
a Weekly journal 0f practical information, art, science, mechanics, CHEMISTRY, ani Mantractures. Vol. LXXXII.-No. 22.j NEW YORK, NOVEMBER 27, 1897.

## LENGTHENING A HUDSON RIVER STEAMBOAT.

Whenever the historian shall take up his pen to write the complete story of steam navigation, if he be a fit man for his task, with a due sense is task, with a due sense of perspective and proportion, he will write large and lengthily the chronicles of "steamboating" on the waters of the Hudson River. Here, surely, if anywhere, we must look for the cradle and nursery of the practical steam propelled freight and passenger carryingr vessel ; for when Robert vessel ; for when Robert
Fulton dispatched the Clermont, a 160 ton steamClermont, a 160 ton steam-
er, on its first trip from New York to Albany on the morning of August 7, 1807, he established his claim as the father of the steamship with as much certainty as the Rocket in a later day entitled Stephenson to be called the phenson to be called the
father of the locomotive.

The Clermont was a worthy ancestor to the fleet of truly magnificent boats which have made


BOW VEEW, SHOWING SLIDING WAYs.
the Hudson River service the most famous of its kind in the world. The requirements of the ser vice have produced two distinct classes of boats, those for night service, carrying both freight and passengers, of which the Adirondack, of the People's Line, is the finest and latest example, and another class for day ser vice, represented by the historic Mary Powell and the swift and luxurious New York and Albany, of the Albany Day Line. Each type of boat has been designed with special reference to the necessities of night or day service. The night boats, as exemplified in the Adirondack, are characterized by large freight-carrying capacity, lofty tiers of staterooms for the accommodation of passengers, and a high rate of speed, the boat named having made about 20 knots under fa vorable conditions. The day boats, carrying no (Continued on page 342.3


LENGTHENING A HUDSON RIVER STEAMBOAT-THE HULL PULLED APART-FRAMING THE NEW SECTION.

## Srientifir American.

ESTABLISHED 1845
MUNN \& CO., - - - Editors and Proprietors.
published weerly at
No. 36I BROADWAY, - - NEW YORK.
TERMS FOR THE SCIENTIFIC AMERICAN. (Established 1845.)
One copy, one year, for the U. S., Canada or Mexico...

One copy, six months, for the U. S., Canada or Mexico | . 83.100 |
| :--- |
| .1 .20 |
| 100 | One copy, one year, to any foreign country, postage prepaid, $£ 0$ 16s. 5 d . 4.00 mit by postal or express money order, or by bank draft or check. The Scientillc American Supplement Established 1876)



Export Edition of the Scientifle American




NEW YORK, SATURDAY, NOVEMBER 27, 1897.


## TABLE OF CONTENTS OF

Scientific American Supplement

## No. 1143.

## For the Week Ending November 27, 1897


II. BICYCLEES.-Briges's Bicycle Attachment.- 1 iilustration.............. 182
I. BOTANY AND HORTICULTTERE.-EChinocystis Lobata.-1ii. Benewing Oid Trees.
Tobacco in Germany.
 $\underset{\substack{\text { the } \\ \text { Ev } \\ A N}}{\text { Cin }}$


II ELECTRICITY.-





 old engraving reproduced from a rare work. 1 Illustr
1.1

Selected Formule Hountion Food Preparations
XIII. NATURAL HISTORY.-






## appellate commission report favorably on the

 NEW YORK RAPID TRANSIT SCHEME.The commissioners appointed by the Appellate Division of the Supreme Court to determine whether th rapid transit tunnel should be constructed have filed a report in favor of the building of the road. Every one who is intelligently informed as to the problem of transportation in this city, and is disposed to look at the question from a broadminded standpoint, will be glad to know that this, the greatest and most needed improvement in the history of the city, is now in a fair way to be accomplished. So rapid is the growth of New York that not even the great enlargement of their facilities which the street traction companies are now making can do more than give a temporary relief to the congested traffic. If the present system of elevated roads were enlarged, and the whole two hundred miles of street railways owned by the Metropolitan Street Railway Company were electrically equipped, it would do no more than provide a seat for every passenger in the busiest hours of the day ; and unless the tunne scheme were carried out, it would be but a very few years before the New York business man would be going to and from his downtown office hanging to a hand strap.

The report disposes of the so-called engineering risks and perils, of which the opposition has attempted to make so much, by stating at once that the road as proposed is entirely practicable. The objections raised against the Broadway scheme on the score of encroach ments on vault spaces are, in the opinion of the com missioners, entirely avoided in the Elm Street plans, which call for a fifty foot width, as against a seventy foot width in the Broadway plan. The cost will not exceed $\$ 35,000,000$, and in the opinion of the board $\$ 30,000,000$ will pay for the road.
In regard to the second objection that the road, if built, would not pay expenses, it is estimated that a the Third and Sixth Avenue elevated railroads now carry 390,000 passengers per day, the tunnel road would have a daily capacity of 425,000 . The passenger traffic of the city is increasing at the rate of $20,000,000$ a year, which in the five years that will be consumed in build ng the new road would amount to 300,000 a day mor than are now carried on all roads. This increase, together with the surplus which is now overcrowding the existing roads, should give the new road a full olume of travel.
It is estimated that the income from passenger traffic and advertising would reach $\$ 5,575,000$, and the operat ing expenses, estimated at 60 per cent of the passenger traffic receipts, are put down at $\$ 3,285,000$. The interest on $\$ 35,000,000$, together with depreciation of equip ment and sinking fund payment, would bring up the annual expenditure to $\$ 5,557,000$, or somewhat less than the receipts.
In reply to the statement that the financial condition of the city renders the undertaking impossible, the report quotes the comptroller's testimony that if the assessed valuation of real estate increases as fast in the next decade as it has in the past ten years, it would allow the city to incur an indebtedness of $\$ 135,295,662$ without any reduction of the margin which now exist between its net debt and the limit allowed by law.
We have spoken of the good work being done by the Metropolitan Street Railway Company in equipping its system with the electric underground trolley. Incidentally, a portion of the completed work gives a fair example of what the proposed underground transit will be like. We refer to the portion of the Fourth Avenue line which runs through the tunnel between Forty-second and Thirty-second Streets. The floor was asphalted and the walls and arch were whitewashed just before and after the laying of the splendid track with which the tunnel is equipped. The new cars now pass swiftly and with little noise through an atmosphere that is as pure as the most fastidious could desire, and any one that travels by this route must admit that the discomforts of the proposed rapid tran sit tunnel will prove to be more imaginary than real.

## THE QUEST OF THE NORTH POLE.

In all the recorded history of our race there is nothing to compare with the unfailing persistence with which the quest of the North Pole has been carried on. It is not that men have failed to show perseverance in enterprises of a military, scientific or romantic risk to life and limb; but the fact that renders the search for the North Pole altogether unique and incomparable is the comparative smallness of the result which are expected to crown a successful attempt.
It is not likely that even the most practical anong the many explorers who have set out for the North Pole has expected to contribute to the world's store of scientific knowledge any facts that would add greatly to its sum ; and it is likely that the majority of the explorers who have gone north since the time when the impracticability of a northwest passage was proved have consciously or unconsciously been moved by the pure spirit of daring and discovery, and that spirit of emulation which, properly directed, is one of the most
powerful agencies of human progress.

However, without attempting to analyze the motives which underlie these crusades of the nineteenth cen tury, it must be admitted that their increasing fre quency, their exhibition of courage and unconquerable purpose, and the ingenuity and resourcefulness with which they are in quick succession conceived and carried out, all indicate that man has set his heart resolutely upon reaching the North Pole, and that he is within measurable distance of the day when he will stand there.
The prospects of an early discovery (so called) of the North Pole are rendered more likely by the intelligen methods which are now being proposed for future ex peditions. The work that has been done already has been too much of the nature of a forlorn hope. The mall party that has cut loose from the main expedition, and made the "dash for the pole," has had about as much reasonable expectation of success as would a ingle regiment of an invading army, if it should push ahead and attempt to reach the interior of an enemy's country without maintaining its lines of communica ion with the main body
We publish on another page a timely letter from Timbirsk, Russia, in which the writer dwells upon the positive necessity for systematic and strongly organized advance, if the pole is ever to be reached. The writer in commenting upon Mr. Wellman's proposed expedi ion next year, points out two elements which are liable to bring on failure, one of these being haste and the other national and personal egotism. While the sug gestion that such expeditions should partake of an in ternational character, "accepting both universal sub cription and universal help," is a good one. which, if adopted, would insure the expedition being carried out on the scale which, in our opinion, is necessary to uccess, we think that national and personal egotism has been and will continue to be a 'powerful and per ectly legitimate controlling factor in Arctic explora tion. The element of undue haste, on the other hand has been a fruitful cause of failure. The expedition that sets out deliberately to journey to the pole must place no strict limit to the time which wili be consumed in the effort. The expedition should be considered in the light of a hostile incursion into an enemy's country, where the rate of progress wili be determined by ex pected and unexpected resistance. It should star from a well-supplied base and should maintain a strong line of communications. If there is one thing more than another that the tragic history of Arctic exploration teaches, it is that the northern citadel can never be taken by a dashing assault.
By far the most promising attempt, judged by the tandards abovegiven, is that which will be made by our own distinguished explorer, Lieut. Peary, during the coming year. The plan of attack includes an expedition by ship through Robeson Channel to a point as far north on the Greeuland coast as possible; then an advance of the party of Eskimos, with a few selected white leaders, by easy stages to the northern terminus of the North Greenland archipelago, caches of provisions being established at each headland; aind from this point the inevitable "dash for the pole"-two Eskimos, picked dogs and the lightest possible equipment being taken for the final three hundred miles.
The fact that both Peary and Wellman intend to carry their lines of communication only as far north as the mainland, or archipelago, as the case may be, extends, seems to indicate that, in their opinion, it would be impossible to establish a chain of caches or depots across the sea of ice which encircles, or is supposed to encircle, the North Pole. If it is possible to place a line of depots across the floating ice beyond the land, it seems like inviting disaster not to do so, and one is driven to the conclusion that it is only the increased cost that prevents such a plan from being carried out. If our surmise is correct, the chances of reaching the pole would be very much greater if the two or three separate expeditions which are planned for next year were to join forces, and make the attempt through an unbroken line of communications and on the general lines suggested by Lieut. Peary.

## REPORT OF THE SECRETARY OF THE INTERIOR.

In his first annual report, the Hon. Cornelius $N$. Bliss, Secretary of the Interior, deals at length and in an interesting manner on the condition, work and needs of this department of the government. We give below some of the topics touched upon in the report. In speaking of the devastation of the public domain by forest fires, the Secretary says

There are now existing nineteen forest reservations, embracing lands having an estimated area of $18,993,280$ acres, which from time to time have been set aside by presidential proclamations. Thirteen forest reserves created by proclamation of February 22, 1897, were, with the exception of two in the State of California, suspended by the sundry civil act of June 4, 1897, until March 1, 1898. The suspended reservations contain an estimated area of $19,951,360$ acres. The preservation of the public forests is a matter of vital interest to the entire nation. The enactment of adequate laws fur their protection and the proper enforcement thereof, coupled
with the inauguration of a comprehensive forest system, can only effect such result.
"I most heartily concur in the recommendation of the Commissioner of the General Land Office that liberal appropriations be made by Congress for the forestry service
"Attention is directed to the law, which provides a penalty for the cutting or destruction of live oak or red cedar, or other timber on the public lands. It is open to serious objection, in that it is inadequate for the punishment of offenses to which it relates; it fails to discriminate clearly and justly as to what constitutes a crime with respect to the use of public timber. As this law is the principal penal statute upon which the Land Department has to rely to check the waste and destruction of public timber, its failure to meet the ends desired is a serious matter, and legislation more in accord with the needs of the times should be secured."
Secretary Bliss calls attention to the report of the Commissioner of Pensions, already published, which shows that on June 30, 1897, there were on the pension rolls 976,014 names, an increase of 5,336 during the year. Of these there were 16 widows and daughters of revoluulonary soldiers, 7 survivors of the war of 1812,281 widows of soldiers of that war, 18,994 survivors and widows of the Mexican war, 6,661 survivors and widows of Indian wars, 663 army nurses and 438,064 survivors and widows and children of deceased soldiers and sailors of the war of the rebellion. The latter number represents those pensioned on account of disabilities or death resulting from army and navy service. The number of persons remaining on the rolls June 30, 1897, who were pensioned under the act of June 27,1890 , which allows pensions on account of death and disability not chargeable to the service, was 508,799.
The number added to the rolls during the year was 54,072 , the number dropped from various causes was 41,122 , and the number of claims of various classes disallowed was 76,234 . The amount disbursed for pensions during the year was $\$ 139,799,242.12$, exceeding the amount disbursed during the fiscal year 1896 by the sum of $\$ 1,584,480.18$. During the year 994.454 pension certificates were issued.
The Secretary indorses the recommendation of Commissioner Evans for the passage of a law providing that no pension shall be granted to the widow of any soldier who shall hereafter marry. As to the status of pen sion claims generally, he says

