, and convenience, not only for its own
ships and vessels, but for all ships and vessels engaged ships and vess
in commerce.
The State of Florida commends to Congress this great enterprise of a ship canal across its territory, that American ships and American products may safely pas to and from every portion of our great country with out leaving our coast line or sailing in foreign waters, and to that end the State of Florida asks from the Congress of the United States that, within its con stitutional powers, it will deepen and improve the entrance to the St. John's River from the ocean, and its navigable waters from its mouth to the point of intersection with this pro posed ship canal ; and tha it will deepen and other wise mprove the harbors and entrance ways thereto from the Atlantic Ocean and Gulf of Mexico, and that in all ways and means deemed just and expedient it will favor and encour age the construction of this ship canal across the State of Florida from the ocean to the Gulf.

Care Necessary for Pipe Lines - The oil pipe line which was recently constructed from Cygnet, Wood County, Ohio, to Cleveland, is one of the best in the country, yet it is necessary to watch it vigilantly to prevent any leaks. Track walkers pass over every mile of the line each day, about 15 miles being assigned to each man. Every walker is a telegraph operator and is supplied with a pocket instrument. Should he discover a leak in the line, he immediately telegraphs the division superintendent. At stated inter:als along the telegraph lines wires run down the poles into locked boxes, the key of which is carried by the
he attaches his instrument walker. Opening the box, he atta.
and wires a report to headquarters.

A small box filled with lime and placed on a shelf in the pantry or closest will absorb dampness and keep the air in the closet dry and sweet.

## AN IMPROVED FRUIT DRIER

A fruit drier especially designed for use in the drying of small amounts of fruit over an ordinary kitchen stove is shown in the accompanying illustration, and has been patented by Mr. Frank H. Gilbert, of Union Ridge, Washington. The drier is made in the form of a rectangular frame having a downwardly extending metallic shield, the lower edges of the front and back walls of which are cut away to provide for the entrance of a current of air. At each corner of the frame are posts, the upper ends of the posts being connected by another frame braced by diagonal wires. The posts are also attached by transverse end strips, and the top and bottom frames have flanges serving to support three vertical racks on each side, each rack being formed with a number of supporting shoulders. The racks are preferably made of sheet metal bent to give sufficient rigidity to stepped sections of the rack by a corrugated back, the racks being held in yielding contact with the top and bottom flanges by springs secured to the middle transverse end strip. The racks form the sides of the drier, and the fronts of the drawers its front, and the top frame is centrally apertured at its ends, just above the central racks, to facilitate the raising of these racks. To the bottom frame are pivotally connected two bell crank levers, the short arms of which ride in apertures formed near the lower ends of the central racks, the levers being connected by a rod having a stem extending through an aperture in the front of the drier near its base. In order that the racks may be held against accidental displacement, swinging stops are attached to the top and bottom end strips, these stops allowing the side racks to yield as the drawers are raised with the central racks, and resuming their normal position when the central racks are lowered. The bottoms of the drawers are made with wire cloth screens, on which the fruit rests, the ends of the drawers fitting against the inner stepped walls of the racks. As the fruit in the upper drawer becomes dry, the drawer may be removed and the other drawers moved upward one step by drawing out the stem extending through the front of the drier near


## GILBERT'S FRUIT DRIER.

its base, the bell crank levers then operating to raise the central one of the three racks on each side, and thus carry up the trays, the racks moving back against the tension of the side springs. By this construction also the progress made in the drying of the fruit held in any particular drawer may be readily observed without disturbing the other drawers.

## A Hint Manufacturers Should Regard

The United States consul at Marseilles furnishes, in a recent report, the following information as to the ways of trading adopted by some American firms. The American manufacturer sends to a consulate abroad a catalogue, a package of circulars (all in English, of course), and a lithographed letter stating that he has decided to open a foreign trade, and asking that the circulars be distributed among firms in the consul's dis trict who might likely be interested in his machine or product. In many cases the article offered is practically new in the foreign market, designed to supply a popu lar want which has hitherto been scarcely felt outside the United States. The consul, however, distributes the circulars, translates and explains them, and per suades one or more firms in his district to write for further information, particularly in respect to terms Not infrequently the reply is something like this :
"Dear Sir: Yours of the 15th at hand and content noted. Our terms are five per cent from list f. o. b cash, or three days' sight on B. L. Yours truly, U. S \& Co."
The foreign merchant-a Frenchman, let us say-sit down with his lexicon to translate this sententious re sponse, and if he succeeds, which he frequently does not, he feels that in some way his inquiry has given of fense, and this brusque, laconic reply must have been meant as a rebuke. The letter says just what the American means, but to a person trained in the elaborate and courteous phraseology of French commerce such economy of words is chilling. But, most import ant of all, he finds the proposed terms quite out of the question. For a standard article of popular utility
manufactured in his own country, the French mer chant may, and often does, pay cash or its equivalent within thirty days of receipt of goods; but as to sending money across the Atlantic to pay in advance for an article which is to be at best an experiment, all this is quite out of his line, and the incipient negotiation falls to the ground.

## AN IMPROVED SUSPENDER BELT

The accompanying illustration represents a suspen der belt designed to be especially useful for firemen, policemen, and mili ary men, as well as for lawn tennis and baseball players, etc. It has been patented by Mr. George Van Duzer, of the American Institute, Clinton Hall, Astor Place, New York City, and patents therefor have also been

## VAN DUZER'S SUSPENDER BELT

land, France, Germany, and Canada. The main portion or band may be of leather, or thin metal, or of any woven form of buckle or link or clasp fastening device. To the outer face of the belt a series of button clasps are attached, adapted to engage buttons secured on the imner face of the waistband of the garment, whereby the latter will be securely supported without showing buttons at the outside, and also allowing the garment to be quickly loosened or readjusted. The clasp plate is preferably made with marginal holes in its corners, to facilitate attachment to the belt, and in its central portion is a lengthwise slot adapted to receive the shank of a trousers or garment button. The plate also has a short transverse slot or notch opening downward into the longitudinal slot, providing for a more easy engagement of the button with the clasp, a latch sleeve being fitted to slide on one side of the clasp plate and cover this notch, thus securely latching or locking the button in the clasp. The belt band may, if desired, be wholly concealed within the garment waistband, or be made to show a narrow strip or gir dle slightly above it, as may seem preferable with silk or colored belts worn with fancy costumes, etc.

## AN ELECTRIC STENOGRAPHIC PEN.

The accompanying illustration represents a pen for stenography, in which the record is made through the medium of an electric current controlled by the feet and hands of the operator. This is an invention pat ented by Mr. Augustus S. Cooper, of Santa Barbara Cal. To one pole of a battery is connected a metallic plate, upon which is placed the prepared paper for receiving the record, and to the opposite pole is connected a conductor from which extend ten branches, there being placed in each of these branches, except No. 1, an open circuit key, and all of the branches being con nected with an electric pen adapted to be held on the record plate. The keys of five of the branches are ar ranged to be conveniently touched by the thumb and fingers of the left hand; the key of one branch i arranged to be operated by the palm of the hand, while the key of another branch is isolated, but conveniently near the other keys, so that it inay be touched as occa sion requires. The keys of two of the branches are ar ranged to be touched by the feet, while No. 1 is in con stant communication with the generator, so that when ver the pen touches the paper a mark is made whether a record is being formed or not. The pen is formed with a series of ten conductors, insulated from each other and arranged in a handle of convenient size The conductors are rendered interchangeable by divid ing them and connecting the divided ends by thumb


COOPER'S ELECTRIC STENOGRAPHIC PEN,
screws. It is designed that different combinations of these branches will represent the letters of the alpha bet, and by the opening and closing of the keys, suit ably arranged in combination with a convenient finger board, and by moving the pen over the prepared paper in different forms, the prefixes, suffixes, and roots of the language will be made, word signs being supplied in the same manner.

Sinking of the Northern Coast of France.
This has recently been proved by measurements. Since 1884 the "genic" corps of engineers have been engaged in effecting level measurementsover the whole country, and it has been shown that the country sinks from the south toward the north. Thus between Mar seilles and Lille-a distance of 540 miles-the sinking amounts to 10 inches annually. If this movement con tinues, the northern part of France may in a few cen turies become submerged. It way here be mentioned that off the coast of St. Malo, in fine weather, fossilized trunks of trees may be seen at the bottom of the sea, indicating that these parts were once above water. Research.

