SCIENTIFIC AMERICAN

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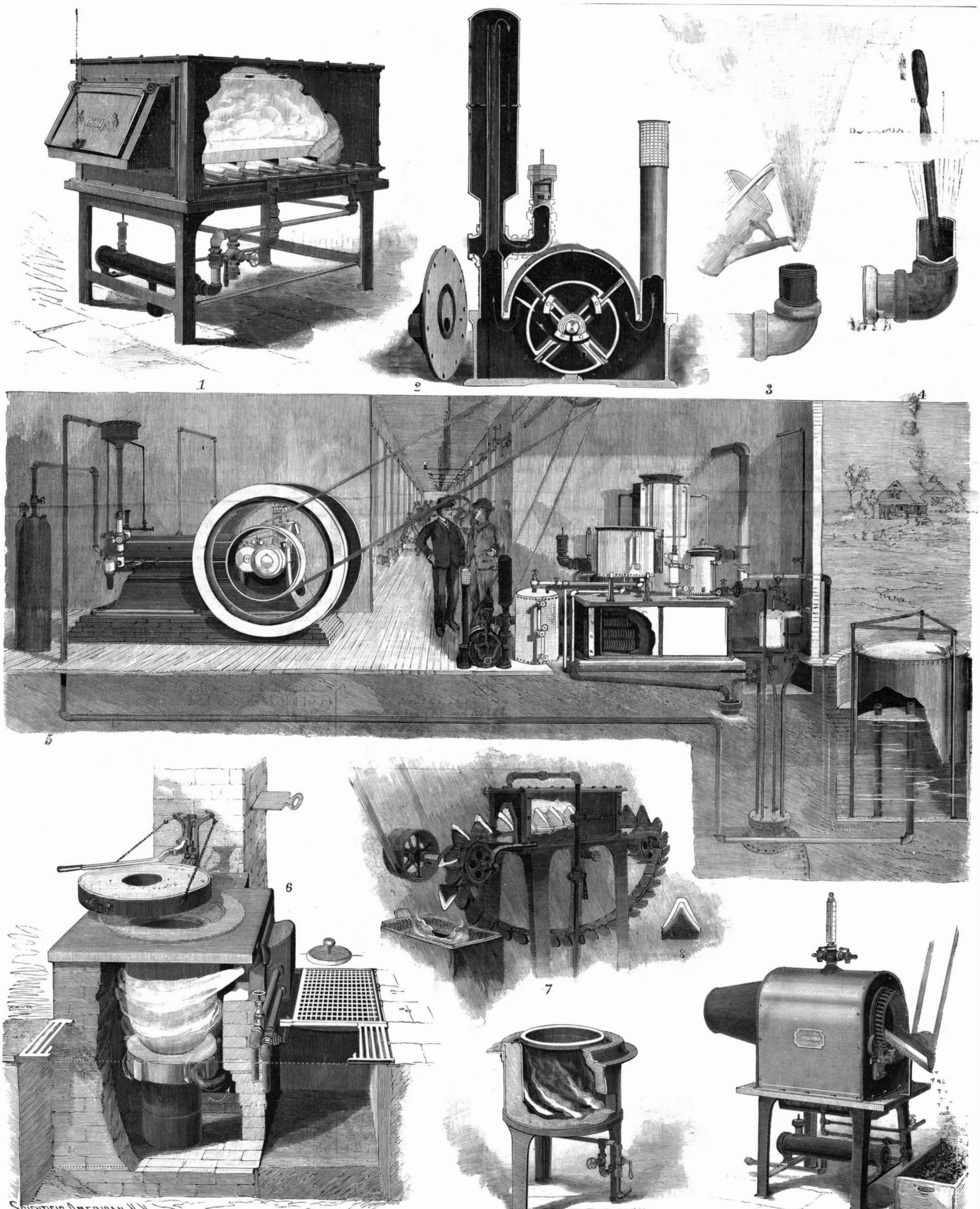

1. Large oven furnace. 2. Rotary blower. 3 and 4. Experiments with the blast. 5. The gas-producing plant 6. Large melting furnace. 7. Furnace for tempering mowing machine cutters. 8. Soft metal furnace. 9. Furnace for bluing screws.

THE AMERICAN GAS FURNACE COMPANY'S GAS PLANT AND FURNACES.—[See page 24.]

Scientific American.

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NEW YORK, SATURDAY, JANUARY 12, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 993.

For the Week Ending January 12, 1895.

Price 10 cents. For sale by all newsdealers.

JAMES H. GRIDLEY.

It is with the deepest sorrow we record the decease, on the 25th ult., at Washington, of Mr. James H. Gridley, the active manager of the branch offices of the SCIENTIFIC AMERICAN in that city.

Mr. Gridley was born in Boston, Mass., January 15, 1833. His family removed to Providence, R. I., when he was quite a lad, and there he received his early education. In youth he was more than ordinarily intelligent and quick to learn. Among his early acquirements was stenography, and his knowledge of this art, a rare accomplishment in those days, gave him a position as stenographer and clerk with Fowler & Wells, phrenologists, New York. In 1854 he was in Cincinnati, learning the art of mechanical drawing in the patent offices of Knight Bros.; subsequently he had practical experience in a machine shop. 1858 finds him in Washington as a mechanical draughtsman and stenographic reporter in Congress.