There are about 200,000 pension claims awaiting adjudication, and it is estimated that 40 or 50 per cent thereof will be finally admitted. If these claims are rapidly adjudicated, they will swell the pension rol from $\$ 5,000,000$ to $\$ 7,000,000$.
The receipts of the Patent Office during the fiscal year exceeded the expenditures to the amount of $\$ 317,135.05$, and the money covered into the Treasury from fees in patent cases from July 4, 1836, when the office was created, to June 30, 1897, in excess of the amount expended, reached the sum of $\$ 5,093,614.23$. A greater number of applications for patents were in the
during the year 1896 than in any previous year in the history of the Patent Office, and yet the number filed history of the Patent Office, and yet the number filed
during the first six months of 1897 has exceeded by more than 7 per cent the number received in the first half of 1896. From January 1, 1897, to June 30, 1897, there were filed 25,559 applications. During the same period the total receipts of the office were $\$ 722,897.47$ a gain of $\$ 102,015.50$ over the six months immediately preceding. These figures are used as a basis for a recommendation for increased clerical force and office accommodations.
the american beet sugar industry

## (Continued from page 323.)

To sum up, then, nearly seventy years of experiment in the beet sugar manufacture in the United States has brought the industry to such a point that we can pro-
duce in one year only enough to supply the nation's requirements for about a week. Europe, on the other hand, long ago began to export beet sugar, Germany alone sending us last year some 800,000 tons, or about twenty times our home production. That we have not made better progress in so long a period is due to no climatic obstacles. We have a sugar beet belt stretching from ocean to ocean and of no mean width, inferior in few parts to Europe and in some sections surpassing its most favored beet districts in both soil and climate. The early failures must therefore be ascribed to a want of thoroughness on the part of the pioneers, due to inexperience and a lack of sufficient capital. Theirs was no easy road to travel, and it would have been nothing short of marvelous had they succeeded in securing an immediate foothold for a new manufacture and an un tried crop.
This applies to all the failures recorded down to 1890. The plants were not only located unwisely, but were to Sinall to then two factories have been thoroughly unsuc Since then two factories have been thoroughly unsuc-
cessful. The one at Staunton, Virginia, was destroyed by fire after it had been operated on a small scale, and made a very little raw sugar, and the one at Menominee Falls, Wisconsin, was not completed until towar
the end of last winter, by which tine the siloed beets, none too rich in the beginning, had so deteriorated in
sugar content that they could not be worked up with profit, and the result was the failure of the sugar com pany. Neither one of these failures however, is any proof that the States of Virginia and Wisconsin are unsuited for sugar beet culture. On the contrary, experi ments with the crop in various points of these State indicate that they both have desirable sections for the establishment of beet sugar factories, but any resump tion of the industry must be on a larger scale, with enough capital behind the scheme to tide over the agricultural uncertainties of the first year or two. Of the other plants mentioned, none can be called a dis tinct failure, because they are still running, although some of them have not been as profitable as was ex pected when they were built. All of them had their trials at the start, and it may be said that for some years to come the first campaign or two of a new factory will not be free from tribulations of one kind or another The oldest of them, which is operated by the Alameda Sugar Company, at Alvarado, California, achieved success only after a long uphill struggle occasioned by lack of capital and the difficulties of establishing a new branch of agriculture in a country only partially de veloped. Those behind the project chose their location wisely, and to this choice and their close study of the situation of the industry must be attributed the stable foundation of beet sugar manufacture in this country. Coming later, as it did, the Watsonville fac tory, which was recently purchased by the American Sugar Refining Company (at a figure said to be 300 for the capital stock), had its way in a measure paved for it, but still had its pioneer work to accomplish. The next plant to be installed, that of the Oxnard Beet Sugar Company, at Grand Island, Nebraska, profited in a measure by the work of its predecessors, and yet, with the untried prairie to conquer, it had obstacles that were unique. This and the one built by the Norfolk Beet Sugar Company, at Norfolk, in the same State, a year later, have had on the whole unprofitable areers, though each succeeding season has undoubted ly brought them nearer to the desired goal. Drought excessive rains at the wrong periods, the failure of both the State and nation to redeem promises of protection by bounties, and the inability during the earlier years to convince the farmers that beets could be grown profitably at the prices offered-all made the progres of the industry in Nebraska exceedingly uphill work. The Chino factory, built by the Chino Valley Beet Sugar Company, also suffered from drought and the loss of federal bounty and was obliged to endure bad easons before it attained the great prosperity that ultimately came to it. At Lehi, the plant of the Utah Sugar Company likewise failed to profit long by the
McKinley bounty, and while drought was conquered by McKinley bounty, and while drought was conquered by
irrigation of the crop, the use of water at first made the beets somewhat low in sugar and purity. How ever, an American-built factory that could be run eco nomically, very conservative management and the o-operation so characteristic of the Mormons, hav made the course of this factory perhaps the smoothest fall. It certainly has lost nothing, even if it has not made a fortune in the six campaigns of its history Comparatively smooth, also, has been the brief histor of the plant of the Pecos Valley Beet Sugar Company at Eddy, New Mexico. It probably had the least un successful first campaign of any of our beet sugar fac tories, irrigation securing for it a fair sized crop of ex traordinarily rich beets that but for the difficulties en countered in working it up would haverealized a handsome profit. So then, to sum up the general history of the sugar beet in the United States, whatever failures there are to record may be set down to the natural obstacles that lie in the path of any new industry of such great magnitude and importance, and, far from imped ng its progress, have helped to place it on a sounder basis To-day beet sugar manufacture in this country is an established success, even if-as has been stated-nearly seventy years of experiment have given us but nine fac tories to work up this season's crop.
As for the future, what with the protection that the Dingley act gives sugar, and the growing desire of farmrs to familiarize themselves with the culture of the sugar beet for manufacturing purposes, it is full of ope. It would be more than desirable to have this country eventually produce all the sugar that it con umes, and it is because of the possibility of some time bringing this about that the new industry is looked
upon with the greatest favor and interest; for, with the cane belt so restricted to a few States that it may never have an annual output of more than a quarter of our present consumption, everything depends practically upon the sugar beet. Allowing for the cane crop of the Southern States and Hawaii (the latter must be ncluded, as it enters free of duty), we should require some 350 beet sugar factories, each with a daily capaci ty of 500 tons of beets, to manufacture the sugar tha we now import; and, considering the rapid growth o this nation, before the erection of so many expensive plants could be brought about, it can readily be seen
that there will be little danger of over-production fo years to come. Thus far, California has shown the
greatest development. Its four factories will, this sea son, turn out about two-thirds of all the beet sugar made in the United States, and, if the various project in the air materialize, another year will see an immense increase in the output of this State.
Claus Spreckels is building at Salinas a plant which it is claimed will have a daily capacity of 3,000 tons of beets, thus exceeding by about 500 tons the largest one n Europe. Rumor has it also that one of the suga king's sons is about to build a big factory, and that still another for both beets and Hawaiian raw sugar will go up at Crocketts.
The special advantages of California are several. In the northern part, where the Watsonville and Alvarado plants (both within 100 miles of San Francisco) have shown the best average results thus far obtained in this country. the soil and climate possess not only the best qualities of Europe-excellent beets growing hand in hand with very high tonnage-but it is surpassed one important respect, the short winter season per mitting planting to be distributed over a long period and harvesting prolonged, without danger of killing osts.
Southern California makes even greater claims for superiority. It has a wealth of sunshine, considerable moisture from sea and mountains, and a goodly stor of subterranean water, but is not drought-proof, and may eventually be obliged to irrigate certain of its lands. However, six years of work at Chino have proved the possibility of raising big crops of rich beets here in an average season, and that the wiseacres wh insisted that proper culture was practicable only in a
temperate climate were greatly mistaken. Therefore, temperate climate were greatly mistaken. Therefore,
unless other difficulties arise, the Chino and Los Ala unless other difficulties arise, the Chino and Los Ala mos plants-each 30 odd miles from Los Angeles-ar
the nucleus of what is destined to become a big suga producing district.
Meanwhile, New Mexico is running after California's aurels. Last season, at Eddy, the average sugar and purity of the beets were unprecedented, and with bundant water supplies for irrigation purposes and sunshine 300 days in the year, the pioneer manufac turers in that territory firmly believe that they have found the ideal section of the United States for beet culture.
A new 500 ton plant is talked of at Roswell, 75 miles north of Eddy, and as soon as the country thereabout becomes a little more thickly populated, there is ever eason to believe that beet sugar will be a staple pro duct of New Mexico
In Utah further development will probably be quite slow. There is plenty of land in the valleys, and that irrigation would render suitable for beet culture, but lacking, as it does, the continued sunshine of the South, it is still questionable whether the application of water in this way can be so regulated as not to keep the sugar and purity down to a rather low point.
Nebraska, also, is not likely to show rapid or imme diate progress in the industry. Drought and the lack of sufficient surface water to make irrigation practicable debar a considerable portion of the State from profitable agriculture, and, while eastern Nebraska has some very fine sections of land that in a normal year can be depended upon for crops that will compare favorably with Europe, the general results have not been good enough to warrant anything but most cau tious progress. Two of the most desirable sites are now looking for a factory, and if such a one wer built of not less than 500 tons capacity, it could, with out doubt, be made to pay well.
To sum up, therefore, the future of the industry in California and New Mexico is quite rosy; in Nebraska and Utah it is somewhat problematical, though by no means dark; while New York, being about to engage in its first practical test, is as yet hardly a fit subject for prophecy. It may be said in its favor, however, that it seems to have an abundance of good beet land, climatic conditions that are all right, if rains are not too heavy at harvest time, a class of farmers that are more used to the intense culture that the beet requires than those west of the Mississippi, and, lastly, very cheap coal and other important supplies.
So far as other States of the Union are concerned several of them promise well, judging by the reports from agricultural experiment stations and test patches of farmers-Iowa, Minnesota, Michigan, South Dakota Indiana, Colorado, Washington and Arizona having shown very satisfactory analyses. None of these, however, is likely to enjoy any immediate boom as a sugar State.
The eyes of capitalists are, for the present, turned upon California and New Mexico, and until they have their quota of beet sugar factories, it looks as if the progress of the industry in other States would be slow, unless local capital takes the thing in hand, as has been the case in Utah and New York. In other words, while the industry is bound to develop, and develop with as great rapidity as proper caution will allow, the capitalist who has half a million dollars or so to invest in a beet sugar plant will naturally choose what seem to be the most favored spots, so long as they last, and profit by the pioneer work of others, rather than un dertake it himself.

## an improved gas burner.

The illustration represents a gas burner provided with an automatic gas stop or cut-off, whereby, should the light be accidentally extinguished or blown It is also provided with a controller to gage the size of the light, and means for locking the fixture so that it cannot be used for unauthorized purposes. The improvement has been patented by Horace W. Billington, of No. 565 Jersey Avenue, Jersey City, N. J. The base of the burner is spherical, on this portion being


## billington's gas burner.

crewed a neck, with which the tip is removably connected, the hollow base where the gas first enters forming a receptacle to receive and hold all impurities, which may be cleaned out occasionally through an opening at the bottom. In the portion of the neck which joins the lower part of the burner is a fixed perforated disk, whose openings correspond with similar perforations on a lower revoluble disk on a rod or key, on whose lower end is a turning knob, while on the upper end of the rod is a crank whose upright member is finely pointed, and adapted to engage one of several apertures in a locking disk, as indicated in the sectional view. A spring attached to and coiled around the key rod is also attached by its other end to the inner surface of the hollow base. In the lower portion of the tip is secured a spider, through which and through an upper guide spider a hollow rectangular copper rod extends upward to the inner face of the burner tip, where it is connected with the apertured cap, a spring around the rod bearing against the two spiders, and the lower end of the rod being connected with the apertured locking disk, preferably made of steel. When the key is turned to bring the cut-off disks in registry and the gas is ignited, the copper rod is expanded, bringing the locking disk downward, so that the fine point of the crank arm of the key rod will enter one of the apertures of the disk, and the key will thus be held open, the locking disk thus also forming a controller to gage the flow of the gas. Should the flame be accidentally extinguished, the cooling of the copper rod and its consequent expansion, assisted by the spring within the tip, causes the lifting of the locking disk and the freeing of the key, when the cut-off disks move to non-registering positions, and prevent the further flow of gas. Provi-
sion is made to lock the fixture against unauthorized use, by means of a spring and a corresponding opening in the meeting faces of the cut-off disks, it being thus possible to turn the lower disk by means of the key to a locking engagement, such lock being released by passing a rod of the necessary shape through an opening in the neck portion of the burner to depress the spring.