## THE SHERMAN "KING" VAPORIZER

The necessity for aerial disinfection is recognized by all sanitarians. To carry out such treatment properly and provide a simple apparatus adapted for use in the household and wherever required has been a difficult problem; but it has been successfully solved in the vaporizer which we here illustrate.
The device consists of an iron vessel provided with a tightly fitting lid that can be held down with a screw, inclosing a porous cup. A small aperture closed by a screw valve is arranged on the side of the case about half way up from the base. A volatile disinfecting fluid is used to saturate the porous cup. The latter can absorb about one-half its bulk of fluid.
The liquid that has been selected is a coal tar pro duct characterized by the presence of phenol and cre sol. This is of wide reputation as a disinfectant. To cause it to be delivered in suitable quantities. the top and side apertures are both slightly opened. A current of air at once begins to issue from the apparatus,

the sherman " king" vaporizer.
carrying with it the volatile disinfectants. The quantity of disinfecting air delivered can be regulated by opening or closing the lid and valve.
The apparatus may be placed in any desired place It is neat in appearance, if upset can do no harm, and is practically indestructible
In short, it supplies a means for delivering con stantly volatile disinfectants, and at the same time for regulating the supply as desired. A single saturation of the porous cup lasts for three months. It is inex pensive, and in maintenance requires only nominal at tention. It is a most useful article, and should be abundantly placed in every building in the land.
For further particulars the reader is referred to th manufacturers, Sherman "King" Vaporizer Company, Chicopee Falls, Mass.

Who Can Best be Spared?
Young men, this is the first question your employers ask themselves when business becomes slack, and when it is thought necessary to economize in the matter of salaries. "Who can best be spared ?" The barnacles, the shirks, the makeshifts, somebody's proteges, somebody's nephews, and especially somebody's good-fornothing. Young men, please remember that these are not the ones who are called for when responsible positions are to be filled. Would you like to gauge your own future for a position of prominence? Would you like to know the probabilities of your getting such a position? Inquire within! What are you doing to make yourself valuable in the position you now occupy? If you are doing with your might what your hands find to do, the chances are ten to one that you soon become so valuable in that position that you cannot be spared from it; and then, singular to relate, will be the very time when you will be sought out for promotion for a better place.-The Medical Record.

AN alloy that expands in cooling and is suitable for repairing cracks in cast iron is made with nine parts of lead, two of antimony, and one of bismuth.

## an improved fence wire stretcher.

 A device whereby fence wires may be conveniently stretched beyond the posts, and stapled or otherwise attached while stretched, without hinderance, is illustrated herewith, and has been patented by Mr. Zadoc V. Long, of Peoria, Neb. A draw rod is held to slide freely in a sleeve adapted for attachment to the fence post by a length of chain. At one end of the draw rod is a guide clamp, and upon the same side of the rod one or more pressure clamps are attached, each pressure clamp consisting of a plate attached longi-

## long's fence wire stretcher

tudinally to the rod, and having a vertical extension at one side in alignment with a flange of the guide clamps, this vertical extension having a threaded aperture for a thumb screw, the inner surface of the thumb screw being corrugated and adapted for contact with the contiguous face of the vertical extension, whereby a strong hold may be obtained upon the wire. There is also a pivoted pressure clamp on the side of the sleeve opposite to that on which it is attached to the post. The draw rod, before being introduced into the sleeve, is passed through two jaws, one jaw extending beyond the farther side of the drawhead to a link connection with a lever fulcrumed on the under face of the sleeve, while the other jaw is carried horizontally out ward on the opposite side of the drawhead to be connected by a shorter link with the same lever, the two jaws being thus pivotally connected with the lever, one at each side of the fulcrum, and the jaws being normally held in engagement with the draw rod by springs attached to the links and bearing against one edge of the jaws. The wire having been secured to the draw rod, the lever is worked alternately from left to right, whereby the jaws propel the rod past the post, and gradually tighten or stretch it, when a staple may be driven into the post and the wire made fast thereto, or secured in any other suitable manner. Before fasten ing the wire the pivoted pressure clamp on the outside of the sleeve may be brought to face in the direction of the other pressure clamps and the wire secured therein, whereupon the thumb screws of the fixed pressure clamps may be released from contact with the wire.

## AN IMPROVED PIPE WRENCH.

The accompanying illustration represents a wrench invented by Mr. Richard J. Robbins, adapted to turn a pipe in either direction, without being able to crush the pipe, the wrench being designed to grip to 1-32 o an inch, taking the shortest nipple from any boiler, and enabling a person to work in very close quarters When the wrench is applied, the jaws are brought in contact with opposite sides of the pipe by sliding the auxiliary lever backward on the main lever, the auxiliary lever being held with its free end away from the main lever, and when both jaws are in contact with the pipe the auxiliary lever is turned toward the main lever, its cam or spud forming the fulcrum on which it turns. The movement produced in the movable jaw by sliding the auxiliary lever is comparatively large, but the movement of the jaw effected by turning the auxiliary lever is quite small, and comparatively powerful, so that a firm grip is obtained without danger of crushing the pipe. The pipe may be turned in either direction when the grip is not released, but when the pipe is to be turned in one particular direction, the grip of the jaws is released during the backward stroke of the wrench, the wrench being readily adjustable and adapting itself to widely varying sizes of pipe. All communications in reference to Wrench, No. 503 Connecticat Street, Buffalo, N. Y.


## THE GRAHAM VISE WRENCH

currents of transparent air seems to be quite insuffi cient, and however great the heat near the surface o the ground. say in the desert, with consequent distortion of images, it does not, as a rule, bring about the common in temperate climate Haze of an abnormal kind need barely be mentioned
here-namely, that due to smoke, palpable dust, and the products of volcanoes. It may, however, be very widely spread and very dense. In 1783 Europe was fo months covered by the dust ejected by an Icelandic volcano, and the Atlantic for 900 miles west of the northwest coast of Africa is every year subject to a haze composed of fine particles of sand from the Great Desert.

## THE NEW ASTIGMATIC LENS FOR OPTICAL

 INSTRUMENTSOur engraving shows the new astigmatic eyepiece as adapted for use upon optical instruments, such as opera and field glasses. It consists of an astigmatic lens pivoted to the frame of the ordinary eyepiece. When the astigmatic lens is not needed, the button is depressed, which throws out the lens into the position shown in Fig. 2.

The notion once prevalent that the human eye is a perfect optical instrument has been long ago exploded ; and the demands of our modern life, with all its complicated activities, constantly render the defects of this important organ more manifest. Of these defects, per haps no single one is attended with more evil results than the refractive error known as astigmatism. Probably few persons outside of those professionally interested in defects of vision understand what astigmatism is. It may be briefly said to consist in the absence o a single, common focal point for the rays that come in different planes. Most frequently the cornea is at fault, being more strongly curved in one meridian than in others, the meridians of greatest and of least curva in others, the meridians of greatest and
ture being at right angles to each other.

But if the nature of astigmatism is not generally comprehended, its effects are obvious enough. No only does it more or less seriously impair the vision, but it is a frequent cause of asthenopia, headache, and other forms of nervous trouble. It has been assigned as a cause of chorea, paralysis, and even of reflex dis turbances in the digestive apparatus. It may well be doubted, therefore, whether any contrivance has eve been devised of more practical benefit than the cylin drical glass which corrects this affection.

Of course astigmatic persons do not experience the same benefit as others in the use of opera glasses, tele scopes, etc., even if they wear the spectacles which cor rect the astigmatism. For this reasor the recently patented device known as the Kornblum-Painter astig natic eyepiece will be very highly appreciated Messrs. Tiffany \& Co., of Union Square, after giving
-
each other, or that the mixture of currents of difer nt temperature may in some way set p molecular aggregations.
Whatever the cause, we should bear in mind the small quantity of nontransparent matter required to produce the dimwing effect of haze. If the eye can observe the color produced in a drop of water by the fifty-millionth of a gramme of fuchsine, possibly a weight of water or dust not much reater would suffice for visibility in a coluwn of air 1,000 feet long. The to a degree which it is difficult to realize dust particle air tested by Mr. Aitken previous to his measurement on the top of Ben Nevis contained about 34,000 dust particles to the cubic inch--this was on the Ayrshire coast. In every cubic foot there would be $35,232,000$ particles, and, in a horizontal column of 1,000 feet $35,232,000,000$ particles. It is manifest that a condensa tion upon a small proportion of these, or an agglomera tion of a small proportion into larger groups, or a momentary adhesion by electric attraction, would suffice to produce optical effects
The evidence concerning the appearance of haze by irregular transmission of light due to unequally heate


ASTIGMATIC EYEPIECE FOR OPERA GLASSES.
the invention a most careful test, have secured the sole right for the sale and manufacture in New York. The invention is applicable to opera and field glasses.