In 1860 Mr. Gridley entered the SCIENTIFIC AMERICAN office in Washington, where his sterling abilities found immediate employment and recognition. His conspicuous talents soon caused his promotion as manager, a position which he continued to hold without interruption until his decease, always enjoying the confidence and esteem of his employers. The business interests of Messrs. Munn & Company in Washington, it is known, are very extensive. Of these, in all their details, Mr. Gridley had the management, yet such were his superior qualities as a business man that in all these years there was never an example of irregularity or confusion. No one could have been more devoted to the interests of those for whom he acted than was Mr. Gridley. He was implicitly relied upon, and discharged every trust with zeal and ability.

The number of employes under his management was quite large. He had the happy faculty of so directing their efforts as to yield the best industrial results, and yet every individual revered Mr. Gridley as a friend and associate.

As the head of a large establishment like ours, the number and variety of important questions relating to Patent Office law and practice, that constantly arose for decision was marvelous; but Mr. Gridley disposed of them with rapidity and almost unerring judgment. He was necessarily brought into frequent intercourse with the various officials of the Patent Office, from the Commissioner down, and it may be said, without affectation, that he invariably commanded the respect and esteem of those with whom he had dealings. Mr. Gridley's position often brought him into communication with the heads of the various government departments, with governors, senators and representatives. He is remembered by all for his kindly disposition and satisfactory business methods. His domestic relations were all that could be desired. He had a lovely home, and here, after the business cares of the day were over, he was accustomed to enjoy the refining influences of music and literature. He was one of nature's noblemen. To us his loss is irreparable.

"Green be the turf above thee,
Friend of our better days;
None knew thee but to love thee,
None named thee but to praise."

PARALLEL BOUNDARIES.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of December 15 I find an article on page 371 relative to the migratory character of parallels of latitude, in part as follows:

"From the Lake of the Woods to Vancouver's Island, the 49th parallel has been established as the boundary line between the United States and British America, for a distance of more than 1,200 miles. Similarly, the north line of New York, Vermont, and a part of New Hampshire is the 45th parallel for more than 250 miles. The shifting of these two boundary lines, consequently, brings alternately under the jurisdiction of the United States and Canada two strips of land 60 feet wide and 1,200 and 250 miles in length.

"Together they contain 11,000 acres, or land enough for a hundred good sized farms. This land was all on the Canadian side in April and May, 1890, and in May, 1891, all on the United States side in Nov., 1890, and again in Dec., 1891."

Without occupying any of your space commenting upon the usefulness of this discovery, if it is one, I think you need have no apprehensions relative to its effect upon boundary lines that may have been originally referred to some parallel of latitude, as was the line between Pennsylvania and New York fixed by decree upon the 42d parallel.

This line was located on the ground by commissioners in 1787, one of whom was the celebrated David Rittenhouse (a surveyor then without a peer in this country or any other), with all the precision available at that time, and monuments placed at every mile.

After a lapse of nearly a century, many of these monuments were more or less displaced or lost, and portions of the line became somewhat obscured. Commissioners for both States were authorized about the year 1875 to investigate this subject. The commissioners on the part of Pennsylvania proposed to go back to the original decree and fix the line upon the 42d parallel of latitude, with all the precision of modern science.

The following extract from the report of the New York commissioners will show the position taken by that State:

"Since this boundary was fixed by methods always employed in laying out boundaries described as parallels, and since the work was of the best quality of its day, therefore, according to all precedent and legal ruling, there can be no doubt that the line marked on the ground by our commissioners in 1786–7 is the bounding line between New York and Pennsylvania; and every effort therefore should be made to restore this line."

In such cases the practice is to use landsmarks and all available testimony to recover as many points on the line as possible, and then to connect these with straight lines.

This method was adopted in the final settlement of the boundary between the United States and Great Britain, and in all other cases with which we are familiar.

Thus we see that boundary lines, whether between States or nations, when once established on the face of the earth, agreed upon by all the parties interested and monumented, none of the gymnastic performances of the magnetic needle, variations in isogonic lines, or any modern discoveries as to the migratory character of parallels of latitude, will ever disturb them thereafter. Even the joint action of two States is not sufficient to move a boundary line that has once been established, until such action has been ratified by an act of the United States Congress.

Any one desiring to pursue this subject farther will find ample satisfaction in the final report of the New York commissioners, to which the surveyor's (Maj. Clarke) report is appended, 1886. What map of New Hampshire shows any part of that State limited by the 45th or any other parallel of latitude?

N. SPOFFORD,
Surveyor for Massachusetts on her northern boundary.
Haverhill, Mass., Dec. 31, 1894.

Japanese Athletics.

Athletics hold an important but subordinate position in the schools of Japan. Once a year there is a gathering of all the students in a district to engage in athletic contests. In those seen by Mr. Hearn, and described in "Glimpses of Unfamiliar Japan," six thousand boys and girls from all the schools within a distance of twenty-five miles were entered to take part. A circular race track, roomy enough for an army, allowed four different kinds of games to be performed at the same time.