## AN IMPROVED AUTOMATIC WEIR.

The illustration represents a weir arranged to open and close automatically according to the amount of water passing down the waterway, to always retain the desired amount of water and permit a ready discharge of the surplus. Between suitable side abutments, and on top of a foundation in the bed of the waterway, are secured longitudinal I beams, the space between being secured longitudinal I beams, the space between being
filled in with cement or concrete, and on each of the beams a vertical rib is fastened by angle irons. A series of gates extend across between the abutments, rearwardly inclined and normally resting with their lower edges on the bottom of the weir, each gate having in its lower portion one or more slots adapted to straddle the vertical ribs. The gates are mounted to swing at the rear on a series of curved rider plates, one of which is shown in Fig. 2, these rider plates being bolted to opposite sides of each vertical rib, and there being also on top of the ribs horizontal angle irons, forming a rest for the gates when they curve from a vertical to a hori zontal position. On the back of each gate is a reinforcing plate, adapted to ride on the rider plates, and the gates carry keepers, which inclose the rider plates, preventing the accidental displacement of them. If the height of the water to be retained is equal to the height of the gates, they press, with about one-third of their height from the bottom edges, against the rider plates, as shown in Fig. 3 : and if the height of the water increases beyond the limit, the pressure on the upper portion of the gates causes them to turn on the rider plates, the gates opening proportionately to let one-half of the surplus water over the top edges of the gates and one-half under the bottom edges, as shown in Fig. 1. The gates change their resting point on the rider plates, moving upwardly and rearwardly, accord ing to the pressure of the surplus water, and when this has been discharged and a normal pressure again prevails, the gates return to their first position
To facilitate opening the gates when water is not de sired, their upper ends are connected by chains with drums on a transverse shaft at the rear, the shaft hav ing at one end a bevel gear with a worm on a vertical shaft to be turned by a handle. The several drums are locked to the shaft by clutches, which may be moved into and out of engagement with the drums by trans versely sliding rods connected with a link under the control of a gateman on one of the abutments When the gates move to a horizontal position, hooks on their upper ends engage pins on the vertical ribs, and the hooks may be disengaged by rods sliding on the ribs, and pivotally connected with arms on a shaft in brackets attached to a runway or gang plank, extending from one abutment to the other in the rear of the gates, one end of the shaft having a lever, by which the gateman may simultaneously throw the several hooks to unlock the gates and return them to the normal upright position. The main principle in the construction of this weir is that it is designed to retain the water to the full height of the gates when the pressure is in equilibrium, the weir commencing to discharge when the water rises above this point. The point of support of the gates changes according to the height of the water, and the gates come back again to their lowest resting point on $t h e r i d e r ~ p l a t e s$ when the excess of water is discharged.
This improvement has been patented by Mr. G. Ludwig Fuchs, of Meiningen, Germany, and further information relative thereto may be obtained through Mr. Ern esto Fuchs, Ciu dad Lerdo, Mexi co. The construc tion of the weir is especially adapt ed for streams, rivers or creeks where water is to be retained to a certain level for hydraulic power
or for irrigation
purposes. It is also designed for use in rivers where large amounts of ice or floating obstructions may injure a weir, in which case it is provided in front of the ribs with a grate that allows the gates to perform their ac tion without allowing any obstructions to go underneath the lower part of the gates, but forcing such obstacles to go over the weir without causing injury to its con struction. Where sudden floods come, the gates work automatically to release the surplus water without the supervision of a gateman, and the practical working of the weir is designed to keep the river bed clean, as in floods all the sediment, which would accumulate before a dam made of mason work, is carried down.

## A COVER FOR MUCILAGE RESERVOIRS.

The appliance shown herewith is especially designed for use with bottles having a vacuuin reservoir within which the liquid is retained by air pressure, a fount or cup being connected with the reservoir by a passage a the bottom. The improvement has been patented by Truman S. Lewis, of Waterbury, Conn. (Box 823), The larger view shows the device with the cover thrown back, the small figure showing it in section with the back, the small figure showing it in section with the
cover closed. A connecting passage opens from the cover closed. A connecting passage opens from the
bottom of the reservoir into a well or cup in front, and the cover is pivoted to a band which surrounds the lower portion of the bottle, the lower portion of the cover having a projecting arm to engage the side of the bottle, and keep the cover from being thrown too far back. On the inside of the cover is an outwardly extending downwardly bent arm carrying a small bucket or cup, which is immersed in the mucilage when the cover is down, and on the inner side of the reservoi is a groove adapted to receive the handle of a brush placed in the cup. When the cover is thrown back, as shown in the main view, this cup then acts as a brush wiper, but when the cover is closed the brush is kept constantly immersed, with the cup, in the mucilage, so that the evaporation is not great, and the brush and


LEWIS' COVER FOR MUCILAGE RESERVOIRS.
its supporting cup are constantly kept moist, prevent ing the edges of the reservoir and brush from becoming gummed up.

The World's Production of Coal.
The following table has been compiled by Dr. E. WV. Parker, of the United States Geological Survey, giving the coal output of the principal countries for the years nearest 1896 for which figures could be obtained. The table will appear in the Report of the Survey for 1896 The long ton is, of course, 2,240 pounds and the shor ton 2,000 pounत̄s.

| Country. | Usual unit in producing country. |
| :---: | :---: |
| Great Britain (1893), long to | . 195,361,2 |
| United States (1896), long tons. | 171,416,390 |
| Germany (1896), metric tons. | 112,437,741 |
| France (1896), metric tons. | 29,310,832 |
| Austria-Hungary (1895), metric tons. | 32,654,777 |
| Belgium (1895), metric tons. | 21,213,00! |
| Russia (1896), metric tons. | 9,079,138 |
| Canada (1896), short tons. | 3,743,034 |
| Japan (1893), short tuns. | 3,400,000 |
| India (1895), long tons | 4,441,890 |
| New South Wales (1895), long tons. | 3,737,536 |
| Spain (1896), metric tons. | ... 1,878,399 |
| New Zealand (1894), long tons | 719.546 |
| Sweden (1895), metric tons. | 223,652 |
| Italy (1895), metric tons. | 305,321 |
| Transvaal (1895), long tons | 1,152,206 |
| Queensland (1895), long tons. | 322,97\% |
| Victoria (1895), long tons. | 194,171 |
| Natal (1895), long tons..... | 153,951 |
| Cape Colony (1895), ong tuns | 87,985 |
| Tasmania (1895), loug tons | 36.856 |
| Other countries. | 2,000,000 |
| Total in English tons. |  |
| Percentage of Great Britain |  |

The total under "other countries" includes China Turkey, Servia, Portugal, United States of Colombia, Chile, Borneo and Labuan, Mexico, Peru, Greece, etc.

## MOULDS FOR SOLDERING PIPES

The apparatus represented in the accompanying figure consists of a bronze mould formed of two pieces opening through a hinge, and which is fitted either horizontally or vertically to the extremities of the two lead pipes that it is desired to solder together. For vertical pipes a special hopper is provided. It is necessary to scrape and carefully prepare the extremities of the pipes to be united. Then the mould is heated and fixed to the latter. After this the molten lead, which has been raised to a red heat, is poured in. In this way there is obtained a very clean joint with out any burrs. It is to be remarked that only lead is employed, instead of the soft solder used with the soldering iron and lamp.
These moulds, due to M. Tye, permit of soldering more rapidly and surely than with the ordinary process, and of effecting a considerable saving, resulting from the difference in the cost of the material and diminution in manual labor. These apparatus are made in several series, varying according to the external diameters of the pipes. They can be arranged for uniting pipes of different diameters and for soldering two pipes at right angles, and either horizontal or vertical.-La Nature.

## BORING OIL WELLS AT SEA

The early settlers in California were familiar with the indications of oil, which were common at various localities up and down the coast, and the asphaltum from beds in the sea, where this product oozed up out of the bottom, formed an important factor in the household economy of the ancients. In almost every burial place on the coast asphaltum is found. The natives employed it to mend objects which were broken, and as a base in which to place ornamental pieces of pearl mosaic ; baskets were fastened to ollas by this means, and it was used for endless purposes in lieu of nails, cordage and glue. The natives on the islands obtained their supply from the water, and today the rocks at various places can be seen splashed with asphaltum which has drifted in. This is particularly noticeable after an east wind, showing that there is a large area in the deep Santa Catalina channel from which asphaltum oozes up. Off Redondo Beach, Los Angeles County, it is extremely troublesome, oozing out of the sand offshore and drifting in. Between Santa Monica and Los Angeles there are undoubted deposits, and north of Santa Barbara several enormous ones. That owned by the More estate extends some distance alongshore, so that vessels run in and the asphaltum is shoveled aboard. The quality, it is said, is quite equal to that of the famous Trinidad variety.

At Santa Paula, oil wells were long ago developed, and later the oii-producing belt was found at Puente, and again at Summerlan 1, below Santa Barbara, where a singular state of a faire may be seen. That the oil-bearing strata reached out irto the ocean soon became apparent at Summerland, and the drill scaffold-
ings, looking like windmills without the wheel, began in a short time to extend down the little cañon which they had filled and to creep up the shore in the direc tion of Santa Barbara. At first, as shown in the ac companying illustration, they kept along the sides of the hills which breast the ocean here, but gradually they turned seaward, until one more adventurous than the rest rose from the water. The work was started at extreme low tide, and finally the tall scaffolding ap peared twenty or thirty feet from shore, seemingly ris ing from the sea.
The illustration shows the location of three wells, which at low tide are in the water and at flood tide are


MOULDS FOR SOLDERING PIPES
completely surrounded, the men working on platforms of various heights which they ascend when working a the sea rises. The structures that are built in the sea have not yet experienced a strong southwester, and it is assumed by some that there wil. be a fall in oil when a heavy sea begins to break against the scaffolding The drill is worked in the water by an engine on th beach, the fuel being the oil pumped up: this engine working several wells. At present the most daring well scaffold stands in six feet or more of water at high tide, and there is rumor that others will be pushed out into the shallow water near the kelp beds. This is probably the only place where oil is pumped out of the ocean. Undoubtedly the entire coast in this vicinity overlies an oil-producing stratum. Off what is known as More's wharf, half a mile out, oil rises to the surface in several places. A spring of water also rushes up here with such velocity that it can be taken up and used if one does not mind a slight intermixture of salt. A similar spring is known on the Florida coast, where it A is said that a vessel can lie alongside the great rus
of water and fill her tanks with fresh drinking wate out of the ocean.
Probably one of the most extraordinary sights of oil wells is seen in Los Angeles. Oil was first discovered in the west portion, in what was considered a choice residence part of the city, but like magic the lighthouse ike scaffoldings began to rise until the land appeared fairly to bristle with them. Fine residences wer ruined by the proximity of the unsightly objects, and finally, the section was given over to them, and now resembles certain sections of the oil region in Pennsyl vania. See the Scientific American for July 17, 1897 The wells have advanced in a well defined tract in a northeasterly direction, and at present appear to be stopped by the large Catholic cemetery, which over lies the oil-producing strata. Not far distant is the Los Angeles River, which probably will ultimately be encroached upon and made to give up its hidden riches.
The discovery of oil in and about Los Angeles bids fair to revolutionize certain lines of business, and prom ises to produce the long wished for power for manufac tories. The Terminal Railroad has adopted the oil as fuel, and the Southern Pacific is said to be experiment ing in the same direction
California is without deposits of coal, if we excep lignite beds, which crop out in various places, so that oil, as fuel, will supply a long felt want, and become a factor in the rapid development of this growing city

## Reported Discovery of Strontium

The discovery of a large bed of strontium at Put-in Bay Island, reported from Toledo, has awakened a considerable amount of interest among the manufac turers of fireworks, as it is thought likely that it wil result in a considerable reduction in the price of a fireworks in which strontium nitrate or strontium car bonate is used. One large manufacturer of firework in New York, who makes use of about one hundred and fifty tons of strontium nitrate in a year and imports the whole of it from Europe, states that it cost his firm now about seven and a quarter cents a pound If the strontium should be found in large quantities, it would have the effect of lowering the cost of certain classes of fireworks, that is, all those that use a red or crimson light. At present the supply comes chiefly rom Germany, and the American manufacturer has to pay a high price for it.