## The Weight of a Cubic Iuch of Water.

A cubic inch of distilled water, which forms the basi of our present imperial weights and measures, says $I n$ dustries, was defined by act of Parliament in the reign of George IV to weigh 252.458 grains. Redeterminations of this ratio have since been made, proving that the experiments then conducted were not absolute, but that the weight of a cubic inch of water at the temperature of maximum density is equal to 252.286 standard grains. This alteration must necessarily affect the gallon and bushel and other derived measures, and we understand that the authorities at the Standards office have proposed to the president of the Board of Trade that steps shall forthwith be taken for readjusting the national measures. We hope that when the matter comes before the House the question of permanently altering our English measures to those of the metric system, which have now been introduced into use in most coun tries, will be discussed, and that the correction of this error will have some effect in simplifying our present com plex system of weights and measures.

THE charred condition of the wood en coverings of the steam pipes recently exhumed by the New York Steam Power Company, in making way for the subways, after remaining for several years undisturbed, shows that even with such unfavorable surroundings as to moisture, etc., steam pipes are
capable of actually burning wood. The question has often been discussed, but the evidence furnished in the case cited is very conclusive.

## RECENTLY PATENTED INVENTIONS.

 EngineeringValve Gear. - Georg A. Franke, Uuhlhausen, Prussia, Germany. This is a valve gear for steam engines, pumps, etc., in which there is no team pressure upon the back of the slide valves, 80 abricant may be supplied direct to the slide valve face, and the steam-tight valve chest covers, stuffing boxes, lands, and valve rods nece
Condenser. -Colcord Upton, Salem, Mass. This is a compound condenser more particularl ion, the invention providing a simple and effective construction including various novel features and com binations of parts.

## Railway Appliances.

Passenger Recorder.-Addison C. Stone, Chicago, Ill. Combined with a paper-carrying a second shaft geared to the first one and carrying a spring, with means for winding it, and connectio with each seat of the car and with a dial, whereby record will be made of those entering and leaving the

Coupling for Car Heaters.-Erwin . Graver, Philadelphia, Pa. This is an improved pip S. Grer farneche the hearing pipes of a train, the acking of the cars together, and when upon the train up and down or sidewise a sleeve and spring with which the coupler is provided are adapted to yield and permit the coupler to partake of the swaying motion.

## Mechanical.

Lubricator. - John A. Holmes, Salt Lake City, Utah Ter. This is a lubricator intended more particulany for supplying oil or other lubricant to relatively stationary bearings, such as pillow blocks
and hangers of line shafting, etc., the invention proand hangers of line shafting, etc., the invention profeed may be maintained without waste.
Belt Lacing Needle.- Harvey Bosworth, Plattsburg, N. Y. This needle has an eye in eye in the direction of the length of the needle, with an enlargement at its extremity, whereby, when the lace cord or thread has been passed through the eye, it wil be so attached that there will he no danger of its sliping from the ey
Hat Crown Press. - William J. Walker, Fishkill-on-the-Hudson, N. Y. This invention embraces a plug for pressing hat crowns, consisting of
a flexible shell having the form of the crown to be moulded, with an inturned flange at its top, the flange and the upper portion of the shell being of greater making an inexpensive and effective press for moulding the erowns of all kinds of hats.
Casting Flask. - William Schumacher, Brooklyn, N. Y. This is a flask for casting ornaments, in which jewels of glass or stone are set in
a manner to form a part of the mould face to be exposed to the molten metal, to not only impress the face of the jewels in the casting, but impart a luster to
casting at the points of its contact with the jewels.

## Agricultural.

Plunger Operating Means for hay Presses.-William A. Mayo, Paris, Texas. This hivention covers an improved horse power designed to
operate four or less hay presses by the movement of one operating lever, and to be also used for a great variety of other purposes, the construction being strong and simple while the weight and friction are greatly reduced, the efficiency and economy of operatiou of the
al users.
Corn Planter. - William Shortlo, Springfield, III. This invention covers a machine matically-worknis the corn at the proper distances apart as the machine drawn along, and the invention covering various novel etails and combinations of part.
Plow. - John U. Stephens, Point eter, Ga. The point proper of this plow is formed a triangular plate, the upper portion of which extends laterally to each side of the shank so as to admit the dirt or clay to fall back into the furrow, the invention being in the nature of combined plow and subsoil culti-
vator attachmente, to be used on any ordinary plow vator attachments, to be used ou any ordinary plow
stock.
Threshing Machine. - Horace a. Wetsell. Tracy, Minn. Combined with a slotted table arms working in the slots, an endless carrier below the beater, aud a vibrating shoe, in front of which is a fan, the machine being designed to quickly and efficiently hrash all kinds of grain
Cotton Harvester. - George P. Saltenberer, Lakeport, Ark. This invention relates to that class of harvesters in which an air blast is employed to force the ripe bolls of cotton upward into a receiving
chamber, the invention covering various novel features chamber, the invention covering various no
Tobacco Hanger.-Jordan F. Jones, Laurel, N. C. This invention is in that class of tobacco hangers generally designated "tobacco sticks," and
censists of a bar with sharpened teeth attached to its consists of a bar with sharpened teeth attached to it and held suspended when the hanger is supported horizoutally in the caring house or on racks in the field.
Potato Digger.-John H. Priestley. Meriden, Iowa. This invention consists of a frame
suitably mounted on wheels, carrying an adjustable
scoop or dıgger at its front end, a sifting hopper bein ocated within the frame, arms revolving in the hoppe and an adjustable holder to support the bags while eing filled.
Plow. - Robert Weber, Sealy, Texas This is a double mouldboard plow of simple and durwherein the point may be easily removed or replace when necessary, the invention also providing mean whereby the plow beam may be raised or lowered a will.

## Miscellaneous.

Churn Dasher. - Daniel A. Fiske, St. Louis, Mo. The main frame of this dasher has a central har and parallel cross pieces, the staff bein mortised into the center of the bar, the coss pieces, so that when the dasher is forced down through the cream the bars deflect it outward, there being blades
Shield.-Beaumont B. Buck, United iates Army (Fort Douglas, Utah Ter.) This is bullet proof shield to be made of steel or aluminum or sections. and shaped to fit the body, or to otect may be made in a single piece.
Barrel Head Holder. - Alfred L. North and Halleck Howe, Patriot. Ind. This holder is its lower end to form an euter sering head clamp, the sides of which are curved in to bring its top closer to the sides, and curved at its upper end to form an inner retaining clamp, the holder being designed to hold the head of a barrel compactly and securely,

Siphon Bung. - George C. Peeling Lock Haven, Pa. This bung has a driving face on top, longitudinal core to one side of which opens a valved air inlet passage, while an adjustable pipe extends adapted to receive a hose for conveying the liquid to

Radiator. - John T. Breadner, Port Henry, N. Y. This invention relates to hot water radiating surface withont disturbing the induction and eduction pipes, the invention covering various nov eatures of construction and arrangement of parts.
Harmonic Key Board - John M. rest on top of the egular keys of an organ or piano, with longitudinally extendıng bars having projections adapted to engage
he false keys, to permit the performer to play any the false keys, to permit the performer to pla
desired chords without much study or practice.
Pencil Sharpener. - James T. and Hubert W. Morgan, Winsted, Conn. This sharpener he lead from projecting through the end of the he lead from arpien clasp for holding and guiding the pencil, while combined therewith is an eraser which

Letter Press. - Frank Casto, Cin
Letter Press. - Frank Casto, Cin innati, Ohio. This invention provides a means as far as possible by the manipulation of the usual hand wheel or lever the follower may then be forced still farther downward by means of an extra lever, gear,