There were races between the best runners of different schools, and races in which the runners were tied together in pairs, the left leg of one to the right leg of the other.

Little girls—as pretty as butterflies, in their sky blue hakama and many-colored robes—contested in races in which each one had to pick up as she ran three balls of different colors out of a number scattered over the turf.

The most wonderful spectacle was the dumb bell exercise. Six thousand boys and girls, massed in ranks about five hundred deep; six thousand pairs of arms rising and falling exactly together; six thousand pairs of sandaled feet advancing or retreating together at the signal of the masters of gymnastics, directing all from the tops of little wooden towers; six thousand voices chanting at once the "One, two, three," at the dumb bell drill: "Ichi, ni—san, shi—go, roku—shichi, hachi."

The games began at eight o'clock in the morning and ended at five in the evening. Then, at a signal, fully six thousand voices pealed out the national anthem, and concluded it with three cheers for the Emperor and Empress of Japan. The Japanese, instead of shouting when they cheer, chant with a long cry, "A-a-a-a-a-a!" which sounds like the opening tones of a musical chorus.

Wreck of an Engine.

A serious accident occurred recently to the great engine in the blast furnace of the Carnegie works at Braddock, Pa. The engine was used for four years to furnish the hot air for two of the great furnaces. The engine was disabled by a mass of iron falling on it from a height of twenty feet. Several of the pipes were crushed, and the engine "ran away" and was broken to pieces by the violence of its own action. The fly wheel, which measures thirty feet in diameter, flew apart, and pieces of it weighing two tons were hurled more than a block away. The engine house was demolished. The loss is about $15,000, and it will necessitate closing the furnaces for an indefinite period.

The output of the furnaces was about 250 tons per day, and over 300 men employed in this department will be thrown out of work.

Nut Planting.

To the amateur planter, says a writer in Garden and Forest, no class of the larger seeds of trees and shrubs causes more disappointments and elicits as many questions as do the various kinds of fruits known as nuts. The cause is generally a lack of knowledge, of proper treatment or carelessness. It does not seem to be generally understood, although the fact has been stated over and over again in horticultural journals, that many of these seeds retain their germinative power for a comparatively short time after maturity, unless they find the proper conditions for their preservation. The acorns of the white oak, Quercus alba, for instance, often crack and sprout and show the so-called root before the fruit falls from the tree. If these acorns are gathered and allowed to dry for a few weeks before planting, it is unlikely that any of them will grow. The same result follows in nature, if they fall on ground which is hard and dry and continues so for some time afterward, but if the ground is moist, the radicle or incipient root will soon enter it and be secured from drying, unless the soil itself should be deprived of moisture. What is true of the white oak is true of other species, although often in a much less marked degree. Some of the black oak group, for instance, bear acorns which are slower in germinating and appear to preserve their vitality better under adverse conditions. It is destructive to the vegetative power of all acorns to collect them in the autumn and keep them uncovered in an ordinary dry room to be planted in spring. But any of them may be preserved for months if simply packed or mixed with moist, but not wet, sand, soil or moss, and kept in a cool temperature, such as would prevail under a light covering of leaves or soil in the open air. Similar treatment must be given to hazel nuts, chestnuts and to beech nuts. In all cases care should be taken to mix in plenty of soil, or to place the nuts in layers so that they do not touch each other, and any tendency to heat and consequent moulding should be guarded against. Butternuts, walnuts and hickory nuts will not grow readily, or at all, if allowed to become thoroughly dried or cured, although the kernels may preserve a fresh appearance for years after germinative power is lost. They will, however, keep their vitality much better and longer than acorns under the same conditions.

As a rule, direct planting in the open ground as soon as the seed is collected is to be preferred, wherever practicable, for most kinds of nuts and acorns.

Among objections to this system are (1) the liability of the larger nuts to destruction by squirrels, of the thinner shelled ones by mice and some other rodents, or by birds; and (2) the action of frost in heaving the nuts out of the ground. Where the depredators can be guarded against, the heaving action of frost may be obviated by a covering of leaves or boards laid over the seed. Some growers aim to plant after hard freezing weather has set in, because there is then less liability to disturbance by animals. In this system of planting an extra quantity of seed is required to allow for failures or mishaps, just as is the rule with many field crops.

Walnuts, hickories and oaks generally form long tap roots, and some persons consider it an advantage to have the seed planted where the trees are to remain permanently, as it is generally found expedient to cut the tap root when transplanting. When the seed is planted where the tree is to remain, experiments have shown that these undisturbed trees make a much faster growth, in their early years at least, than those whose main roots have been cut.

The Penny Juggler.

A writer on the streets of old Paris gives in Blackwood's Magazine the description of a wonderful juggler, who must, however, have performed the following trick by skill rather than by deception:

He asked the crowd for pennies, that is, pieces worth two sous; he put five of them into his right hand, played with them, tossed them a few times in the air, and then suddenly flung them straight up to a height which seemed above the housetops.

He watched them intently, as they rose, and as they turned, and began to fall, he opened, with his left hand, the left pocket of his waistcoat, and held it open, perhaps two inches.