On the approach of a thunder storm French peas ants often make up a very smoky fire, says Industrie and Iron, in the belief that safety from lightning is thus assured. By sonie this is deemed a superstition, but Schuster shows that the custom is based on reason, nasmuch as the smoke acts as a good conductor for carrying away the electricity slowly and safely. He points out that in 1,000 cases of damage by lightning 6.3 churches and 8.5 mills have been struck while the number of factory chimneys has only been 0.3 .


LENGTHENING A HUDSON RIVER STEAMBOAT. (Continued from first page.)
freight, have no sleeping accommodation, and are built with the sole object of giving the traveler a swift passage with every possible facility for seeing the beauties of the Hudson River. As compared with the night boats they sit low in the water, and one misses the towering superstructure, the dining saloons, parlors, etc., being all contained on the main and upper decks. They are distinguished by the extreme fineness of their lines and a general rakish and yacht-like appearance that is not belied by the speed of 23 miles an hour of which they are capable under favorable conditions.
The twin boats of the Albany Day Line were built with the object of enabling the tourist to leave New York at a reasonable hour in the morning and reach Albany in the early evening; or, should he prefer it, to make the round trip between New York and Poughkeepsie between nine in the morning and half past five in the evening. As the distance is 150 miles, and the current varies from one to two and a half miles an hour and seven different landings have to be made en route, the actual speed of these boats has frequently to be maintained at 20 miles an hour to enable them to make the run within the nine hours. This large reserve of power enables them in cases of emergency or delay to run up to 23 miles an hour, and herein lies the secret of the remarkable regularity with which the landings are made. This is seen at Poughkeepsie, where the passengers that are making the round trip are timed to land five
the radial type, at once absorbs much of the engine power and sets up an uncomfortable vibration in the boat. Steam is supplied by three return-flue boilers $1 / 4$ feet diameter and 33 feet long.
As the boat is designed for giving full opportunity to see the beauties of the river, the saloons and private parlors on the main and upper decks are liberally supplied with glass, the partitions between the windows being kept down to the lowest practicable limit. A special feature, borrowed no doubt from the railroad observation car, is a set of private observation parlors, located just forward of the paddle boxes, the fronts of which consist of large plate glass bay windows, which reach from the ceiling almost to the floor. Taken altogether, the New York, with its long unbroken lines of hull and superstructure, its double row of continuous plate glass windows, its shapely paddle boxes, and its pale, buff-colored smokestacks standing three abreast, is as dainty and picturesque a piece of naval architecture as can be seen anywhere in American waters.
The sister ship, the Albany, which was built in 1880 , was lengthened 30 feet during the winter of 1892 , and the results were so satisfactory that the company recently determined to make the same addition to the length of the New York. The operation of cutting the hull of a vessel in two, hauling it apart, and building in a new section at the point of division, is a delicate operation that calls for the best skill of the shipbuilder. The Albany was sent down to Wilmington to be lengthened; but it was decided that the local ship-
and was carried entirely by the ways. The pulling apart of the hull was accomplished by means of four $13 / 8$ inch chains, a pair of 5 inch manila ropes working in fourfold blocks, and a couple of steam winches located at the head of the dock. A chain was led through the hawse hole on each side at the main deck and wound around four successive bitts so as to secure a thorough distribution of the strain. Just in front of the stem they were lashed together, and made fast to a pair of fivefold blocks. The inshore blocks were connected to $13 / 8$ inch chains, which were led back through one of the dock buildings and secured to a $12 \times 12$ stick of timber placed on the outside of the building at the ground level. The falls of the tackles were led to a pair of steam winches. In cutting apart the iron hull, all that was necessary was to cut off the rivet heads and knock out the rivets. This was done in every case at the original butts. The three decks, partitions, guards, and sponsons, were then sawn through and everything was now ready for the pull. At a given signal the forward half of the boat, weighing 350 tons, began to move slowly and steadily forward, and in exactly 5 minutes and 30 seconds it was stopped precisely at the measured mark, thirty feet ahead on the ways. Mr. W. D. Dickey, the superintendent of the Dry Dock Company, stood on the floor of the dock under the bow and directed the enginemen at the winches by sig nal what was $t$, be done. When the two portions of the boat were lined up with fine piano forte wire, it was found that one side of the bow had to be raised only ${ }_{16}^{\frac{3}{6}}$
 in pull inq-apart Steamboat "New York"at Erie Basin Dry Docks Brooklyn Nov $12{ }^{21} 1897$


## METHOD OF SEPARATING THE TWO SECTIONS OF STEAMBOAT NEW YORK.

minutes before the arrival of the return boat from Albany. The transfer is made with unfailing regularity. The New York, which forms the subject of our front page illustrations, was built in 1887 at the yards of the Harlan \& Hollingsworth Company, Wilmington, Del. Her dimensions are as follows :

| Length on water line | 301 feet. |  |
| :---: | :---: | :---: |
| Length over all. |  |  |
| Breadth of beam, moulded. | 40 |  |
| Breadth of beam, over guards. | 74 |  |
| Depth, moulded | 12 | 3 inches. |
| Draught. | 6 " |  |
| Tonnage (net 109181) | 1,552 |  |

The hull is built of iron, and everything was done to cut down the weights and secure the light draught which is necessary for running at high speed over the shoals of the upper river. The frames, which are spaced 2 feet apart, are 4 inches by 3 inches by 7-16 inch; the reverse bars are $21 / 2$ inches by $21 / 2$ inches by $5-16$ inch; the stringers are 4 inches by 3 inches by $3 / 8$ inch, and the floors 16 inches by $3 / 8$ inch. The shell plating is $3 / 8$ inch throughout, except the sheer strake and garboards, which are $1 / 2$ inch and 7-16 inch respectively. The hull is divided into four watertight compartments by bulkheads, which extend to the main deck and are free from doors or passageways, the compartments being entered by stairways from this deck. The boat is driven by a standard American beam engine of 3,850 horse power, with a culinder 75 inches diameter by 12 feet stroke, provided with a Stevens cut-off. The 30 foot paddle wheels are of the "feathering" type, in which the steel buckets enter and leave the water perpendicularly, and thereby avoid that beating of the water which, in wheels of
yards were quite equal to a task of this kind, and ac解 the dry at the Erie Basin. He keel blocks and bilge blocks in the usual manner. It was decided to cut the hull at a point between the engines and boilers, and the first step was to build launching ways beneath the the first step was to build launching ways beneath the
forward half of the hull, and transfer to it the load that was carried by the blocks. The accompanying diagram, which has been prepared from drawings furnished by the John N. Robins Company, shows in detail the construction of the ways and the rigging of the gear with which the vessel was pulled apart. The fixed ways, which were 10 inches deep by 14 inches wide, wer laid upon blocking on the floor of the dock and wel shored guide pieces were spiked to the outside of these ways to keep the sliding ways in place. The latter were built of $6 \times 14$ inch timbers and were tied to gether with $12 \times 12$ transverse timbers at regular in tervals. The space between the transverse timbers and the floor of the hull was filled in with blocks and wedges, and at the forward end shoring pieces were the taper of the bow. The length of these ways wa 102 feet, and they were placed 10 feet 9 inches apart in the clear. At a distance of 3 feet 9 inches on the out side of the main ways, a pair of additional ways were built to take the weight of the boilers. The rubbing surfaces of the ways, which of course were planed and smoothed, were freely lubricated with a mixture of tallow and fish oil. When everything was completed, the wedges were gradually driven home until the weight had been lifted from the keel and bilge blocks
of an inch and the stem jacked over about an inch-a highly creditable result. During the building of the ways, the fifteen frames for the new section of the hull had been made in the shops to model. The work of carrying them into the dock and putting them in place was done by hand, as shown in the engraving. It commenced on Saturday morning, and by noon of the same day the work was in frame. The raming and plating is similar to that of the resto the hull, with the exception of two additional sister keelsons of $3 / 8$ inch plate, which are spaced about 16 feet apart.
The owners of the shipyard are to be congratulated on the rapidity and success with which this novel and difficult piece of work was done. The work of cutting the rivets was started at 1 A . M. Thursday, November 11, and completed that night. The ways were completed by $3: 30$ P. M. on Friday, and the hull was in frame by noon on Saturday, the total working time be ing $171 / 2$ hours. It is expected that within 15 days from the time the boat was docked, the new hull and the main deck work will be completed.
It is estimated that the additional buoyancy afforded by the new section of the hull will lighten the draught by $51 / 2$ inches. This, on a model of such great beam and fine lines as the New York, will give her an easier waterline and will, if anything, increase her speed However, as the lengtleening was undertaken with a view to increasing the passenger accommodation which at present is 2,500 , it is probable that with a larger load the speed will remain at 23 knots with orced draught or 20 knots under ordinary working conditions.

## Sorrespondence

## Increase of the Artillery Force.

To the Editor of the Scientific American :
Referring to the article upon sea coast defense in your number of November 13, in which mention is made of the large number of men required to man the guns which will be required, your correspondent begs leave to make the following suggestion
After retaining at each post the minimum of regu larly enlisted men necessary to keep the armament in order, let the full fighting force required be enlisted in the vicinity under the following conditions
The men to serve, with pay, for a stipulated time each year, during which time they will be instructed in their duties. During the remainder of the year, except in time of war, the men to remain at their homes, without pay, subject to call when needed.
By selecting the time of service when little labor on the farm is required, an abundance of the very best material would be secured, men who would be glad to remain in the service for years, and who would be available at any time on a day's notice
Such a force woula be brought under the best possible influences for making them do their duty gallantly, for they would be fighting directly in defense of their homes under the very eyes of their friends and neighbors.

While the efficiency of this service would be equal if not superior to any other, the cost would be far less, and the money expended would go into the pockets of thrifty, worthy people, where it would do the country some good.
A similar plan is now followed in the life saving ser vice, the men serving, on pay, for certain months of the year only, and where could a finer body of men be found than these? Wm. W. Blackford.
Lynnhaven, Princess Anne County, Va.

## Organized Arctic Exploration.

To the Editor of the Scientific American
In the number for September 25 of your valued paper I find a note on Mr. W. Wellman's proposed polar expedition.
Mr. Wellman's plan in so far coincides with what I have long considered to be the only rational solution of this problem that I am encouraged to offer a few general suggestions that may, perhaps, elicit a broade discussion of this interesting subject.
I quite agree with Mr. Wellman that up to this time all attempts to reach the north pole were dashes. Therein, in my opinion, lay the ultimate cause of their failure. I am certain that if half the energy, patience and money spent in organizing polar expeditions in this century had been applied to systematic advance, the north pole would have been reached many years ago. I shall not spend time in analyzing the psychical mo tives that led Franklin, Dr. Kane, Peary, Nansen and all the host of polar explorers to prefer individual feats of nearly superhuman exertion to a steady and, possibly, international action in this direction. Very probably the main reason can be found even in Mr Wellınan's words: "I am eager
to plant the American flag," . . etc. The world at large ha gained very little by following this plan, and many brave men and valuable lives have been sacrificed without any real necessity.
When we come to think quietly over the matter, it is difficult to see any necessity in reaching the north pole at a jump. In all probability, if even the jump is successful, the happy individual who succeeds in alighting on the spot " whence there is no direction but strain of his feat that he will have no more energy left for steady exploration and observation that can left for steady exploration and observation that can
alone $k e$ of any real use to science or humanity. All alone $k e$ of any real use to science or humanity. All
the remnant of his courage and physical endurance will necessarily be employed in attempting to jump home again.
Mr. Wellman's plan seems to me the first step in the true direction; unfortunately, I see in the plan as it now stands two elements that can bring on failure where success should be certain. One of these elements is haste and the other national and persona egotism. If, instead of fixing a term of three years Mr. Wellman had not put any limit to his work, and if,
instead of packing up only the gallant "stars and stripes," and refusing "public subscription and uni versal consent," he would take the international flag "Excelsior" and accept both universal subscription and universal consent, his ultimate success would, I am confident, be a matter of certainty and not of doubt. Private means and private energy may, certainly, cover the expenses and furnish the exertions of found ing two or three supply stations and undertaking a three years' expedition toward the pole, but they can hardly suffice to bring that enchanted spot within th reach of continuous scientific research.
I think that the north pole should be and can be reached only by a continuous chain of stations, placed " not two or three degrees," i. e., 30 or 45 geographical miles, apart, but within an easy day's journey
from each other ; say at a distance of 15 or 20 kilometers. At intervals of a week's march, say at every 100 or 120 kilometers, a large depot should be con-
structed, where a party of 10 or 12 men and 60 dogs structed, where a party of 10 or 12 men and 60 dogs
could live comfortably for months at a time, if necessary. The intermediate stations could be much simpler equipped, and consist of a warm shanty, with a sufficient supply of provisions and fuel to allow a party to stay over a blizzard or even a few days of exceptionally inclement weather. All the stations should be connected by a telephone line, made strong enough to insure continuous service. This line would serve also as a guide rope from station to station.
If the point of departure be Cape Flora, as proposed by Mr. Wellman, ten degrees from the pole, or about 1,200 kilometers, ten large depots and fifty smaller stations would bring the pole into constant communi cation with America or Europe, provided Cape Flora can be regularly reached by shipping. If not, one or two intermediate large stations should connect Cape Flora with some open port.
The cost of such a " road to the pole" would certainly be very considerable (some of the stations may pos-
sibly have to be solidly constructed house boats, heavily anchored in the open sea), but that cost wil scarcely be greater than that of a first class overland railroad of the same length, and certainly not beyond the limits of international enterprise and international wealth.
The time needed to construct such a chain of stations may be ten years (at the tortoise speed of 120-150 kilometers a year) instead of three, but really, ten years are a short time for inevitable success in comparison
with the seventy or eighty years already spent in more or less heroical failures.
N. Thishkov.