Store Service Apparatus.-Edward A. Rorke, Brooklyn, N. Y. This is a store service rall way having a main track, a series of branch tracks and switches, and a series of carriers which are automatically switched to their particular station, different carrie he automatic action of the carrers or different switche
Fire Kindler. - Anton D. L. Gatheidea and a projecting porous body with concave sides and a projecting stem
or rod at one end with suitable fingers whereby the block may be suspended under the grate bars when used under a high grate, and form a support for the
block when the latter is tilted on its side under a low used un
block wh
grate.
Coffee Pot. - James S. Stidham, Floyd. Texas. Combined wath this pot is a bag to contain the coffee, and one or more tubes for forming jets directed against the exterior of the bag, the invention being designed to facilitate the quicker and more
thorough extraction of the aroma of the coffee and promote economy in its use.
Garment Stay.-Edward K. Warren and Joseph H. Ames, Three Oaks, Mich. Thss invention covers a dress stay formed of a thin resilient
blade and an ornamental fabric strip of greater width than the blade, the adjacent faces of the blade and strip. being glued or cemented together, and the margins or selvedges of the strip being free from glue or cement.
Heating Drum -George E. Leonard. Farmington, Waupaca County, Wis. This is a tubular drum to be used as an upper section of a heating stove
or as a section of a stove pipe, thereby giving greater heat-radiating surfaces and more fully utilizing the alue of the fuel.
Churn Operating Mechanism. means for imparting a rotary motion to a churn, and regulating such motion, the churn when in motion being elevated above the floor, and being convenie
To Prevent Horses from Cribbing. Jacques Meyer, Paris, France. This is a device con ating of an expansible yoke formed with bearing aces, and a means for connecting the strap with the head
piece of a halter, whereby the throwing of the head forward by the horse will bring pressure to bear u
windpipe and cause the horse to raise his head.
Fefd Bag.-Charles R. Monfort, 212 St. Nicholas Avenue, New York City. This is a feed whereby the grain or other food in the bag may be whereby the grain or other food in the bag may be
automatically fed in greater or less amounts as desired, the construction also providing for a circulation of air over the food, while the storage compartment may be folded in the feeding compartment when the bag is not use.
Halter.-John Gleiser, Manilla, Iowa. This halter has an improved link with metallic loops uniting the throat and jaw pieces through the medium of sliding rings, in combination with the straps forming
such pieces, the check pieces and the fastener plates, such pieces, the check pieces and the fastener plates,
the whole making a halter of durable and cheap construction.
Diving Apparatus. - Oliver Pelkey, Duluth, Minn. This is essentially a metallic body armor designed to have sufficient strength to resist ex-
ternal pressure while at the same time being of sufficient flexibility to permit the requisite movements of the diver, the invention covering various novel features of construction and a peculiar combination of parts.
Lock. - Alfred C. Lawrence, Toronto, Ontario, Canada. This is a permutation lock designed nore especially for money drawers at cashiers' desks, etc., to be operated only by authorized persons knowing the proper order in which the permutation levers or
parts must be worked to allow the withdrawal of the parts m
bolt.
Photographic Camera. - Hervy Laney, Cumberland, Md. This is a camera for instantaneous pictures, in which the shutter is actuated by a spring mechanism with a rotary motion, and is held in number of instantaneous views without removing the negatives from the camera, the negatives being formed on a continuous roll.

SCIENTIFIC AMERICAN

## bulldina EDItion

## JANUARY NUMBER.-(No. 51.)

## TABLE OF CONTENTS

Elegant plate in colors of the residence of C. F.
Callahan, Esq., Buffalo, N. Y. Perspective elevaCallahan, Esq., Buffalo, N. Y
tion, floor plans and details.
Plate in colors illustrating cottage on Staten Island, N. Y. Cost three thousand doller Floor plans, elevation and sheet of detail
3. Page engraving of a chimney piece by Hugues
Lallemand, Museum de Cluny, Paris. Lallemand, Museum de Cluny, Paris.
Perspective elevation and floor plans of a house at
N. Y. Cost five thousand eight New Rochelle,
hundred dollars.
5. A residence costing twenty-four hundred dollars, erected on Chester Hill, Mt. Vern
Floor plans and perspective elevation.
A dwelling recently erected at Stamford, Conn. at a cost of
perspective.
Engraving of a Frerich bay window, constructed in the style of Henry III.
8. United States post office and court house, Lan

A handsome residence at Larchmont Manor, erected at a cost of seven thousand dollars. A
Sargent, architect, New York. Perspective view and floor plans.
10. A cottage recently erected at West New Rochelle, N. Y., at a cost of three thousand eight hundred dollars. G. O. Haurs, architect, New Rochelle N. Y. Floor plan
11. A residence at Grand Rapids, Mich. Cost complete, six thousand dollars. Plans and per
spective.
. An attractive dwelling at New Dorp, Staten Island N. Y., erected at a cost of $\$ 5,000$. Plans and
13. Engraving of the Corbin building, corner John plot of ground 20 feet by 162 feet.
14. A dwelling at Chester Hill, , Mt. Vernon, N. Y Cost complete $\$ 5.800$. Perspective elevation and floor plans.
non, $\mathrm{N} . \mathrm{Y}$.
A very attractive dwelling at Ludlow, N. Y., re cently completed at a cost of $\$ 4,773$ complete
Architect Benj. Silliman, Yonkers, N. Y. Plan and perspectlve elevation
16. Miscellaneous Contents: The hornbeam.-'The Peerless Brick Co.-The American Institute of Architects.--Tie Hellderson heaters.-Regenera-
tive gas lighting, illustrated.- Filtering and puritive gas lighting, illustrated.-Filtering and puri-
fying water, ill ustrated.-Foot power mortising fying water, illustrated.-Foot power mortising metal work, with two illustrations.-The Manhattan dumbwaiter.-Hot water heating.-Academy
of Archttecture and Building.
he Scientific American Architects and Builders Edition is issued monthly. $\$ 2.50$ a year. Single copies 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practi cally, a large and splendid Magazine of architec with ine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.
The Fullness, Richness, Cheapness, and Convenience of his work have won for it the largest circulation fll ny Architectural por by all newsdealers.
MUNN \& CO., Publiberre,

## $\mathfrak{D}$ Business and Personal.

The charge for Insertion under thes head is One Dollar
a line jor each insertion: about eight words to a line inejor each insertion: about eight woras to a line. Advertisements must be received at pubicalzon office

Salesmen can add to their incomes by selling our oods on commission. Commissions to one salesman, Who devoted only one hour daily to our goods, averazed
wenty-five dollars per month for past three months. wenty-ive dollars per month for past three months.
Our goods have been on the market for twenty-one years, are well known, and are first class in every recan, New York.
Wauted-Experienced mechanical draughtsman. Ad-

## Patent Development Company, <br> 59 Hifth Avenue, New York.

This coted 1889. Thd placing on the market desirable patented and unpatented articles of a nature calculated to come into
general use. Preference given to light farming imple ments and useful household utensils. No fees or charges of any nature required from the owner of inventions. Hours for examination of models or drawings, from 10 Lo o'clock.
Patent No. 417,450. See page 38. The right to manufacture on royalty for U. S. offered to re
Address inventor, Mr. George Van Duzer.
Wanted to buy an established machine shop, having modern tools and kood business. Situated in New York, Conn., or Mass. Address Tools, Scientific American.
We desire to receive communications from those who
ontemplate patenting any new method or material for contemplate patenting any new method or material for the covering of steam pipes, boilers or other heated sur-
faces, and will pay for valuable suggestions, or unpatented formula, if accepted, tending to improve the products of this class, now on the market. Address, B. C. D., P. Box 773, New York City.
Wanted: Mechanical engineer experienced in designing and building modern automatic high speed engines
(plain and compound), one who is capable of taking charge of correspondence and acting as general manager
of office and shops. Location, Southern Pennsylvania. ddress " Mechanical Engineer," care of this paper. Machine tools, catalogue No. 47-B; wood-working machinery, catalogue No. $52-\mathrm{A}$; steam power, catalogue
No. 48. Laresest lines offered by any frm in this country.
Send for bed-rock prices, stating exactly what you want. S. C. Forsaith Mach. Co., Manchester, N. H.

Best Ice and Refrigerating Machines made by David
Boyle, Chicago. III. 140 machines in satisfactory use. Guild \& Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air For the latest improved diamond prospecting drills, Presses \& Dies Ferracute Mach Co Bride
Presses \& Di. B. N. J. The Holly Manufacturing Co., of Lockport, N. Y., hinery, and containing reports of tests, on application. Twerk water motors at 12 Cortlandt St., New York. Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York Billings' Patent Adjustable Tap and ${ }^{\text {Br }}$ Co., Hartford es. Br
Conn.
Stea
Steam Hammers, Improved Hydraulic Jacks, and Tube Safety Elevators, steam and belt power ; quick and "How to Keep Boilers Clean." Send your address Magic Lanterns and Stereopticons of all prices. etc. A profitable business for a man with small capi-
tal. Also lanterns for home amusement. 180 page cata-
logue free. McAlister, Optician, 49 Nassau St., N. Y. For best hoisting engine. J. S. Mundy, Newark, N.J. For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc.. address $J$.
S. \& G. F. Simpson, 26 to 36 Rodne St., Brooklyn, N. Y. Split Pulleys at low prices, and of same strength and Works, Drinker St. Philadelphia, Pa.
艮
HINTS TO CORRESPONDENTS.