Down came the pennies, not loosely or separated from each other, but in what looked like a compact mass. He gazed at them fixedly, shifting his body slightly, so as to keep under them—he scarcely had to move his feet at all—and crash! came the pile into his waistcoat pocket.

He repeated the operation with ten pennies, and finally he did it with twenty. Yes, positively with twenty! It almost took one's breath away to hear the thud. Never did he miss, and never did the pennies break apart or scatter. They stuck to each other by some strange attraction, as if they had become soldered in air. There was evidently something in the manner of flinging that made them hold together.

After wondering each time at the astonishing skill of the operation, I always went on to wonder what that waistcoat pocket could be made of, to support such blows. The force, the dexterity, and the precision of the throwing—some sixty feet high, as well as I could guess—and the unfailing exactness of the catch were quite amazing. The pennies went up and came down in an absolutely vertical line.

The Forests of the National Domain.

The small company of forward-looking people who, in the face of almost universal apathy, had been for years urging the necessity of some rational system of management for the forests on our national domain, felt greatly encouraged ten years ago when President Arthur was moved to mention the subject in one of his annual messages. We have no systematic forest policy yet, not even the beginning of such a policy, but we are no longer surprised or unduly elated over the fact that men in places of high authority consider the matter worth talking about, at least. President Cleveland, like his immediate predecessors, in his message to Congress, which assembled last month, strongly advised that some adequate protection should be provided for the areas of forest which had been reserved by proclamation, and he also recommended the adoption of some comprehensive scheme of forest management. He condemned the present policy of the government of surrendering for small considerations immense tracts of timber land which ought to be reserved as permanent sources of timber supply, and urged the prompt abandonment of this wasteful policy for a conservative one, which should recognize in a practical way the importance of our forest inheritance as a vital element of the national prosperity.

The House of Representatives, too, has taken prompt action upon Mr. McRae's bill, entitled, An Act to Protect Public Forest Reservations. The provisions of the bill are simple. It authorizes the employment of the army to patrol these reservations, as has been done effectively in the Yellowstone Park and in the Yosemite Valley, and it empowers the Secretary of the Interior to make regulations in regard to their occupancy, to utilize the timber of commercial value they contain, and to preserve the forest cover from destruction. It also empowers the Secretary of the Interior to cut and sell timber on non-reserved lands under the same rules as those made for the forest reservations, provided that it shall be first shown that such cuttings shall not be injurious to the public interests. The bill had some unfortunate features, but any system which regulates the use of public timber is better than the indiscriminate plunder that has been going on hitherto, and the authorization to use the military for protective purposes is altogether commendable. The bill was amended, however, so as to strike out, if we understand it correctly, the provisions relating to non-reserved lands, and it restricts the sale of timber on reservations to trees that are dead or mature, thus limiting skilled forest practice, instead of authorizing trained foresters to make their own selection, and, worse than all, it grants free supplies of timber from the reservations to miners and settlers.

It is to be hoped when this measure comes before the Senate that its original features will be restored. In its present form it does little more than to expose the timber on the reservations to new dangers. We are judging, it is true, from newspaper accounts, and the published text of the bill may show that the amendments are not so bad as they seem. If military protection is assured, that is one step forward, but if such protection is made possible only when the War Department shall consider it worth while, it is a very short step, indeed. No doubt, any measure which gives the assurance of efficient policing of the reservations, or efficiently controls the cutting of public timber, is to that extent a gain, but we certainly want something more definite and decisive than the McRae bill as it now stands.

And, while measures of this sort are being prepared and pressed for passage, why shall we not take immediate steps to examine this magnificent forest property of ours in a more thorough manner than has yet been done, so that we can obtain facts to guide us in framing future laws, or, at least, to enable us to administer them intelligently? Seven years ago we argued the withdrawal of all these lands from sale until a comprehensive report should have been made by some commission capable of deciding what lands to sell and what to hold forever in forest, and we then proposed that, pending such a report, they should all be put under military protection. Why not provide for such a commission now and begin the investigation at once? This work would not interfere with the adoption of any protective policy, and certainly we can get no laws which go farther and deeper, and furnish a comprehensive system of forest management until we have secured possession of forests to manage. The appointment of such a commission need not be deferred until the passage of a protective law. Its creation would be entirely independent of other action. The work of the commission certainly would not obviate the need of forest protection. It would be in quite another field to furnish facts as a basis for future legislation which shall embrace a detailed management of the forests. If such legislation were devised at once, the very first thing done by the officials created under it would be to make just such a forest survey as a commission would make. This means that the appointment of such a commission as we contemplate would not disturb the administration of any law, but would in every way be in harmony with it, and help to carry out its spirit.

The nation holds these magnificent forests in trust for future generations. We certainly cannot know too much about their extent, their value and their character, and we cannot learn these things too soon.

No Congressman who opposes other forest laws need object to the inauguration of such a survey, because a commission can do nothing except to disseminate knowledge and furnish facts as a foundation for future action. Even if every recommendation of the commission should be rejected, we can think of nothing which would be a more powerful stimulus to public opinion than a comprehensive report upon our forest resources. The discussion which would be aroused by such a report, with its accompanying recommendations, would be an educational force of the highest value, and our only hope for legislation, immediate or in the future, depends upon the creation of such a public sentiment as will compel action.—Garden and Forest.