Timbirsk, Russia.
The steamer Warrimoo, from Australia, brings ad vices as follows: H. M. S. Penguin has just returned to Fiji after surveying the proposed Pacific cable route from Suva to Honolulu. The bottom of the ocean was ound to be very uneven. One or two uncharted patches near Honolulu were discovered, but, as they have seven or eight fathoms of water over them, they re not dangerous to navigation
Sir Rutherford Alcock, K.C.B., F.R.C.S., died re cently at the age of eighty-eight years. The deceased as brought up to the medical profession, but soo ave it up for travel and the diplomatic societ in 1876, and also presided over the health department of the Social Science Congress a few years afterward. To Sir Rutherford Alcock we owe much of our know edge of the far Fast
Twenty million dollars is the sum which the French government proposes to devote to the Paris Exhibition of 1900 . Nearly $\$ 10,000,000$ will be consumed by the construction of two palaces in the Champs Elysées and those in the Champ de Mars, in the Esplanade des Invalides, and on the quays. The bridges across the Seine are to cost $\$ 1,000,000$, and the mechanical and electrical services another $\$ 1,000,000$. In one word France proposes to do the whole thing on a scale of unprecedented magnificence.
The World's Columbian Exposition Company must pay the loss to the French republic and French ex hibitors caused by the fire on January 8, 1894. Such is the opinion of Judge Grosscup, handed down No ember 8, from the Federal bench. The fire at the Casino and Peristyle showered sparks upon the wool n walk of the Manufactures building. The burnin timbers fell into the building and upon the exhibits of the Frenchmen. The French republic lost somie finc Beauvais and Gobelins tapestries and two magnificent Sevres vases, made for ornaments at the entrance to the
Chamber of Deputies. The loss amounted to about $\$ 75,000$.
The Straits Times states that, according to telegraph ic advices from British North Borneo, an earthquake was felt at Kudat on September 21, as also a slight tremor at several places along the coast. About the same time a new island was thrown up from the sea between Mempakul and Lambeidan, 50 yards from the mainland, opposite Labuan. The island is of clay and rocks, and measures 200 yards long by 150 yards broad and 60 feet high. The island appears to be increasing in size, and emits inflammable gas in severa places, with a strong smell of petroleum gas. The earthquake was not felt at Labuan.
Experiments made in the laboratories of Sibley College show that the usual figures for dense smoke per ton cf fuel employed ranged from 10 to 12 pounds of soot; of the latter, about one-half was carbon, the remainder principally unconsumed hydrocarbons, 10 to 15 per cent of ash, and, if collected outside the furnace, perhaps 2 per cent of inoisture. It was found that no smoke was ever produced in an atmosphere of oxygen. With restricted air supply the maximum just stated was obtainable : but low temperature combustiou and restricted oxygen supply appeared to be the two main conditions favoring smoke production. Again, main conditions favoring smoke production. Agaili,
the composition of soot was found often to be subthe composition of soot was found often to be sub-
stantially that of the coal from which it was produced. A reduction of the proportion of smoke made effects a reduction correspondingly, and, perhaps, proportion ately, in the percentage of carbon contained in the soot.

## Krupp Armor Plate Process.

According to press dispatches the Krupp armor plate process is to be adopted by both the Carnegie Steel Company and the Bethlehem Company, they having purchased exclusive rights to the process in the United States. The details of the process have not been made public, but it is claimed that the plates which are produced by it are superior to those made by the Harvey process. It is said the cost, of the armor under this process will be higher than under the Harvey process. The English armor plate making firms of John Brown \& Company, Cammell \& Company, Vickers \& Company, and the French firm of St. Chamond have also purchased rights of the Krupp process.

## Mount Vesuvius in Eruption.

Mount Vesuvius is more active than it has been for years, and the eruption is daily increasing in magnitude. The volcano now presents a beautiful appearance, shooting forth immense columns of smoke and ashes, through which the fire from the central crater pours upward, illuminating the showers of cinders and the lava streams. The wind carries the ashes to Naples.

## wedish Polar Expedition.

King Oscar and a number of private persons have contributed a sufficient sum of money to insure the dispatch of a Swedish polar expedition in 1898 . It will be led by Prof. Nathorst, the geologist. The cost of the expedition is estimated at 70,000 crowns.

STEAM MOTOR CAR FOR BRANCH LINE SERVICE.
It frequently happens that the large railroads have branch lines on which the travel is so light that they cannot be worked to advantage by the usual locomotive and cars. On such lines, where the traffic is light and scattered, a regular train can only secure a full load if it is run at infrequent intervals-an arrangement which, though it may be to the advantage of the company, is more or less inconvenient to the public. To run a regular train at more frequent intervals would be a dead loss to the company, on accoun of the large dead weigh of the train in proportion to the paying load, and to the paying load, and also on account of the large train crew which must b employed. Nor would th electrical equipment o such roads be profitable the travel being too light to warrant the cost.
It is in this particular class of service that the steam dummy, as the combined locomotive and car is called, is likely to prove is called, is likely to prove extremely useful, on ac count of its large passenger the weight of the motor power and the size of the train crew. The composite car which is herewith illus trated has recently been completed by the Schenec tady Locomotive Works for use on a branch line of the New England Rail road, where the traffic does not warrant the services of a complete train of loco motive and cars. As the first motor was somewhat in the nature of an ex periment, it was decided to make use of an old dining car. The internal fittings, kitchen, tables, etc., were removed, and the car, which is 64 feet long, was divided by partitions into three compartments, one being given up to the engine and the other two constituting the smoking compartment and day coach.

The six-wheeled truck at one end of the car has been retained, but the other truck has been removed and its place is taken by the four-wheeled locomotive shown in the engraving. The cylinders, which are 12 inches diameter by 16 inches stroke, are carried at the forward end of the frame, and are connected to crank pins on the rear axle. The center of the frame is oc cupied by the vertical boiler, which projects through the engine compartment of the car and answers to the king pin of an ordinary truck. This connection between the locomotive and the car is an interesting feature. A circular casting, which is bolted to the engine frame and to the lower part of the coiler, is provided with a groove, in which are 125 hardened


LOCOMOTIVE OF NEW ENGLAND RAILROAD MOTOR CAR

## A Tank for Model Ships

An experimental model ship tank, for which Congress appropriated $\$ 100,000$ last year, is being rapidly constructed in the Washington navy yard. It is thought the tank will be ready for experimental operations early in the spring. The project is being watched with great attention by naval officers and marine architects, as its novel features and purposes are mainly of an unand Russia England, Italy and Russia, but the Ameri can tank embraces a number of mechanical contri vances which are expected to add materially to our knowledge of hull design. The tank is four hundred and seventy feet long, and is built entirely of concrete, and will be covered by a substantial steel framed building. Spanning the water surface, a moving bridge will carry the dyna nometrical device for measuring the resistance of the accurate models of vessels towed from one end of the tank to the other. These models, representing precisely the form of the ships, will be from fifteen to twenty feet long, and when towed at slow speed will furnish data upon which the efficiency of a full-sized vessel at high speeds may be determined from formulæ. The frame for the building, which is to be five hundred fee long and fifty feet high in the clear, is being delivered at Washington. The shel ter is designed to enable the maintenance of a constant temperature and an

5,000 pounds on the six-wheeled truck
The car was tested on a grade which varied from 50 to 58 feet to the mile, where, with a regular passenger coach attached, it maintained a speed of thirty miles an hour. A test for speed was made by running the motor car alone on a level track, under which condi tions it covered five miles in five minutes and fifty-five seconds. The details of the run were as follows :


The fastest mile, therefore, was run at the rate of 53.7 miles per hour.

The car was run under its own power from the Schenectady shops to its destination on the New England road, a distance of 315 miles. It should also be
mentioned that the train crew consists of only two
low pressure cylinders of the fore engine broke, smash ing the crank shaft, shaft frame and foundations. The accident occurred in a heavy gale. A steamer tried to take her in tow on the ninth, but the hawsers broke The Maasdam then got her after engine working and on November 10 proceeded without assistance, but when she reached Plymouth her after engine brok down just as she got inside the breakwater. The ves


STEAM MOTOR CAR FOR THE NEW ENGLAND RAILROAD, COMPRISING LOCOMOTIVE, SMOKER AND DAY COACH-CAPACITY, 60 PEOPLE
,teel balls $1 / 2$ inches in diameter. A similar casting is men-an engineer and a conductor. This exceedingly bolted to the framing of the car, and rests upon the circle of balls. This ball-bearing connection permits the motor to take the curves freely, and it also prevents the vibration of the locomotive from being trans mitted to the car. The steam pipe connections from the boiler to the cylinders are laid on the inside of the cast iron rings, and flexible steam joints are avoided.
The furnace door is on the front of the boiler, and above it, on the upper end, are steam and air pressure
a new departure in steam rail ll not be surprised if it prove to be the forerunner of a large and ever-growing number of the same type of motor car.

A REMARKABLE thunderstorm passed over Italy on April 24. The rain was mixed with sand and seeds of the carob that must have come from Africa, according to Prof. Tacchini, of Rome.
el anchored and her passengers were taken off ani sent to New York on another steamer.

Ice Breaking Steamer for the Arctic.
Capt. Sverdrup. of the Fram, Nansen's Arctic vessel, has arrived at St. Petersburg to take part in the proceedings of a conference which is to be held in that city for the discussion of the feasibility of constructing an ice-breaking steamer to penetrate the Arctic Sea, specially along the coast of Siberia.

THE STEEL CELL AND CENTRAL CORRIDOR SYSTEM OF PRISON CONSTRUCTION.
The new addition to the Erie County Penitentiary at Buffalo marks a departure from the commonly accepted methods of prison construction, and introduces features which not only increase the security with which the prisoner is held, but conduce to far better sanitary conditions than obtain under the common methods of construction. A prison building constructed on the ordinary lines consists of strong outer walls pierced with grated windows, inclosing a central block of cells, which have balconies provided at each story. The cells are provided with swing doors opening onto the balconies, and the balconies are provided with a railing which is usually about 3 or 4 feet high.

There are several objections to this system. In the first place, the security of the prison depends upon the outer walls and the gratings which cover the windows. Then the heating and ventilation are generally imperfect, the higher rows of cells becoming too warm and the lower too cold, as the result of the heated air rising to the top of the main building. The lighting rising to the top of the main building. The lighting
also is usually very poor;, as the cells are from 15 feet to 20 feet removed from the outer wall of the building, and the only light that the prisoner gets comes through the grated doorway of the cell. There is a further objection to this system on account of the unprotected condition of the balconies, which, with their low railings, present an easy means of violence by the prisoner throwing himself or the turnkey over, as has at times been done.

The Erie County Penitentiary has been designed with a view to obviating these defects. It will be seen


THE STEEL CELLS BEFORE OUTER WALLS WERE CARRIED UP.