(1725) W. M. C. asks if a fish killed by nelectric current would be eatable. A. Yes if fresh,
but the shock is liable to induce early decomposition. (1726) J. A. C. asks: Is there any posive evidence that the earth is getting cold and its crus
getting thicker? After volcanoes have become cold ordead, do not some of them burn again? Are the larg lakes getting shallow: Do astronomers claim that star burn up? If so, how many do they know to have been
destroyed in that way? What is the largest number of destroyed in that way? What is the largest number o cubic inches of brain that any monkey has? What is the largeet, also the smallest, number of cubic noches of
branu that man has? A. There :s nothuy posure a bram that man has? A. There :s nothing positive as
evidence of the prehisturic condition of the earth and evidence of the prehistonc condition of the earth and
its crust. The geological succession of the strata form
ing the crust of the earth suggests the generally r
ceived theory of the gradual cooling of a former fluid globe. The volcanic and earthquake evolutions upon it surface now are suggestive of a thin crust resting upon a heated flnid center. Deep borings and mines also cor many years of silence, and many volcanic cones an craters are known to have been sllent during the his toric period. Our large lakes have probably become from drainage deposit of silt. Astronomers do claim that stars burn up in the ordinary sense of the word, for there is nothing destroyed, but only the pro bability that collisions of suns, or suns and planets, o of suns with erratic bodies in space, produce vast out
bursts of heat and light, which finally subside into the bursts of heat and light, which finally subside into the
natural condition of a quiet body. There have been natural condition of a quiet body. There have been
many outbursts of star light within historic times. Provaries from 75 to 110 cubic inches. The brains of monkeys vary very much as the size of their bodies probably 10 to 25 cubic inches.
(1727) C. H. asks: What is the compo sition of the fluid contained in the glass bottles called
fire extinguishers, to be thrown on starting fires? And is the composition the same in the larger vessels in tended to be carried on a man's back or transported in vehicle drawn by a horse? A. A number of formula soda are excellent ingredients for liberating carbonic acid gas in large quantity, which tends to extinguish fire To prevent freezing and to act as an agent that will re tard combustion, sulphate of soda may be also usec The larger vessels you refer to are of ten charged with solution of bicarbonate of soda. In use sulphuric acid
is added by turning a handle which breaks or reverses a is added by turning a handle which breaks or reverses bottleful of the same. This forms sulphate of soda and the water in a jet when the loose fancet is
(1728) T. E. P. asks: 1. What is the name of the poet, author of "Bachelor's Hall"? A.
John Finley, of Cincinnati, Ohio. 2. A description of mino for tights and how to construction of See our Supplement, No. 600, for an 8 light dynamo, which is the nearest to your requirements that we have published. 3. A receipt to make emery wheels. A.
Turn out a wheel of wood, coat edge with glue, and Turn out a wheel of wood, coat edge with glue, and
roll it in ground emery. 4. How do they manufacture roll it in ground emery. 4. How do they manufacture
Bessemer steel? A. Cast iron is melted and run into Bessemer steel? A. Cast iron is melted and run into
converters, large vessels whose bottoms are perforated bubbling through the melted iron burns out the carbo and silicon and raises the heat so as to make it ver liquid. Finally some highly carbonized iron is run in and the product is withdrawn.
(1729) H. A. I. asks (1) if there is any feet deep on a fish net for floats better than cork or wood: A. Use hollow metal floats, made of heavy tin
plate or brass. 2. About how much is the pressure to plate or brass. 2. About how much is the pressure to
the square inch in fresh water at that depth? A. the square inch
About 133 pounds.
(1730) "Archimedes" asks : What would happen if an irresistible force should come against an
immovable substance? A. You assame an impossi bility; nothing can be predicated as the result of an im possibility.
(1731) W. M.-To dissolve aluminate or silicate of potash, use boiling water, preferably under liquids, use chloride of calcium and sulphate of soda both dissolved to saturation. Use four parts of sulphate of soda to one part of chloride of calcium (no chloride of lime)
(1732) J. N. H. writes: I have made some marble ornaments and tried to polish them with I think something else is used in connection with th acid. If so, will you inform me what it is, and how to be nsed so as to have satisfactory results? A. Marble
polishing is quite a complicated process and is described at length in Workshop Receipts, 1st series, $\$ 2.50$. Yo will probably find rubbing with hard pumice, followed by rouge and water on a linen cushion, and this fo lowed by pntty powder, sufficient. Use no acid.
(1733) U. S. R. and L. C.. H.-The in sects you complain of are the Bayobia pratensis, a
small mite which occnrs upon clover in great number through the summer and which sometimes enters house during the fall. They can be killed with insect powder Benzine is recommended, but of course involves very
great risk of fire. They do no harm to clothing or great risk of fire. They do no harm to clothing or
carpets.
(1734) H. G. D. writes for a rceipt for making a liquid and a non-liquid pad composition, suc as printers and others use for putting paper up in pad paper coated with postage stamp or other mucilage For liquid use a solution of gutta percha in bisulphide of carbon, objectionable on account of the injury don by it to the operatives, or following glue composition or fifty parts of dry glue weigh out nine parts of gly erine. Soak glue for 10 minutes or more, dissolve in water by heat, and add the glycerin
(1735) W. H. asks : Is there any explana ion why a tnft of entirely white hair will appear in a purely vegetable and harmless preparation for chang ing the defective color to hrown? A. No explanatio that really explains can be given. Use the juice of crushed black walnut husks to restore the color. Appl it with gloves on hands, as it stains the skin. The for owing is given as a formula for walnut dye for th
(1736) J. G. Von H. writes: Not long go I chanced to see a man called the "hnman vol cano," performing with fire, blowing continually from
his mouth a gas which ignited and appeared from its his mouth a gas which ignited and appeared from its
flame like ordinary illuminating gas. I noticed before ato his mouth (secretly) which louked like sponge
and after he eoncluded rubbed his mouth with a hand
kerchief in order to relieve himself of the substunce un erchief in order to relieve himself of the substunce un o prepare it? A. A short piece of lampllack in suake in a solution of nitrate of potash and is dreed. This is whole is placed in the mouth, the performances you describe can be performed by breathing through it. When
the combustion gets too active, the mouth may be combustion gets too active, the mouth may be
closed and the piece of wick will preveut entire exnguishment, but the tow will cease burning,
(1737) H. S. asks : 1. Will a solid wrought iron ring in the place of wire wound ring do on
armature of the simple electro-motor? A. The wire ing is preferable. 2. Will the field magnet be just as cood, if made out of a solid piece of wrought iron in tead of sheet iron? A. Yes.
(1738) A. S. E. asks: 1. What is the name, popular and scientific, of the bark used in many kinds of dyeing? A. We presume you mean quercitron, black ouk (Quercus nigra) according to others of the bellow oak ( $Q$ infectoria or $Q$. tinctoria). 2. A goo ellow or amber dye, not containing annatto $\%$ A. Use
urmeric or tungstic acid. 3. A method of detecting the bark in a dye? A. Test extract with (a) salts of ron, giving olive green precipitates passing into brown, (b) protochloride of tin, giving a yellowish red precipi ate, (c) hydrochloric acid, giving reddish yellow precipitates. In a mixture such tests may fail, and its de ectio
(1739) G. B. M. asks for the material in which to cast silver. A. Use brass founder's sand and very high is P Paris 3 parts, fine brickdust part, mix to a paste with solution of alum, and whe ry bake it. You will have some trouble in workin with silver, as it absorbs oxygen and gives it off sudWe recommend Spretson's "Practical Treatise on Case ing and Founding," $\$ 6$.
(1740) F. W asks: 1. In winding a bob in for an electro-magnet, does it make any difference
whether the magnet wire is wound back and forth like spool of common thread, or should the winding be all one direction, viz., from left to right or right to left, are ually wound back and forth like a spool of thread In a steamer with 18 feet side wheels, $18 \times 48$ inches engine, 18 revolutions, steam 70 pounds and plenty of it, would it increase the speed of the boat to narrow down the paddles so that the engine would turn faster, say $1 / 3$, or would the increase of power of the engine be
lost in the increased slip of the wheels? A. Probably ost in the increased slip of the wheels? A. Probably (1741) H. D. asks why free burying grounds are cailed potter's fields, and where the name
orignated. A. We know of no earlier use of the na han in the Bible, Matthew xxvii. 7 , where it is applied to a field south of Jerusalem. and which it is not unlikely might have been a place or neighborhood used for the work of the potter, thus originating the name.