Problem in Railroading.

The big siege mortars now being put in place at Fort Point have occasioned considerable difficulty in transportation. Even after arriving here trouble was experienced in hauling them through the city, and the commanding officer at the Presidio seemed imbued with fear that the roads there would be ruined by the transportation of the big dogs of war. Bringing them across the continent was a job. They weigh 1,341,000 pounds. The mere weight was not of so much importance, but the size of the pieces made it hard work. The ordinary railroad car is ten feet wide, but the circles on which the mortars revolve are solid circles of cast steel, fourteen feet in diameter and two feet thick. They could not lie flat on a car, because they could not go along without jamming or knocking other cars off the track. Furthermore, there is a rule which forbids cars to be loaded higher than fourteen feet from the top of the rail. It looked at first as if it were nearly impossible. It was the Pennsylvania road that had to do the thinking out of the scheme, for that road had the task of carrying them to Chicago. This is the way it was done:

A slot was cut in the bottom of a gondola car, such as is used for carrying coal. This was made wide enough to let in edgeways the circles which belong to each gun. Of course that weakened the car, and long timbers had to be bolted on the floor of the car and to the cross piece in order that it would not collapse. The two circles which were to go on each car were hoisted by a steam derrick and suspended in the slot at just the right height. To tell the truth, the car was technically loaded seven inches too high, but practically there was no violation, since the height of 14 feet 7 inches was reached at only one point in the center of the car, and no brakeman would be required to stand there. The lower rim of the axle has sufficient clearance at the bottom—half an inch above the track level would have been enough—but about four inches was taken. The big circles were suspended at that height, while the structure that was to hold them was built of pine timbers 6×8. These were bolted with tie bolts as securely as possible.

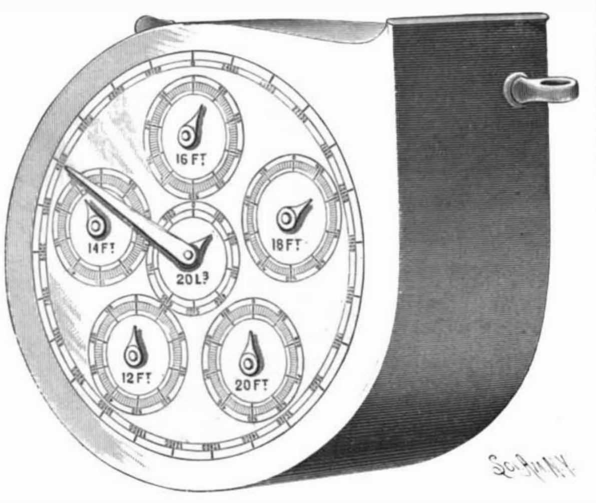
Six cars were so arranged, and the six mortars, with other gear, were loaded on ten other cars, which were not specially treated. The train thus carried half the load of twelve mortars on one trip. The route was on the Pennsylvania to Elizabeth over the tracks of the Central road, thence to San Francisco via the Chicago, Rock Island, and Pacific, the Union and Central Pacific roads.

Astonished Mules.

Six mules that had for four years hauled cars in the lower workings of the Spailand coal shaft, near Lacon, Illinois, were brought to light recently, says an exchange. In all that time the mules had seen no light stronger than the flicker of the Davy lamps the miners carried. The sun was in its zenith when they reached the surface. The astonished mules closed their eyes to shut out the flood of light and kept them tightly closed while they were led to the pasture lot, a mile distant, and turned loose. There they stood trembling as if afraid something evil was about to befall them. Presently they half opened their eyes and peered round in amazement. When they had become accustomed to the sunlight they elevated their heads. Toward sundown they broke into a chorus of joyous brays. After a quarter of an hour of that music they took to kicking, jumping, whirling around the teetotums, and rolling on the sod as if they had gone mad. The sun and pure air were more to them than food, and they refused everything put before them to eat.

A NEW MEASURING AND REGISTERING DEVICE.

The accompanying illustration represents an improved device for measuring, registering, and adding a series of measurements and may be used for measuring lumber and for similar work. The device has been patented by Mr. George Krueger, of Johnstown, Pa. A cord or tape line attached to the knob, to be seen at the side of the instrument, is connected to control a wheel which connects with a number of graduated gear wheels, which in turn control a registering device. To operate the mechanism the cord or measuring line

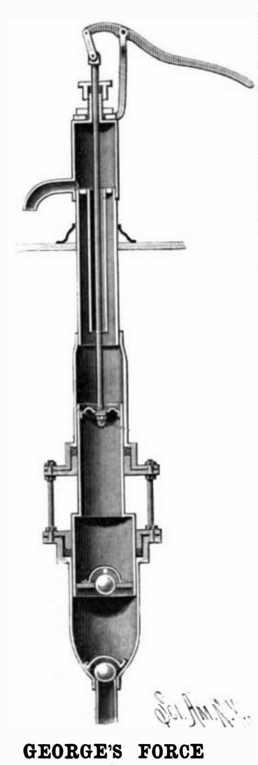


DEVICE FOR MEASURING LUMBER.