CENTRAL CORRIDOR BEFORE CONSTRUCTION OF BALCONIES.
the building in each story are located ordinary steam heating pipes, and above each set of these are the cold air registers. Each section or story is arranged so that the register and the steam can be turned on independently. The air, heated by the pipes, passes through the cells and underneath the The air, heated by the pipes, passes through the cells and underneath the central corridor, as indicated by arrows in Fig. 2. It will thus be seen each prisoner secures the first use of the pure air from the outside. Each cell, moreover, is supplied with additional registers, which can be operated by the prisoner himself, who can regulate the heat at will.
The three feet of space between the cells and the outer wall is utilized as a jailer's corridor, through which the guard can observe the movements of the prisoners. This, it will be understood, is the only side of the cell that is provided with gratings ; the floor, ceiling, side walls, and the door opening onto the prisoners' balcony being made of plate steel, and it is through this grating that the prisoners receive the abundance of light from the large windows only three feet away in the main outer wall of the building. The plate steel door of the cell is furnished with a ventilator which is so arranged that when the cell is closed observation of the opposite cell and vice versa is impossible. This, it may be remarked, is the first prison in this country that has been so arranged that a prisoner can be isolated from his fellow prisoners, and obtain an abundance of light and independent ventilation without being thrown in contact with his fellow prisoners. It will be seen, from the illustration of the central exercise corridor and balconies, that the railings around the balconies are extended the whole height of each story, so as to make it impossible for a prisoner to jump over or force his keeper or other prisoners over the balcony rail. The inclosure of each balcony separately gives the keeper an easy means of separating different classes of prisoners and of taking each class out independently for exercise in the central corridor or for work in the shops.
The locking bars governing the doors of the cells are so arranged acs
by reference to Figs. 1 and 2 that many of the features just enumerated have been entirely reversed, and that instead of being from 15 to 20 feet from the outer walls, the cells are now placed only 3 feet distant from the walls, thereby providing a wide and roomy corridor down the center of the steel inclosure. This corridor, which is lighted by a skylight which extends over the which is lighted by a skylight which extends over the
entire length of it, forms a very commodious exercise entire length of it, forms a very commodious exercise
corridor and a space in which the prisoners may be safely fed if so desired.
The exterior walls of the 300 cells and the ceilings in closing them are made of tool-proof steel grating. The vertical bars of this grating (see Figs. 3 and 4) consist of $11 \%$ inch hexagonal steel spaced 6 inches on centers. The cross bars measure $3 / 4$ inch by 3 inches and are placed 12 inches on centers, the whole being interlocked in the following manner : The hexagonal vertical bars are provided at every 12 inches of their height with a circular recess, as shown in Fig. 4, which gives 12 shoulders, 6 above and 6 below the cross bars. In putcing the grating together, the vertical is inserted into the horizontal (the opening of the latter being hexagonal in shape) and is given one-sixth of a turn, so as to bring the projecting shoulders above and below the metal of the cross bars and securely lock them together. A counterlocking bar is then placed at the top of the joint and is riveted securely to it. It will be seen from Fig. 3 that the counterlocking bar prevents the verti cal bar from being turned back, and, consequently, when the prison grating is once set up, the whole sys tem is firmly locked together. The bars are made of a steel which is saw, file and drill proof, and it renders unnecessary the heavy outer walls which are common in prison construction.
Ventilation and the separation of each tier of cells is secured in the following way: On the outer walls of


CENTRAL EXERCISE CORRIDOR AND BALCONIES, ERIE COUNTY PENITENTIARY, BUFFALO.
to allow the entire row of cells to be locked or unlocked by the movement of one lever. At the same time the interlocking is such that a single prisoner can be removed or incarcerated without disturbing the lock bars on the other cells. On the other hand, if the keeper wishes to retain one or more prisoners, releasing the others, he can do this by a simple operation of the lock bar, unlocking the deimplamer of and leaving the balance locked ired number of cells and leaving the balance locked. About midway of the length of the central corridor the various balconies are connected by a short cross
gallery, or watch tower, as it is called, from which the guards are able to watch the door of every cell in the building. The guards' walk at the rear of the cells is built of stone, and is carried on steel angles, which are placed at the same height as the cell floors; outer angles being laid up as the masonry progresses. This walk serves, as we have already described, to form to the outside door of the building, and, as it is perfectly airproof, the system of ventilation, as above described, is carried out to perfection.
This separation of the cells conduces to considerable economy in the operation of the prison, inasmuch as if only one line, or say twenty or thirty cells, are in use, it is possible to heat this particular floor, thus doing away with the necessity of heating the whole

2.-CROSS SECTION SHOWING METHOD OF VENTILATION. tines. ination into the causes of the lesions it presented, but M. Dubard's but M. Dubard's attention was directed to the state of the remaining carps. Three of the seven were found to have tumors of the flank, and these were inby M. Bataillon, M. T. Bataillon,
servants hadjhabitually cast into this part of the watercourses the dejecta and sputa of a person suffering with tuberculous disease of the lungs and intes-

At the beginning of the winter one of the carps died, and its condition of putrefaction precluded any exam

1.-PLAN OF ERIE COUNTY PENITENTIARY.
toward the natives when he was commissioner in Afri ca in 1891. Dr. Peters is dismissed from the German service and has been ordered to pay the entire cost of the prosecution. The indictment charged him with arbitrarily hanging a negro boy in 1891 and the next year a negro girl, and also unjustly making war against

Dubard. It was found that the first tumor observed, on February 20, 1897, was as large as a hen's egg and had the consistence of a sarcoma. It was formed at the expense of the kidney. Although readily concealable in places, it was elsewhere continuous with the sound rena tissue. Microscopical preparations of the growth showed innumerable bacilli which stained like Koch's bacillus. Amid the lumina of the vessels and the connective tissue, both more or less inflamed and invaded by leucocytes, there were the same bacilli, some of them free, but most of them included in phagocytes. At certain points the formation of tuberculous giant cell was readily recognized.
An extensive series of cultures and inoculations was undertaken. The cultures succeeded at the ordinary temperature, about $57.2^{\circ}$ F., but the did better at from $69 \cdot 6^{\circ}$ to $80 \cdot 6^{\circ}$. At from $96.8^{\circ}$ to $98.6^{\circ}$ their growth wasslow and very difficult to start. There is little difficulty, remarks M. Dubard, in choosing a suitable medium for this micro-organism, but its development requires the presence of oxygen. All the cultures produce bacillary toxines identical with the toxines of the tuker culous disease of birds. On cultures that are a little old there are found dichotomous forms, filaments more elongated and flattened and present ing points where the coloring matter accumulates to a degree suggesting the existence of chlamydospores. O solid media, the closer the tempera prison when only one-half or one quarter of it is in ture to $96.8^{\circ} \mathrm{F}$., the more does the dry, scaly look actual use. The plans of this building were drawn up by the Van Dorn Iron Works Company, of Cleveland, O., the builders of the cellwork, to whom we are indebted for our illustrations and particulars.

## Tuberculous Disease in Fishes.

An interesting contribution to comparative pathology, by Prof. Dubard, of the Dijon school of medicine, is published in the Province Médicale, says the New York Medical Journal. M. Dubard begins his com munication with the remark that chance often effects more than patient investigation, as is shown by the fact that after several years spent in bacteriologica studies of cold-blooded animals he lately had the good fortune to observe a remarkable case of tuberculous disease in the carp. He then goes on to say that he has long been engaged in trout culture in an abund ant spring of pure cold water, of a temperature of from $53.6^{\circ}$ to $57.2^{\circ} \mathrm{F}$., on a piece of property situated near Dijon. In a reserved portion of the stream eight carps, the remnants of experiments in piscicuiture were placed in October, 1895. For two or three years

3.-DETAIIS OF INTERLOCKING JOINT-GRATING OF ERIE COUNTY PENITENTIARY CELLS.
of the cultures distinguish them from those of the tuberculous disease of birds and make their character istics those of a culture of human bacilli. If bouillon is used, whether a pellicle forms or the growth goes on cloudy which seems to be the best for this form, the cultures begin to grow in from five to seven days. As regards inoculations of animals, M Dubard can say little, except that in the course of from seventeen to twenty days there was obtained in the froga "superb" pleural, pulino nary, mesenteric, hepatic, and splenic tubercu ous formation. The results obtained with warm blooded animals the investigators will make the subject of subsequent communica tions.
The second tumor. examined on April 18, was also renal, and it showed precisely the same lesions and bacilli as the first one. The third carp, which was not very decidedly affected was kept with a view to provide against possi ble failures or obstacles in the investigation. M. Dubard inclines to the belief that the microbe found in these carp is a cyprine variety of Koch' bacillus, and that the trinity of tuberculous disease - of man, of birds and of fishesis one fundamentally.

Dr. Carl Peters Punished A special dispatch from Berlin dated November 15 says that the court martia has confirmed the sentence of the lower court upon Dr. Car Peters, the well known Afri can explorer, former German high commissioner in Africa ex-chairman of the German Colonial Society. He was charged with extreme cruelty


GUARDS WALK AROUND THE CELLS.

LTEE GIANT REDWOOD TREES OF CALIFORNIA. An interesting story attaches to the huge slab of wood which is shown in the engraving suspended between two railroad cars ready for shipment to England. At a dinner recently given by an American millionaire to a party of English friends in London, the guests had expressed their incredulity at the account given by the host of the mammoth trees of California. To prove his assertions, he offered to wager that he could procure from one cross section of a kig tree a table large enough to accommodate all of the forty guests then assembled. The wager was accepted and an order was promptly given which resulted in the shipment of a cut from a redwood log, which was two feet thick and over fifteen feet in diameter.

The engraving shows the novel method of transportation. The possibility of the slab splitting in two, or of a section of it becoming detached, was guarded against by passing two one-inch rods entirely around the circumference and drawing them tight with screw bolts. Two large chains were then slung beneath the slab and made fast to two heavy timbers, one on each side of it, the ends of the timbers resting upon two rail-
somewhat by driving wedges into the cut behind the saw. The tree gives warning of its fall by the cracking of the remaining fibers, and if proper precaution is descent of a falling tree though accidents do occasionally happen, due to the carelessness of the lumbermen.

Water Power and Momentous Changes.
The purposes, says a writer in The Spectator, for which water power is being utilized are exceedingly varied. It is used directly as electrical energy for lighting purposes and for chemical and metallurgical operations. Transformed again into mechanical energy by means of the electric motor, it is used for working tramway systems, for producing wood pulp for paper making, and for driving machinery of all kinds at the mines or in engineering and other workshops. The significance of this new step forward in the application of water power to industrial purposes is startling. On the one hand, it signifies that man has at last learned how to effectualiy master and utilize one of the Coal is natural forces of the earth.
Coal is an exhaustible possession, and the day must
tries of Europe, that may already be observed as one result of the increased use of water power in countries hitherto of little or no account in the industria struggle, will be followed by the gradual migration of the staple industries to the cheaper centers of power remains for the future to disclose, but it is a question of tremendous significance for the prosperity of the countries concerned.

[^0]

SLAB OF REDWOOD FOR A LONDON DINING TABLE DESIGNED TO SEAT FORTY GUESTS-DIAMETER 15 FEET.
road cars. The lower edge of the slab was a few inches clear of the rails, and the method of supporting it allowed the cars to swing freely in passing round the curves. Before shipping it was dressed down to the required size, and it finally left San Francisco for London by the German ship Maria Hackfield.
The slab was cut by the John Vance Mill and Lumber Company, of Eureka, California, and for the photo graph we are indebted to Mr. A. W. Ericson, of Arcata, in the same State.
In felling these giant redwoods the tree is usually cut at a point a few feet above the ground, so as to avoid the great thickness which occurs at the bottom of the stump. Notches are cut in the tree just below the line at which it is to be cut through and planks are inserted in the notches, to form a platform for the two axmen. The tree is then "undercut" on the side toward which it is to be felled. The undercut is $V$ shaped and generally reaches about half way through the tree, the lower face of the cut being horizontal and the upper face sloping to meet it at a steep angle. When the undercutting is complete, the tree is cut through from the opposite side with large crosscut saws, the fall of the tree being guided and hastened
come when the coal fields of the earth will be worked out. Our rivers and falls offer, on the other hand, an inexhaustible supply of energy; for so long as the heat of the sun evaporates the water of the sea. and causes it to fall again as rain upon the hills or as snow upon the mountains, this source will be available for the supply of man's wants, and the arrival of the time when the earth's coal fields will be exhausted need no longer be awaited with misgivings. But there is another aspect of this development which is less cheerful for contemplation by three of the nations of Europe. The position which England, Germany and Belgium occupy to-day as the leading manufacturing countries of Europe has resulted chiefly from their possession of extensive coal fields capable of cheap developinent, coal having been in the past the chief factor in determining the industrial progress of any country. The progress of electrical science has, however, apparently changed the conditions of industrial supremacy, and it appears as though the possession, not of coal fields, but of water power, will be the determining factor in the future.
Whether the check to the natural growth and expansion of industry in the older manufacturing coun-
o the present year. Those who have only the large, oldtime encyclopædias, with their absence of information about the striking progress in the arts and sciences for a generation back, will take up these volumes with a keen appreciation of the advance that has been made. The up-to-date character of the work is well illustrated by its large official map of the Klondike region; its account of the life and recent sudden death of Henry George; its explanation of the acetylene lamp, and Maxim's and other flying machines; its fine illustrations and descriptions of Roentgen ray experiments and appliances, and in fact in almost every direction where the reader desires the latest and freshest information. A large corps of editors has been employed upon the work, and the publishers acknowledge their indebtedness to the Scientific Americian for many illustrations of late inventions and mechanical processes, the descriptions in many cases having been collated from our columns. The fact that, for a limited period, subscriptions may be made for this new and splendid work at a very low figure, payable in small installments, will probably not be lost sight of by thousands who will bos anxious to obtain it, but do not feel able to pay at once the full purchase price.