## TO INVENTORS.

An experience of forty years, and the preparation of
more than one hundred thousand applications for palents at home and abroad. enable us to understand the equaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all
foreign countries may be had on application, and persons contemplating the securing of patents. either at home or which are low. in accordance with the times and our ex tensive facilities for conducting the business. Address MUNN \& CO.. office ScIENTIFIC AMERICAN, 361 Broad-

## INDEX OF INVENTIONS

For which Letters Patenc of th
December 31, 1889
AND EACH BEARING THAT DATE [See note at end of list about copies of these patents.] Air. app
well
Air. app
Town from, H .
Air brake. T. S. e. Dixon
Illoys, making bronze,
Animal trap, D. B. Roc
Animals, device for liber...............
Animals, portable pen for. D Duck worth
Axle box, car, E. Bes
Axle boxeses, dust shield for car, J. A. Brill Thomson.
Bag. See Paper bag,
Bale covering, cotton. H. O King
Bale tie, J. W. Griswold.............................. 418.4
Baling press. J. Billings. ............
Band cutter and feeder, M. A. Smith
Banjos. tailpiece for, R. C. Bookser
Bar. See Car draw bar. Skylight ventilating sash
Bain
Barrel, box, etc., metallic, L. L. Sag Barrel head holder, North
Bath. See Copying bath
Bathtub, wash basin, or sink, C. H.
Battery. See Secondary battery. Hieatzman
Bedsteads, portable fan for, A. H. Hi
Bell, e. Frost ......
Bellows, M. F. Sallad
Belt shifting device, G. C. Robert
Bevel, D. L. Werts .. .............
Beverage preparation, .. Moerle
Binder, temporary, E. R. Cooper
Binder, temporary, E. R.
Bnat motor. G. Willett.
Whittalles, tension regulating device fo
Boller cleaner, steam, Ainsworth \& Lingo.....................................


Boiler feeder and indicator, steam. J. s. Forbes..
Bot lies, etc., stopper for, F. Bridge............. Box. See Axle box.
Bracket. see shelf bracke
Brake Brake. Sr e Air brake. Car bake. Power brak
Vehicle brake. Brick, arch, Moldenhauer \& Poo
Buckle, C. 11. Harmer. ......... Bucket cover, sap, H. Blake.
Bucket, tre, J. Ingram Bucket, fre. J. Ingram....
Buildings. convtruction of,
Bung Bung, si phon, G. C. Peeling
Bung sp Bur eau drawer. D. C. Clapp.
Burial casket, $\mathbf{C}$
Burner. See Hydrocarbon burner. Lamp burn
er. Oil......................... er. Oil burner. Paint burner. Petroleum

## Butcer mould, O. A. Bingham Butter print. J. W. Culmer...

Butter worring tray, J. W. W. Culm
Button fastening, W. R. Brock
Cabinet stand for sick roums, J. . C. McDowel.......
Camera. See Photoraphic
Camera. See Photogra phigg
Camera shutter, T. O. Hegg
Can, Wallace \& Spencer.
Can feeding apparatus, G. D. Laning..
Car body frame. railag.
Car body frame, railway, D. L.
Car brake, railway, G. M. Brill
Car. cinder, J. Bowen..
Car coupling, J. F. Cook
Car coupling, Edmonds \& Engberg.
Car coupling, I. . . © C. F. R. Harry
Car coupling. o. P. Hix...
Car coupling, Lorraine \& w
Car coupling, D. D. Shaw.
Car coupling, D. D. Shaw.
Car coupling, H. A. Snyde
Car coupling,
Car coupr, , . B. Mouck...
Car draw bar, rallway, D
Car gate, rail way. Jay, B. . L. Baod ..
Car heaters, pine coupling
Car heaters, pipe coupling for, E. S. Graver.
Car. railway, J. A. Brill
Car. railway, J. A. Brill
Car, street. Jo A. Brill.
Cars, card holder for
Cars, card holder for, w.................
Cars, draw hook for street, C. E. Garey
ing.
ing

Carding machines, feeding mechani.
Ferguson .......................
Carpet cleaning machine,
Carpet fabric, J. Jakger.
Carpet sweeper, W. J. Drew....
Carriage. folding baby, C. Mille
Carriage seat rail, w. F . Head
Carrier. See Egg carrier. Sheaf carrie
Cart, hand, E. . . M Mott
Carving machine $\mathbf{s}$.
Carsing machine
Case. See Printe
Cash carriers, propelling device for, J. H. \& H. W
Casting metal ornaments, flask for, w. schu

perstuck...............
Chain link, F. F. Ellis...
Chair. See Night char.
Chair attachment, rocking, c. Kade
Chitney $\begin{aligned} & \text { cowl, F. Vin } \\ & \text { Churn, }\end{aligned}$. P. Jackson
Churn closure, S. D. Palmer.............
Churn closure, H. H. \& S. D. Palmer
Churn dasher, D. A. Fiske.........
Cigarette machine, H. Atkins ..
Clamp. See Rope clamp
Clasp, M. V. Hammack
Cleaner. See Boiler cleaner.
Closet. See Water closet.
Clothes drier, F Brucker
Clothes. G. H. Dixon
Clothes line prop, R
Clothes line prop, R. McAlpine............
Clothes pin. E. M. Watson....
Clothes sprinkier. E. Strebeck
Clothes sprinkler. E. Strebeck. ...............
Clutcn operating mechanism. E. E. Latham
Coal bucket, automatic, Rucker \& Long
Cock, P. Mueller ........
Cock, ball, w J. Cahill
Coffee or tea pot, R. Hein
Coffee pot. J. S. Stidhem .........
Collar stuffing machine, C. Ewing ( r
Condenser. C. Upton.
Cooking utensil, A.
Copying bath, Jenkins \& Hyers .... ............. ....
Corn husking and fodder chopping machine, G.
Tracy..............................................
Corn thiner, Roberton \&
Cotton and corn scraper and cultivator, T. W.
Botton a
Boyle
Cotton gi