is drawn out over the surface to be measured. The length of line drawn out is recorded by the system of gear wheels on the several dials on the face of the instrument. These dials are graduated to indicate measurements from zero to 100 feet board measure (viz., one foot wide by one inch thick). Each dial can be made to record the sum of the measurements of boards of the same length, the unit of length being marked on each dial. Thus one dial may be used for 18 feet lengths, another for 16 feet lengths and so on. A knob is arranged on the top of the instrument to move along a scale graduated to indicate lengths of 18 feet, 16 feet, etc., and when the knob stands at, for instance, 18 feet, all measurements taken will be indicated on dial 18. The device will also record the total length in feet of all measurements this being registered on the outer and on the central dials. The central dial registers from zero to 1,000 feet and the great dial up to 25,000 feet. The inventor claims for his patent perfect accuracy, and a gain over similar devices in simplicity, durability and general convenience of manipulation.

AN EFFICIENT FORCE PUMP.

A simple and efficient pump, for forcing a continuous stream of water at great pressure, has been patented recently by Mr. William R. George, of Staunton, Illinois. The accompanying illustration represents a central longitudinal section of the improved pump and gives a clear idea of its construction. The outer casing is made in four parts. The upper part provides a sealed air chamber with an ordinary spout and handle. Below this is a compartment having a closed upper end and a central tube passing through it to form a passageway for water and for the plunger rod. The space at the top of this compartment around this tube forms an annular air chamber, and this serves as an air cushion, which assists in ejecting the water. Below this compartment are two separated pump barrel sections of different diameters. At the bottoms of these are two upwardly opening valves of the ordinary ball pattern. A tubular plunger of two diameters corresponding to the diameters of the two pump sections works, as may be seen in illustration, in the two lower pump barrels. The action of the pump is very simple and consequently is not likely to get out of order. It will be seen that as the plunger is raised a portion of the water above it will be forced out, and when the plunger is lowered the valve of the upper part of the plunger will be opened while the lower valve will be closed. The lower end of the pump plunger is twice the area of the upper part, and the volume of water therefore forced upward is sufficient to cause the water already in the pump barrel to be ejected, thus keeping up a constant flow of water. The air cushion, it will be seen, causes the water to be ejected with great force, and this makes this form of pump especially valuable in cases where a hose is to be used in connection with it.



GEORGE'S FORCE PUMP.

Electricity in Sugar Manufacture.

Electricity and bacteriology are the two youngest sciences. They are destined to promote human health and wealth to a far greater extent than has been dreamed by those not familiar with the rapid progress which has been made recently in those sciences. Bacteria, microbes and bacilli are the causes of chemical changes upon which our existence depends; they cause health and they also cause disease and death. The influence of electricity upon the vital forces of plants and of animals is not well understood. Its effect upon chemical changes and transformations is only partly comprehended. An electrical current destroys, disintegrates and decomposes. It also builds up, develops and perfects chemical combinations. A green leaf separated from a plant decomposes carbonic acid. Sugar forms in the stem of the cane from material furnished by roots and leaves. An electrical current passed through a solution breaks up strong combinations and forms new combinations. How far these results are due to the same cause we cannot tell. The development of electrical science has been so rapid that electricians have not had time to become old. Its progress is so rapid that an expert electrician would find it difficult to keep informed in regard to its new applications to industrial art in all lines, for it applies directly or indirectly to nearly all lines of human effort. The progress of electrical science is a matter of days or of hours. The electric lamp is the original star of destiny. It lights up the way to startling discoveries which will affect all industrial arts. The electric current produces power, light, heat and chemical effects, all of which are required in sugar manufacture. A wire which passes easily through a keyhole can carry hundreds of horse power to almost any distance. A carbonized fiber of cane produces an illumination. The electric furnace gives heat which is more intense than coal. The strongest chemical compounds are separated and new compounds are formed by electrical action. It seems not at all impossible that electricity may play an important part in future sugar manufacture.

It has been recently discovered that caustic soda is cheaply produced by passing an electric current through a solution of salt. Chloride of sodium—that is, common salt—is a strong combination, but as sodium has also a strong affinity for the oxygen contained in water, and as chlorine has also a strong affinity for the hydrogen of water, the oxide of soda is easily formed by passing an electric current through a solution of salt, forming muriatic acid and caustic soda instead of salt and water.

As the fiber of cane is a valuable paper-making material, and as caustic soda is largely used in cleansing the fiber, it seems that this application of the electric current may be useful to the sugar industry, to the salt industry and to the paper industry; for as salt is one of the cheapest commodities, and as the fiber of cane is practically almost a waste product, and as sugar houses have dynamos for generating current, the caustic soda which is required in reducing cane fiber to paper pulp may be produced upon the plantation.