RECENTLY PATENTED INVENTIONS. Engineering.
Motor Vehicle.-Henry W. Heaton, Olneyville, R. I. This is a four-wheeled vehicle, in whic oil or gas may be used to actuate the motor, the vehicle being easily started, stopped and steered. The motor comprises a revoluble combustion chamber fastened on a
main driving shaft, between which and the rear axle main driving shaft, between which and the rear axle
is a transmitting device, cylinders opening into the is a transmitting device, cylinders opening into the
combustion chamber, and there being an intermediate mechanism between the pistons of the cylinders and a series of gear wheels rolling off on a fixed gear wheel. In the combustion chamber is an electric ignit ing device, whieh is actuated by the rotation of the
Desulphurizing Matte or Other Furnace Products.-James L. Wells, El Paso, Texas An apparatus for reducing low grade matte and other furnace products, producing high grade matte or metal in
a very simple and economical manner, has been devised by this inventor. The furnace is provided with the usual stack, having a water jacket,'and tuyeres are arranged on opposite sides to open into the molten metal, the tuyeres being connected with an air blast with a high pressure air supply. The tuyere consists of a tubular shell, in which a longitudinally divided plug having recesses in it sections forms a longituainal bore, the sections also hav
ing abutting projections engaging a corresponding reces of the shell to prevent the plug from turning.

## Electrical.

Lock Circuit Closer. - Charles E. Pierce, New York City. In an electric alarm to be ope door, according to this invention, a frame piece is employed carrying two normally disconnected contact points and a lever movable to engage them and thus close the circuit, the device being placed in such position that the lever will be rocked by the bolt of the lock when exccssive pressure is applied to the lock, as when the of the device are shown in the patent.

## Bicycles, Etc.

Handle Bar - Henry W. Heaton Oineyville, R.I. To reauce to a minimum the trausmisf the bicycle, in riding over rough places is the object of this invention, according to which a clamp engage the handle bar and the handle bar stem has a head made in sections inclosing the clamp, there being an elastic material between the clamp and the head and means for drawing the head sections together and clamping th everal parts firmly in place, the elastic material taking he handle bar roughened a very frm contact is obtaine between the elastic material and the handle bar, prevent ing possible turning of the latter in the head.
Differential Bicycle Gear.-Guy R. Balloch, Centerville, Canada. To allow a rider to leadily and conveniently change from a high gear to a pally a hollow drive wheel hub provided with differential gear wheels, a double gear wheel being laterally slidabie
to Imesh with either of the hub gear wheels, while a driven sprocket wheel is in gear with the double gear lateral movement. The entire device for transmitting motion to the drive wheel is completely inclosed within he hollow hub, and is thus thoroughly protected from dust and other impurities, and is not liable to get out of
Detachable Carrier for Bicycles. -William M. Tegart, Moosomin, Canada. To facilitate carrying a camera, baggage, etc., on a bicycle, this inentor has devised a carrier wich may be conveniently tacked to or removed from a bicycle. It comprises adapted to be clamped to the steering head and a supporting bracket or bottom frame formed of two sections having a hinged and sliding connection with each other, the inner section being hinged to the back frame. The device is not in the way of the handie bar or
the fork for the front wheel, directly above which the the fork for the
load is supported.

## Agricultural.

Reaping Machine. - Mihail Alexanrescu, Bucharest, Roumania. This is a machine adapt grasps the corn to be cut, bends it down and conveys it to the knives, the cutter bar having motion imparted thereto from the axle. The corn falls upon an endless apron passing over rollers rotated from the axle and is conveyed onto a rack where it collects until it falls to the ground, when the rack is moved inward.

## Miscellaneous

Race Starting Machine. - Victor Carandini, Calcuttta, India. According to this in vention a fence or barrier is mounted transversely to the track, in connection with means for raising and lowering it quickly, so that upon raising the barrier the horses may pass.
The barrier is formed of two bars with flexible connections and slight independent movement, there being a restraining device for each bar and means tending to lift the bars, while a flexible connection is capable of tripping the restraining device for the second bar when the
first bars moves upon being released. The barrier moves upward on the drawing of a cord by the
Necktie Fastener. - Gustave Selowsky, New York City. This is a simple and inexpensive device to be applied to any neckstrap necktie, and
which can be quickly and accurately adjusted to fit the tie to any size of neck. It comprises hook and eye straps and a connecting device having at one end a loop embracing the hook strap and at the ritherend a hook to engage the eye of the eye strap.
Note.-Copies of any of the above patents will be furnished by Munn \& Co. for 10 cents each. Please send name of the patentee, title of invention, and date
of this paper. of this paper.

## Business and Personal.

 e charge for insertion under this head is One Dollarline for each insertion, about eioht words to a line
Advertisements must be received at publication office as early as Thursday morning to appear in the follow ing week's issue.
"U. S." Men Works. Chicago. Catalogue free. Gasoline Brazing Forge, Turner Brass Works, Chicag Yankee Notions. Waterbury Button Co., Waterb'y, Handle \& Spoke Mchy. Ober Lathe Co.,Chagrin Falls, O Inventions developed. models and expe
Charles Crook, 14 C Centre St.. New York
Canadian Patent No. 50.683, on P
Apply to M. S., Box $\overline{73}, \mathrm{~N}$. Y. City.
Improved Bicycle Machinery of every desurio The Garvin Machine Co., Spring and Varick Sts., N. Y. Concrete Houses - cheaper than brick, superior The celeorated "Hornsby-Akroyd" Patent Safety Oil chine Company. Foot of East 133th Street, New York. The best book for electricians and beginners in elec
ricity is "Experimental Science," by Geo. M. Hopkin by mail, 44. Munn \& Co., publishers, 361 Broadway, N. Q. 2 Send for new and complete catalogue of Scientiff
nd other Books for sale by Munn $\&$ Co., 361 Broadway New York. Free on application.

## 

HINTS 'TO CORRESPONDENTS
Vames and Address must accompany all letters
or no attention will be paid thereto. This is for
information and not for publication. References to former articles or answers should
give date of paper and page or number of question.
Inquirites not answered in reasonabbe time should quiries not answered in reasonable time should
be repeated tcorrespondents will bear in mind that
some answers require not a little research, and. some gh we endeavor to reply to all feether by letter
or in this department. each must take his turn Buyers wishng t to purchase any artice hont advertised
in our columns will be furnished with addresses of hour columns will be furnished with addresses o
housee manufacturing or carrying the same. Special Written Information on matters of
personal rather than general interest cannot be
expected without reinumeration.
 Books referred to promptly supplied on receipt of
inicice. (7242) E. E. S. asks : Will the galvanoneter, described in "Experimental Science," show how If it will, will your give me proper instructions how to make proper scales? A. The tangent galvanometer of "Experimental Science" will measure amperes; but no permanent scale reaching amperes could be attached to it. Any change in the strength of the needle would change the value of one ampere on the scale. Any good ext book of electricity or of physics will explain the langent galvanometer, but you will not understand it easily unless you have a knowledge of trigonometry. To
measure volts with a galvanometer, you require a cofl with a large number of ohms resistance. The Deprez D'Arsonval galvanometer, of "Experimental Science," is an ordinary scale. If you have one volt and can find how far the spot of light moves for it, you can then measare volts. The Daniell's cell gives nearly 1.1 volts. All amperes are at hand with which to make the graduation You may be unable to do it. All voltmeters and amme ters with scales reading volts and amperes directly are
made without magnetic needles, since these easily change their magnelic strength, which would change the value of a given deflection on a scale.
(7243) W. F. R. ask: Is there any di rect way, that is, by means of converters and the like, of changing an alternating current nnto a continu ous one ?
A. The only way to transform an alternating current into a direct current is to run a motor with the alternating current, and with this motor drive a direct current dynamo, which will give the voltage and amperes required
These two machines are sometimes wound on same shaft and called a motor dynamo.
(7244) H. C. C. writes: Please explain how nitrate of gold may be separated? A. It is very
doubtful if there be a nitrate of gold. If there be it is an unstable compound which is reduced at once to oxide
of gold or to metallic gold. Fuming nitric acid will dissolve fine gold leaf, but even by shaking the solution with water, the precipitation of gold ozide takes place.
(7245) E. Y. M. writes : I am making the tangent galvanometer described in "Experimental Sciance." Please inform me what size and kind of wire For the coils of the fangent galvanometer as asescribed A For the coils of the tangent galvanometer. as described in
"Experimentai Science," use No. 27 Am . wire copper wire (cotton-covered magnet wire will answer)

| n-covered magnet wire will answer) <br> Oums. <br> Ft. In. | Battery, See Electric battery. Bearing, shaft, F. A. Tourtillott Bearing shaft, ${ }^{\text {F. A. A. Nout. }}$ Bed bottom. K. C. Hout. Bed bottom for iron bedsteads, |
| :---: | :---: |
| For coil b.... 1.... ...... ..... 19 5 | Bed Tinkham. |
| For coil c. .. 9............... .. 174 | Bed, fol |
| 40................... 776. | Bell, po |
| For coil e.... 100.................. 1940 | Berry carrier, A |
| 290 | Bicycie, L. Di, De R |
| The weight required is a little more than $13 / 4 \mathrm{lb}$. | Bicycle |
| (7246) J. G. B. asks: What is the differ- | $\begin{aligned} & \text { Bicycle } \\ & \text { Beycle } \end{aligned}$ |
| etween an incandescent light of 100 volts, 16 can- | Bicycle |
| wer, at $3_{18}^{\text {P }}$ watts per candle power, and one of | Brycle |
| voltage and candle power but of $21 / 2$ watts per can- | ${ }^{\text {Bicycle }}$ W |
| dle power? I understand the difference in horse power, | ${ }^{\text {Bic }}$ |
| but not in the lamp or light. Why not use $21 / 2$ watt | Boile |
| hts in the place of $3_{16} \frac{3}{6}$ watt, because there could |  |
| more lights used per horse power? A. Yon can light |  |
| more lamps per horse power at $21 / 2$ watts per ca | Bottle, nursink, C. Bor |

at any higher rate of power, but you will born your
lamps out a great deal faster than the decrease of power at $21 / 2$ watts will balance. It is more economical to consume three or more watts per candle than to consume
the carbon filament so fast and thus shorten the life of the lamp. It is the interest of the lighting company to prolong the life of the lamp, butit is the interest of the user to obtain a large amount of light. There must be a compromise som
watts per candle.
(7247) W. H. F. writes: I have come across a substance that I think is a compound of acids, immediately. Will you please tell me the name of this substance and how it is made? A. We cannot tell the naine of a substance we have never seen simply by knowing one property of it. If a drop of water be put on potassium, it will be decomposed and the gas which
results will be set on fire. So also sodium will set fire to a drop of hot water. Both these metals are soft, silvery in color when freslly cut, and are kept under kerosene (7248) W. M. M. asks: Is there any disappear: We cause the silver on an electric print to it, but it will not remain away. I want something that will be permanent. These prints are those which are used for crayon work. A. The dis: ppearance of the print when treated with solution of chloride of lime is due to the fact that the chloride of lime changes the silver of the print into chloride of silver, which is white and does not show. To prevent his from turnng black Prepare the following bath

Water, distilled.
.50 parts.
Cyanide of potash.
Soak the print in this for 15 minutes. Wash for one the print as you would any photographic print in fixing, washing and drying. Hyposulphite of soda 1 in 8 of water, will dissolve the chloride of silver, but is not so powerful as the cyanide. It must never be forgotten that cyanides are most violent poisons, and great care must
be exercised in their use, lest they get into the system by be exercised in their use, lest they get i
the mouth or through a cut in the skin.
(7249, V. W. writes: In your SuppleMENT there is a description of a Wimshurst electrica machine, with directions to make it, and in the direchock bottle. and I do not know where to procure these cannot get them here and do not know to whom to send for them. Will you please inform me as to the closest point here that I can get them; also give name of dealer? I am inaking one of these machines and would like to have the bottle at once. A. All the glass parts of a Wimshurst or similar electric machine. and all glass apfrom lead. Glass which contains no lead is called "crown" glass. It is impossible to recognize this glass by its appearance. The best you can do is to get a good window glass for the plates. To test the bottles for the Leyden jars, wash them and dry them thoroughly. When cold. rub them with a dry and warm silk handkerchief or other piece of silk. A suitable bottle will show strong signs of electricity, crackling or even yielding a
spark when the finger is presented to it. It is more convenient if these bottles have a wide mouth. You need not be particular to get "hock" bottle; any bottle which will stand test as above is good. A greenish bottle is likely to prove to be of good glass for electrical uses.