|  <br> McLane $\qquad$ 418,183 |  | Transferring apparatus, E. \& C. E. Lindsley....... 418,525 Trap. See Animal trap. Insect trap. Steam | Pldvertisements. |
| :---: | :---: | :---: | :---: |
| Holder. See Barrel head bolder. Lamp chimney |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  | The above are charges per agate line-about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head ader ment, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue. |
| Horse boot, J.c. C |  |  |  |
| rseshoe, P |  |  |  |
| se coupling, L. .J. R. Rice.. |  |  |  |
| Hubs, point band for, J. Maris......................... 418,204 |  |  | MA |
| Husking pin. H. H. Perkins....................... 4 |  |  |  |
| rant coupli |  |  | It is Hard, Dense, and or crack. It is impervious to wind. water, and disease |
| rocarbon bu | Printer's chase transportation case, P. E. Dnwe.. 418.507 Protren 418015 |  |  |
| Hydrocarbon burner, J. H. Whitburn.............. 418,481 |  |  |  |
| licator. See Speed indicator. Station indi- |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  | adamant Mit. CO. <br> 71 E. Genesee Street, Syracuse, N. Y. |
| lating |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  | Patent Foot Power M |
| Settle, C. W. Pierce............................ 418.340 |  |  | Complete Outfits. <br> Wood or Metal workers without steam |
| Keshole gara, J. B. Bennett..................... 418.287 | and | Velocipede, S. Garmood .......i................ 48.611 |  |
| Lamp burner, T. Wall ............................ 418 | steel, Roenspiess \& Flynn..................... |  | the large shops, by us latest and most improved for practical shop use, also for lndustrial Schools, |
|  |  |  |  |
| 418 | Railm |  | shop use, also for Industrial Schools, Seneca Falis Mfg, Co. 695 Water Street, Seneca Kalls, N. Y. |
| 418 | ${ }_{\substack{\text { Radl } \\ \text { Rail }}}$ | $\xrightarrow{\text { Voting }}$ Wago |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Leathe, metat turning, v.F.Prentice............... 418.382 |  |  |  |
| Letter boxe | Regulator. See Gas regulator. Gas pressure |  |  |
| ter | dril |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Lock. See Door lock. Hasp lock. Nut lock. | 18 |  |  |
| Permutation lock. Seal lock. Wapon body |  |  |  |
|  |  |  |  |
| 418,182 | 418, | W |  |
| omotives, running Hughes. |  |  | Drill Fresses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. Lathes on trial. Catalogues mailed on application. 165 W. 2d St., Cincinnati, 0 . |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Lubrieator, J. A. A. Himes......................... 418.410 |  |  |  |
| Mat. C. W. Troter............................. 418.299 |  |  |  |
|  |  |  |  |
| nes. | Seal lock, C.J. smith.............................. 48.68 |  |  |
| drs |  | s |  |
|  |  |  |  |
|  |  |  | $\underset{\text { Harrison, }}{\operatorname{EDISON}} \int \underset{\substack{\text { v. J. }}}{\operatorname{LAMP} \mathrm{CO}}$ |
| tal. plat |  | Cas |  |
|  |  |  |  |
| al, stir | Shield, B. B. Buck .................. .....................18,3696 |  |  |
|  |  |  |  |
| etallic fasteners, die for the m R J Shipley |  |  |  |
| R.J. Sh |  |  |  |
|  |  |  |  |
|  | Snow scraper, 0. S. Wheeler.................. . . 418,337 |  |  |
| aid. See Butter mould. |  |  |  |
| Mop wringer, e. H. Noble............... ... ...... 41 |  | Water closet bowl or stand, J . Budede............... 19,5 |  |
| or. |  |  | ELECTRO MOTOR. SIMPLE. HOW TO |
| or. |  |  |  |
| Isis stand, J. $\downarrow$ G. Hateh.................... 418 |  |  | make. By G.M. Hopkins.-Description of a small elec amateurs to make a motor which might be driven with advantage by a current derived from a battery, and |
| iil dri |  |  |  |
| 419,2 |  |  |  |
| Nat lock, H. Pick........................................ 418.8586 |  |  |  |
| Ocean motor, I. S. Goldman.................. ... 488.612 |  |  |  |
|  |  |  |  |
|  |  |  | STEEL TYPE for TYPEWRITERS, |
| Oran kess, device for regulating, P. J. Lawrence 418.575 Oven door, bake, e. P. Hilcher ... ........... 418.85 | Spinning frames. traveler cleaning device for ring, W. E. Sharples. ........................ .. .. 418,475 |  |  |
| \% | , | Disinfeetants, Condy \& Mitchell...................17,326 |  |
| ${ }_{18}^{418}$ |  |  | VOLNEY W. Mason \& CO., |
|  |  |  |  |
|  |  |  | FRICTION PULLEYS CLUTCHES and ELEVATORS PROVIDENCE. R. I. |
| Paper baa machine. W. A. Lorenz...............: 41,201 |  |  |  |
|  |  |  |  |
| F. B. |  |  |  |
| per |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | Sticker head. A. crampton............................ 418, 418, | Medicine acting as a blood purifer and nerve | The ASBESTOS PACKING CO <br> as Conchess ${ }^{2}$ BOSTON |
| Pen, foutain, J. D. Drasy......................... 118,394 |  | Medicines for purifying the blood, Dallas |  |
| ceil and calendar, combined lead, J. H. Paige..418,2 |  | cine Manufacturing Company......... . ... |  |
| ecil sharpener, J. T. \& A. W. W. Morgan ............ 418.3 | 418, | P |  |
|  |  |  | USEFUL BOOKS. <br> Manufacturers, Agriculturists, Chemists. Kngineers, Me- |
| troleum, apparatus for burn burn $\qquad$ |  |  |  |
|  |  |  | Manufacturers, Agrıculturists, Chemists. Kngineers, Mechanics, Builders, men of leisure, and professional |
|  |  |  | men, of all classes, need good books in the line of their respective callings. Our post office department |
|  |  |  |  |
| Lyon........................................ 418,527 | 7 Tablet, F. B. Gibss....... ........................ 418,776 |  | their respective callings. Our post office department permits the transmission of books through the maile |
| Picture frame, W. T. Wrizht................. 418.861 | 1 Tap. laundry . N. Garst....................... 418.61 |  | at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for |
|  |  | easo | different subjects, has recently been published for free circulation at the office of this paper. Subjects classifled with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed |
|  | Teleerraphy quadruplex, C. L. Healy.... ........ 418,28 |  |  |
|  |  | Whisky, P. M. Lagoni...................................... 17,3 |  |
|  |  |  | a copy, have only to ask for it, and it will be mailed <br> to them. Address, <br> MUNN \& CO.. 361 Broadway, New York. |
|  |  |  |  |
|  | Thrashing machine or separator, metallic. I. T. | any patent in the foregoing list will be furnished $f$ this office for 25 cents. In ordering please state |  |
|  |  |  | in every SHOP in the United States THE FINEST OF MEGHANGAL TOOLSS A SFjGALTY |
| Planirg machine, Woods \& Thomas....... ...... 418.345 |  |  |  |
| Planter and fertilizer distributer, Q. L. Armbris- ter. |  |  | C.B.JAMES, SB LAKE SI. GHIGAGO. <br> RESSES. 50 TO 500 TONS, |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |



## Emin's Rescue.

THE STORY OF EMIN'S RESCUE, AS TOLD IN STANLEY'S LETTERS. Published by Mr. Librarian to the Royal Geographical Society. With Map of $t$
56 cents.

Other Works by Henry M. Stanley.
THROUGH THE DARK CONTINENT; or, The
Sources of the Nile, Arourd the Great Lakes of Equatorial Africa, and Down the Livingstone River to the Atlantic Ocean. With 14: illustrations and Colored
Maps. 2 vols.. 8 vo , Cluth, $\$ 10.00$; Half Morocco, $\$ 15.00$.
the congo and the founding of its reree
State. a Story of work and Exploration. With over One Hundred Full-page and Smaller Illustra-
tions; Culored Mas tions; Coliored Maps and Mar
Cloth, $\$ 10.00$; Half Morocco, $\$ 15.00$.

Coomassie and magdala: The Story of Two
British Campaigns in africa. With Maps and llustrations. 8vo, Cloth, 83.50 .

Published by HARPER \& BROTHERS, N. Y
The above works are for sale by all booksellers, or will be
sent loy HA RPER \& BROTHERS, postage prepaid, to any part of the Unted States, Canada, or Mexico, on receipt of price.
HARPER's NEw CATALOGUE, a descriptive list of over 3,000 volumes, sent postpaid, on receipt of Ten Cents. EVERYBODY'S HAND-BOOK OF ELECTRICITY By Edw. Trevert.
glossillustrations, 120 pages. With
glossary of CIL WELL SUPPLY CO L Mint OIL WELL SUPPLY CO. Ltd.


CORROSION AN D FOULING OF




ARTESIAN


 AND PHONOGRAPH, GRA PHOPHONE A ND PHONOGRAPH,
-An interesting account of the Edison, Bell, and Train-
tor apparatus for the mechanical reproduction of speeh,


## 

 The Koch Patent File, for preserving newspapers, Mag.azines, and pamohlets. has been reeentilimproved and
price reduced. Subscribers to the ScIENTIFIC AMERI-


## DEAF  



EVANS FRICTION CONE CO


FRICTIONAL GEARING for REGULAT ING and CHANGING SPEED of all MACHINERY.

 ICE-BOATS - THEIR CONSTRUCTION and management. With working drawings, detaiks and
directions in full. Four engravigs showing mode of
 SCREW PITCH and CENTRE GAUGE

 tractors, Depth Gauges, Hard
enee Stel Squares. Graduated
Steen Squas,
Hardened Straight Edges, etce.,
 ATMOS. Directions and Dimensions for construction, with one



Gates Cornish Rolls Pulverizer

 Manufacture Also
Gates Rock and Ore Breakers Address for Catalogues
GATES IRON WORKS, THE MODERN 1CE YACHT. - BY



$\overline{\text { VELOCITY OF ICE BOATS }}$ A COLLEC


Special Screws, Pipe Cutters, Solid
Steel Thum Tacks, Patented Articles Manufacturing Co.. 356 Congress Ave., New Haven, Ct,
PILE DRIVING MACBINEREM


FIRE FELT.
THE NEW NON-CONDUCTING MATERIAL
 it to be superior to Hair Felt in Non-Conducting qualities. Made into sectional form
for pipes and into sheets ard
Asbealtos Bile




Useful, Beautiful, and Cheap.