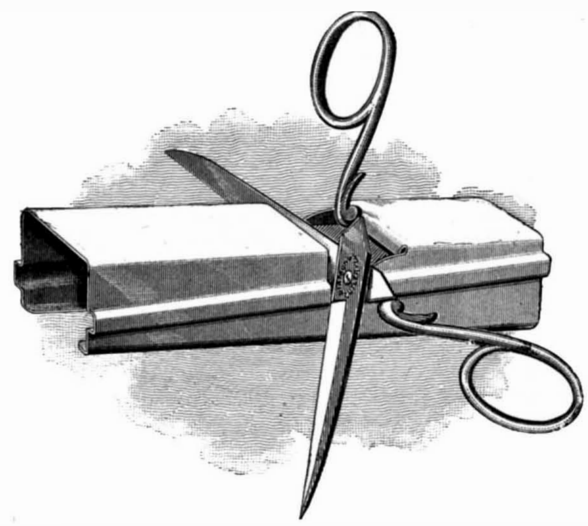
Another application of the electric current in sugar manufacture may be found in clarifying cane juice or sirup. It has been found that a current of electricity at high pressure or voltage inverts sugar, but that at a pressure or voltage which is sufficient to decompose water, the electric current does not invert sugar. Water in the juice is decomposed, oxygen and hydrogen being set free to act upon the impurities in the juice. It is said that fifteen European beet sugar factories will adopt electrical clarification next season.—La. Planter.

The Bearing Power of Various Soils.

Mr. E. L. Corthell, of the Western Association of Architects, gives in a recently published text book the following data as to the bearing power of foundations. In clay soils the resistance is from 2 to 8 or 9 tons per square foot, with allowance for friction. In sand the data vary much in different kinds. Sand mixed with loam will not bear more than 5 tons per square foot. Nine and one-third tons per square foot were placed on fine gravel and sand at Urk Viaduct; masonry piers on cylinders 4·8 inches diameter; friction neglected. In India, on coarse sand, not over 9 tons are used. In experiments 20 tons have been placed on sand without settlement. Referring to friction, the author says: Side friction varies from 200 pounds to 600 pounds per square foot. Blackfriars Bridge, on clay, is put at 5 tons per square foot, settled; new London Bridge, 5 tons per foot on piles = 80 tons per pile, settled badly. Other weights are given of American buildings. Thus, Washington Monument is 9 tons per square foot, inside edge; clay and sand, 3 tons per square foot, outside edge. These data vary greatly, arising from the admixture of loam or gravel with the sand; the latter appears to give the highest results.—Architecture and Building.

THE "DIAMOND" SHEARS AND SCISSORS SHARPENER.

The simple and useful little device for sharpening scissors which we illustrate has been put upon the market by the Diamond Cutlery Company, whose offices are at No. 64 Broadway, New York City. The



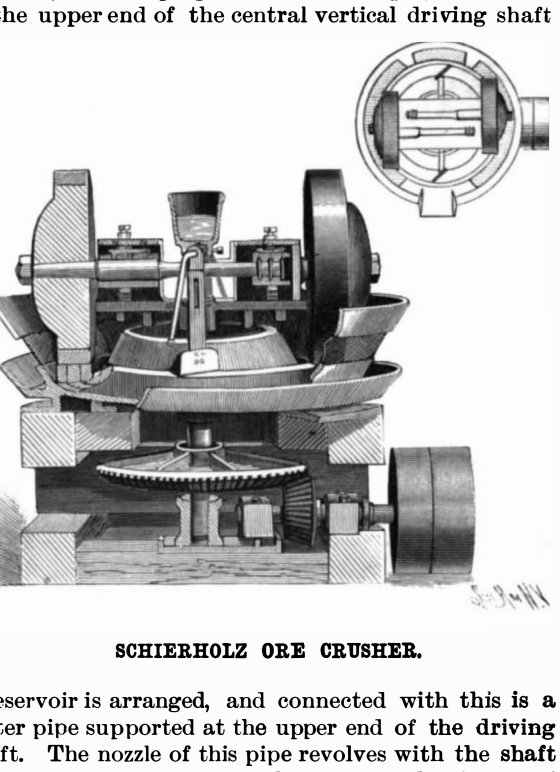
IMPROVED SCISSORS SHARPENER.

device consists of a nickel-plated metallic case provided with inside grooved runways for holding a special diamond-cut file. The top of the case is cut by a groove which holds the scissor in position and guides it when it is passed over the file.

The inside grooved runways holding the file are arranged at such an angle as to file the edge of the scissor at a proper bevel, and they permit the file to be adjusted when one portion becomes worn.

AN IMPROVED ORE CRUSHER.