TO INVENTORS


## INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted NOVEMBER 16, 1897,
AND EACH BEARING THAT DATE

| Adding register, C. H. Bigelow. <br> Advert ser, automatic, Petsch \& Soukup.............. 5939754 |  |
| :---: | :---: |
|  |  |
|  |  |
| Alarm, W. Ling |  |
| Amaligamating |  |
| nuncli |  |
| - |  |
| tohar |  |
|  |  |
|  |  |
|  |  |
| Bale tie. J. W. Griswold............................. |  |
| peeling machine. J.i. \& G w |  |
| ery. see Electric battery. Storage battery. |  |
| Bearing, shaft, F. A. Tourtillotte........................... 593,785 |  |
|  |  |
| Tinkham 593.824 |  |
| Bed bottom, spring, A. F. Purefoy |  |
|  |  |
| Berry carrier, A Horn............................. 593 |  |
|  |  |
|  |  |
| c |  |
| cycle, l |  |
|  |  |
|  |  |
| Brcyce lock, Pond \& Taipe... $\cdots$ |  |
|  |  |
| Rycle st |  |
|  |  |
|  |  |
| tee break |  |
|  |  |
| Book or manuscrit holder, Ek. D. Haili................ 539,935Book rack, portable, G. R. Alden.................. 593,758 |  |
|  |  |
| Bottle, non-r nursing, C. Borgenschild...................... 593,830 |  |
|  |  |



 | 583,839 |
| :--- |
| 593,699 | Bu











 ELECTRICAL APPARATUS REPRE-



 ADVANCE YOURSELVES.
IMPROVE YOUR CONDITION.
THE HOME SCHOLS OF Mechanical, Electrical, Steam, CivMechanical, Electrical, Steam,
il, and Sanitary Engineering,
Architecture, Metal Working, Pattern Making.
To encourage you to start now, we




## Office Desks

Chairs, Tables, etc. Manufactured by Send for Catalogue
and Discounts. Derby Desk Co. 1138 Portland Street, Boston
SAVE $1 / 2$ YOUR FUEL By using our (stove pipe) RADIATOR. ONE stove or turnace two. Drop postal for proofs from prominent men.

TO INTRODUCE OUR RADIATOR, the first order from each neighborhood
fllled at WHOLESALE price, and secures agency. Write at once
Bochester Radiator Company, 82 Furnace St., ROCHESTER, N. $v$


WALWORTH MFG. CO., 16 Oliver St., BOSTON, MASS.
COBURN : Rmict Thack


Parlor, Barn and
All Styles.
Send for Book.
Coburn Trolley Track Mfg
Holyoke, Mass.
BARNES'

## DRILLS

)wata
W. F. \& JOHN BARNES CO


Tools For All Trades

 Wivivawazi


MONTGOMERY \& CO
fulton Street, New York City.
ThE TORPEDO BOAT TURE describesthe construction of the Turbinia


DROP-FORGING SERD USMODELS FR FITURE ON.
 BAGNALLLOUD BLOCK CO EOSTON. MAS.

## 1 <br> <br> \section*{Im Imc In Ind nd nd <br> <br> \section*{Im Imc In Ind nd nd <br> <br>  <br> <br>  <br> <br> <br>  <br> <br> <br>  <br> <br> <br>  <br> <br>  <br> <br>  <br> <br> 

 <br> <br> }



Motor, LIipoinorott \& Homann..
Mower, F. Bower.


Oin burner, mineral, J. J. Hall............
Pad See Copyind pad. Horse hoof pad.
Padiock, permutation, J. K. Houts.......
Paint, Ard Fel
Paint C. F. Lawton et ai...................
Painting machine, w. K. Johinson......


Pin. See Hair pin.
Planter, automatic
Planter, atomatic check row corn, L. Gist.....
Pneumatic motor F. W. Hedgeland .........
Pockets, device for prention Pockers, device or preventie.
Postand brace, combined. E. E. Murry.
Powder, blasting, H. Von Datmen
Powder, blasting, H. Yon Dahmen
Powder packing machine, J. McNab.





P. O'Neill....i......
Puze, E.Cad.
Puzze.W. F. Derwin


 Merry weat ther.
Refriigerator, H .












Snap hook, twin, Lapsley \& Sallee...
Socket piec, hinged, C. Mamito . Hamiton.
Soldering iron, D. H. Allen
Soldering iron, D. H. Alilen.
Soldering ron, J. . .arror.
Soles flexible, machine for
making siöö




(Continued on paoe 351)


## MONITOR MARMYE ENGINES



MONITOR VAPOR ENGINE ANO POWETE
 ACETYLENE GAS AND CARBIDE OF





There is Satisfaction in it

## No. 2 HARTFORD




Buy Telephones ${ }^{\text {PR }}$ THAT ARE GOOD--NOT "CHEAP THINGS."
The difference in cost is little. We guarante The diference in cost is intle. We guarante
our apparatus and guarantee our cestomers
against loss py patent agen
teand instrumentsare both good
WESTER TELEPONE CONTRUCTION 250-254 South Clinton St., Chicago
Largest Manufacturers of Telephones Largest Manufacturers of Telephones

BERLINER TRANSMITTER PATENTS SA full text of the decision of the Supreme Court.
STIENTIFC AMERCAN SUPPLEEENT, 1117,111 .
newsit
newdealers.


Pbonographs, Grapbophones,
Projectoscopes, Rinetoscopes,
 The Edison Phonograph Co.,427 Vine St.,Cincinnati, 0 . SO SIMPLE A CHILD CAN USE THEM
 MAGUANART $\underset{\text { Folding Cameras. }}{\text { MAGAZINE CAMER }}$
 "picture. 2 cent stamp for
nlustrated Catalogue. SUNART PHOTO CO. 5 Aqueduct Street, Rochester, N. Y. A FOLDING CAMERA. - WORKING
 IT COSTS NOTHING TO TRY:
 save in me what


## TRBORUNDUN Pa


MINERAL PRODUCT OF THE UNITED



Electric Battery Motors.


If You Want the Best Lathe and Drill


GHUGKS


 Headquarters for DUMPINC HORSE GARTS.
 HOBSON \& CO.
No. 4 Stone St.,

## EDCE TOOLS-0.



Pou USE

 The CLEVELAND STONE CO.

ON A STILL HUNT.



 Street and station ind dicator, S. E. Bibibee
Street

mitchn See Eliectric switcher Raiiway swit eleephone, J. Weil.




Trees, plants, flowers, etce















 $\qquad$
DESIGNS.







Socketmenber of detachabie fasteners, w.

Switch and signal supormerting standaràds, foundia


TRADE MARKS
























Sargent's
Artistic
Hardware


Sargent's Easy Spring Locks

THE UTY AUTHORITIES OF PRESCOTR,ARE,


 FIL MS R M A A CHINES |CE MACHINES, Corliys Engines, Brewers



 NOVELTIES \& PATENTED ARTICLES

 Experimental \& Model Work MECHANICAL DRAWING and Surveying taukht by mail.
Catalerms rery reasonable.
Catal



## GASNOMASOLINE ENGINES <br> WATER MOTORS

VOLNEY W. MASON \& CO., Friction Pulleys, Clutches \& Elevators PROVIDENCE R.


Odd Tools You Need


 - E. CALDWELL COM, Main Street, Louisille. Kg.


APPARATUS




Motor of ${ }^{\mathrm{THE}} \mathrm{g}^{\mathrm{H}}$ C Century
 No Fire! No Boiler! WORK
No Gauges
No Engineer Cost of opershen ibiout Danger
an hour to each indicated Hent
H.
 Cn
Cbe Fifty Dollar -Cribune
The Best Wheel for the
Price in the World.
Do not think of buying until you have seen it.
Cbe Famous Blue Streak. Faster Than Ever.
Write for Advance Sheets. 1898 Prices Ready. Che Black Mifg. Co., Eric, Pa.



## The CINEOGRAPH <br> A LIFE MOTION PICTURE MACHINE, <br> Fuif ifluy fere filigs fied

ALL FOR \$75.00.
Shows a Life Motion Picture 16x20 feet.
So simple in construction a child can operate it.
Send for Illustrated Catalogues of Cineographs and Films, and 100 Testimonial Letters from SuccessfulExhibitor
S. LUBIN, Manufacturing Optician, I9 So. 8th St., Philadelphia, Pa., U. S. A.




EASTMAN KODAK CO.
Rocatecter $\mathrm{N} . \mathrm{V}$.


## Electrical <br> Novelties

Railwa, fohown in cutw with Butery
 THE CARLISLE \& FINCH CO.

At $\frac{1}{4}$ Prich


HOLDS HOSE


LENSES of every description and in any
quantity manufactured to order. Photographic, Projection Lantern,
Bicycle Lamp, Search Light, etc. BAUSCH \& LOMB OPTICAL CO., $515 \not / 2 \mathrm{~N}$. st. Paul St., Rochester. N. Y位 Mending of mingle Tube Tires.-A p practical article illus
trating the methoo of insertin patcobes and pluys with
piers and pluggers to toether with rubber band pluxging



RAY CAMERAS


The SMITH \& WESSON Revolver



Endorsed by the Leading Carriage Builde TO RIDE EASY, GET RUBBER TIRES. KELLEY, MAUS \& rite for Descriptive Catalogue. Axperial Ball Bearing Ax Vehicle Rubber Tire Dept., 439 Wabash Av., Chicago.

## Wood

Workers'
Tools.


With our Metalworkers' Catalogue "A BOOK OF TOOLS," and our new Woodworkers' Catalogue
"WOODWORKERS' TOOLS," you bave before you the World of Tools. Nothing as complete or com-
prehensive has ever been printed. Either book sent, prehensive has ever been printed. Either book sen
postpaid, upon receipt of 25 cents. (Your money back

THE CHAS. A. STRELINGER CO
Address Box 122\%.6. DETROIT, MICH.


## DO You

 Manufacture Anything?If so, you must be interested in the machinery
that makes your own goods and those of your If so, you must be interested in the machinery
that makes your own goods and those of your
competitors. You would like to see and read competitors. You would like to see and read
about improvements in such machinery, to hear about improvements in such machinery, to hear
of new mechanical inventions that will be a boon to you by increasing your facilities and reducing your expenses. To keep up with the
times in all such matters, and in every branch of

## Scientific American

Which is the acknowledged leader of all publica-
tions in the. world devoted to science and mechanical arts. Publisbed weekly, 16 pages, illus$\$ 1.00$ for four months. Remit by check, draft or P. O. order payable to

MUNN \& CO., Publishers,
361 Broadway, New York City.

## JESSOP'S STEE LTHEVERY

PRINTING INKS



[^0]:    The American Educator-A Library of Universa K nowledge."
    The above is the comprehensive title of a splendid work now being issued in six large quarto volumes with nearly 4,000 illustrations, by the Syndicate Pub lishing Company, 230-238 South Eighth Street, Phila delphia, Pa. It is an entirely new and up-to-date pub lication, giving a carefully summarized compendium of the most valuable encyclopædic information, prepared with great judgment and discrimination, and combin ing therewith a dictionary and library of biography atlas and statistical gazetteer, while presenting also an ample resume of the progress of science and the arts and the facts that go to the making of history right up