 MENT, No. 698. Price 10 cents. To be had at thisoffice
and from all newsdealers.

## NCKEL PLATING \&POLISHING MATERIALS

 ZUGKER \& LEVETH CHEMICAL CO NEW YORKU.S.A. NICKEL ANODES, NICKEL SALTS, COMPUGES, BUFFING WHEELS, ELECTRO \& NICKELPLATING OUTFITS
To any person about to erect a dwelling house or sta-
le, either in the country or city, or any builder wishing to examine the latest and best plans fora church, school
house, club house, or any other pullic building of high or low cost, should procure a complete set of the Archi-
TECTS' $A N D$ BUIDDERS' tects' and Buiderss Edirion of the sciention
The information these volumes contain renders the and to persons about to build for themselves they will find the work suggestive and most useful. They contain
colored plates of the elevation, plan, and detail drawcolored plates of the elevation, plan, and detail draw-
ings of almost every class of building, with specification and approximate cost.
Eight bound volumes are tained, by mail, direct from the publishers or from any newsdealer. Price, $\$ 2.00$ a volume. Stitched in paper
covers. Subscription price, per annum, $\$ 2.50$. Address and remit to
MUNN \& CO., Publishers, 361 Broadway, New Yorlz.







ICE and REFRIGERATING MACHINES
The Pictet Artificial Ice Company (Limited), Room 6, Coal \& Iron Exchange, New York.

NOW READY
Piverinetal S Sinem


By Geo. M. Hopkins.
740 Pages. 680 Illustrations.
PRICE, by mail, postpaid, . . . . $\$ 4.00$
SEND for free llusstrated circular and Table of Contents.

MUNN \& CO., Publishers,











BARREL
SIR WILLIAM THOMSON.-AN AN AC-
 Shepard's New \$60 Screw-Cutting Foot Lathe


 for Amat for cats ologue of Outtits
 WINDMILL FOR PRODUCING ELEC-






## The Scienific American


The prices of the dififerent pablications in the United
he Scientifc Rates br Mall.
 year.
The Scentific A A merican, Spunish Edition (monthis)
5.00
The Scientific American, Architects and Builders
Edition (monthy), one vear.
The Scientific American and Supplement. . . ${ }^{\text {CTOM }}$
 The Scientafic American, supplement, and Areni- ${ }_{9.00}^{\text {tects and Builders Edition }}$ Proportionate Rates for Six Months.
bolut This includes postage, Which we par. Remit by postal
expressmenes order, or dratt to order of
MUNN \& CO.. $\mathbf{3 6 1}$ Brondway, New York


If you area arenter，
CAR PATTERNAKER，


MESSRS．MUNN \＆CO．，in connection with the publi－
cation of he SCIENTIFIC AMERICACAIContinue to bex－
amine improvements，and to act as Solicitors of Patelts


 them is done with special care and promptness，on very
reasomanabe terms．
taining frent full infor of charge，on application，con－




New York Belting and Packing Co． John H．Cheever，Treas． 15 PARKROW，New York．


OLDEST and LARGEST Manufacturers in
ULCANIZED RUBBER FABRICS
RUBBER BELTING， Packing，Hose，
 Vulcanite Emery Wheels，Rubber Mats，Matting \＆Treads



The MOTOR of 9 9th cevicurr Can be used Any Place，to do An
Nork，and by Any ome．No Boiler
No Hrat No Stem！No Ashes
No Gauges！No Engineer！A pet
 Charter Gas Engine Co．

 IMPROVED STEAM GAGE STEAM ENGINE INDIOATOR
 CRNSBY STEEMM GAGE \＆VALVE CO．Bosmonion st THE PHONOGRAPH．－A DETAILED $=2+5=$ Sientific Book Catalosule RECENTLY PUB BISHED．
$\begin{gathered}\text { Our new catalogue containing over 100 pages，includ－} \\ \text { ing Works on more than tift difirert subjects．Will be } \\ \text { mailed tree to any address on appoication．}\end{gathered}$ mailed tree to any address sn appplication．
MUNN ${ }^{\text {CO }}$ ．，Publishers Scientific


H．W．JOIHINS＇ Asbestos Sectional Pipe Covering


A Non－Conducting Covering for Steam and Hot Water Pipes，etc． Asto日stos BOiler DOVOPings． IE．WV．Jolnine Mianufacturing Company， W．Johns＇Asbestos Millboard，Sheahings，Building Felts，Fire－Proof Paints，Liqu 87 Maiden Lane，New York． CHICAGO．PHILADELPHIA．LONDON．


THE FREY，SHECKLER CO．，BUCYRUS， 0 ．


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


TO BUSINESS MEN
The value of the SCIENTIFIC AMERICAN as an adver－
tising medium connot beoverestimate．Its circulation
is many times greater than that of tany similar iournal







DERFORATED METALS + MINING SCREENS
 GARRINGTON \＆KING PERFORATING © ，CHICAGO．

## SYARCUSE NALLEABE RMDNWORKS

Established 37 years，and at present the largest Elevator Works in the world．OTIS BROTHERS \＆CO．，General Offices， 38 Park Row，New York City，and branch offices in nearly every principal city on the globe．Elevators for Passengers and Freight．They are smooth－running，eco nomical，and above all SAFE．

THE CUSHIMAN KEI DRILL CHUCK


1
JACKET KETTLES，
 HOME－MADE INCUBATOR．－PRACTI




エエ』
Scirutific Americau
ESTABLISHED 1846.
The Most Popalar Scientific Paper in the World． Ont5 83.00 a Year，including iroatage．Weekily．
This widely eirculnied and splendidy illustrated paper is put ist．ed weekly．Every number contains six－
teen papes of useful information and a large number of riginal engravings of new inventions and discoveries． representing Entineering Works，Steam M1．Mininery，
New Inventions．Novelties in Mechanics，Menufnuctures Chemistry，Elecet ricity，Te egraphy，Photography，Archi－ tecture，Agriculture．Hort iculture，Natural History，etc． Complete List of Patents each week．
Ternis of Su bscription．－One
Terins of Su becription－－One copy of the scien－ postage prepaid．to any subscriber in the United States， Canada or Mexieo，on reeelpt of three dollirw by the
publishers；six montis， $81.50 ;$ three months， 81.00 publishers；six months， 8.5 ， 1.5 ；three months， 8.1 .00 ．
Clubr．- special rates for seeveral names．and to Masters．Write for particulars．
The safest wast $\begin{aligned} & \text { remit } \\ & \text { Express } \\ & \text { Ey Postal }\end{aligned}$ Order．Draft，or Express M oney Order．Monay carefully pliced inside
 able to

36IN \＆CO．
361 Broadway，New York． TEIE
Scientific American Supplement．
This is a separate and distinct publication from
THis ScIENTITIC AMERICAN，but is uniform theremith in size，every number containing sixteen large pages full
of encravings many of which sre taken papers，and accompanied with translated descriptions．
 weekly，and includes a very wide rane or contents．It
presents the most recent papers by eninent writers in Cill the principal departments of science and the Natural History，Georraphy，Archæology．Astronomy， Cemistry．Electricity，Light．Heat，Mechanical Engi－
neering．Steam and Railmay Engineering．Mining neering，Stean and Railway Engineering，Mining，
Ship Building，Marine Engineering，Photogriphy，
Techntiog， Technology，Manufacturing Industries，Sanitary En－
 lication．
The most important Engineernng Works，，Mechanioms．
and Manumactures at home and abrosd are illustrated Price for the SUPrIEMENST for the United States and Canada． 85.00 a year，or one copy of the Scientific Am－ ERICAN and one copy of the SUPPLEM LNT，both mailed for one year for 55．00．Single coples 10 cents．Address
and remit by postal order，


Building Edition．
The Scientipic Ambrican architects＇and
 to about two hundred ordinary book papes；forming a large and splendid Magazine of A rchitecture，rich 11 adorned with elegant platese in colors．and with other
Ine engravings ；illustrating
Ine
and Ine engravings；illustrating the most interesting ex－
amples of modern Architectural Construction and allied subjects．
A special feature is the presentation in each number of a variett of the latest and pest plans for private resi－ eratecost as well as the more expensive．Drawings in perspective and in cololo are e iven，together with full Plans，Specifications，sheets of Details，Estimates，etc．
The elegance and cheapness of this magnificent wurk
 newsdealers． 82.50 a year．Remit to
MUN $\&$ CO．，Publishers，

361 Broadway，New York．
PRINTING INKS．