The illustration accompanying this notice refers to an improved form of ore crusher, which it is claimed can be operated with less power than is required to run the ordinary forms of such machines. The crusher has been patented by Mr. August H. Schierholz, of 1421 California Street, San Francisco, California. The patent provides for a circular pan for holding the ore, supplied with a feed spout. The sides of the pan are inclined, and these are provided with openings covered with wire screens which allow the crushed ore to pass out into a discharge spout. At the bottom of this pan a circular die is arranged on which the crushing rollers travel. These rollers, two in number, extend on opposite sides of a central driving shaft and are connected with this shaft by a simple and powerful system of gear wheels, as may be seen by reference to the illustration. Power is applied to the horizontal shaft to be seen in the lower part of the illustration, and this shaft transmits its motion to the vertical drive shaft carrying the rollers, so that the crushing rollers are made to revolve both on their own axles and about the vertical shaft. It will be seen that they will move regularly about the circular die, thus crushing the ore. The frame of the rollers is provided with a common form of scrapers which move over the face of the circular die, thus keeping it free from clogging materials. At the upper end of the central vertical driving shaft

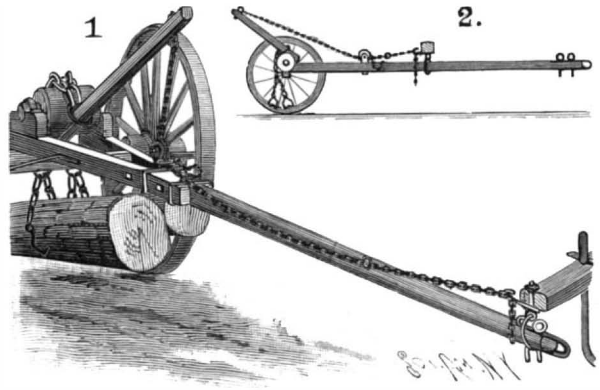


SCHIERHOLZ ORE CRUSHER.

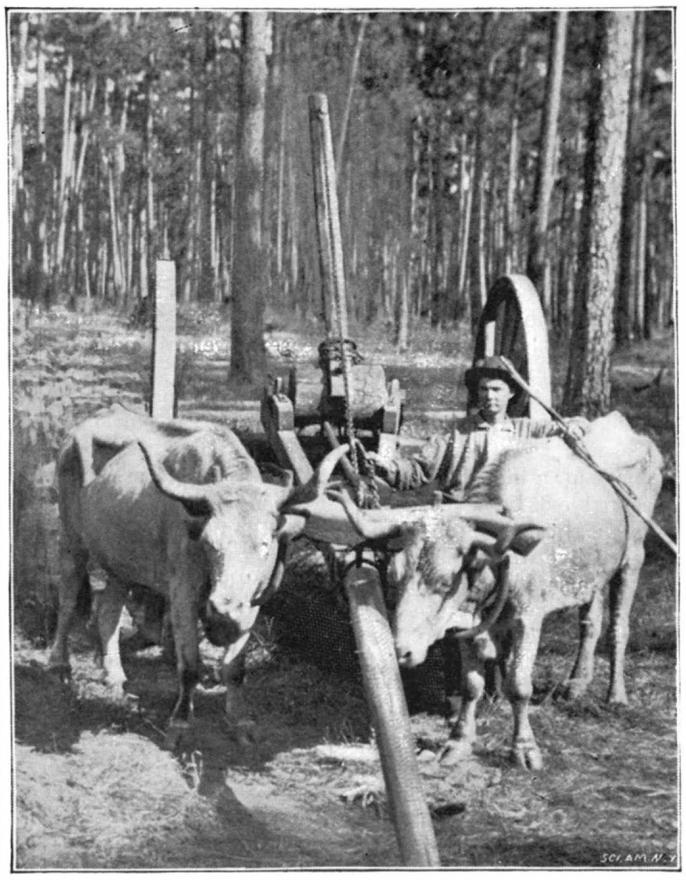
a reservoir is arranged, and connected with this is a water pipe supported at the upper end of the driving shaft. The nozzle of this pipe revolves with the shaft and is carried around and delivers a steady stream of water on the screens over the openings in the side of the pan. This serves to wash the materials through the screens into the circular discharge spout, and keeps the screens free from clogging matter.

A NEW LOG LOADER.

The illustrations herewith refer to a new contrivance for loading logs on high-wheeled trucks, which is intended to do away with the use of hand windlasses and similar machinery. The device has been invented and patented by Mr. William Brough, Jr., of Warren, Tyler County, Texas. The general plan of the device may be readily understood from the illustrations. In the cut presenting the two views, Fig. 1 shows the position of the device with the log raised in position for hauling and Fig. 2 gives the side elevation of the truck, showing the position before loading. The truck is provided with high wheels and a common form of wagon tongue. Directly over the axis of the wheels is a roller or support which serves as a fulcrum for the sweep. At the lower end of this sweep is attached the chain and grapple used in hoisting. At its upper end another chain is attached and this passes around a revolving wheel fastened to the top of the tongue, as shown in the illustration. The end of this chain is attached to a ring which slides along the tongue and may be fastened to a clip at the end of the tongue or yoke. When the device is to be used, the sweep is turned back and the grapple is made fast to the log to be raised. The team is then hitched to the end of the chain and driven forward, thus pulling the chain and moving the sweep, which in turn moves the roller, winds up the chain on the fulcrum and raises the log into position for hauling. When the team has drawn the chain far enough to raise the log to the desired height, a pin is slipped through a link of the chain just in front of the wheel, which prevents it from slipping back. A rod may be used to operate the sweep in place of the chain, though the chain is generally found preferable. It will be seen that the contrivance is exceedingly simple and durable.



DETAILS OF BROUGH'S LOGGING TRUCK.


IMPROVED LOGGING TRUCK.

THE BATTLE OF THE YALU RIVER.

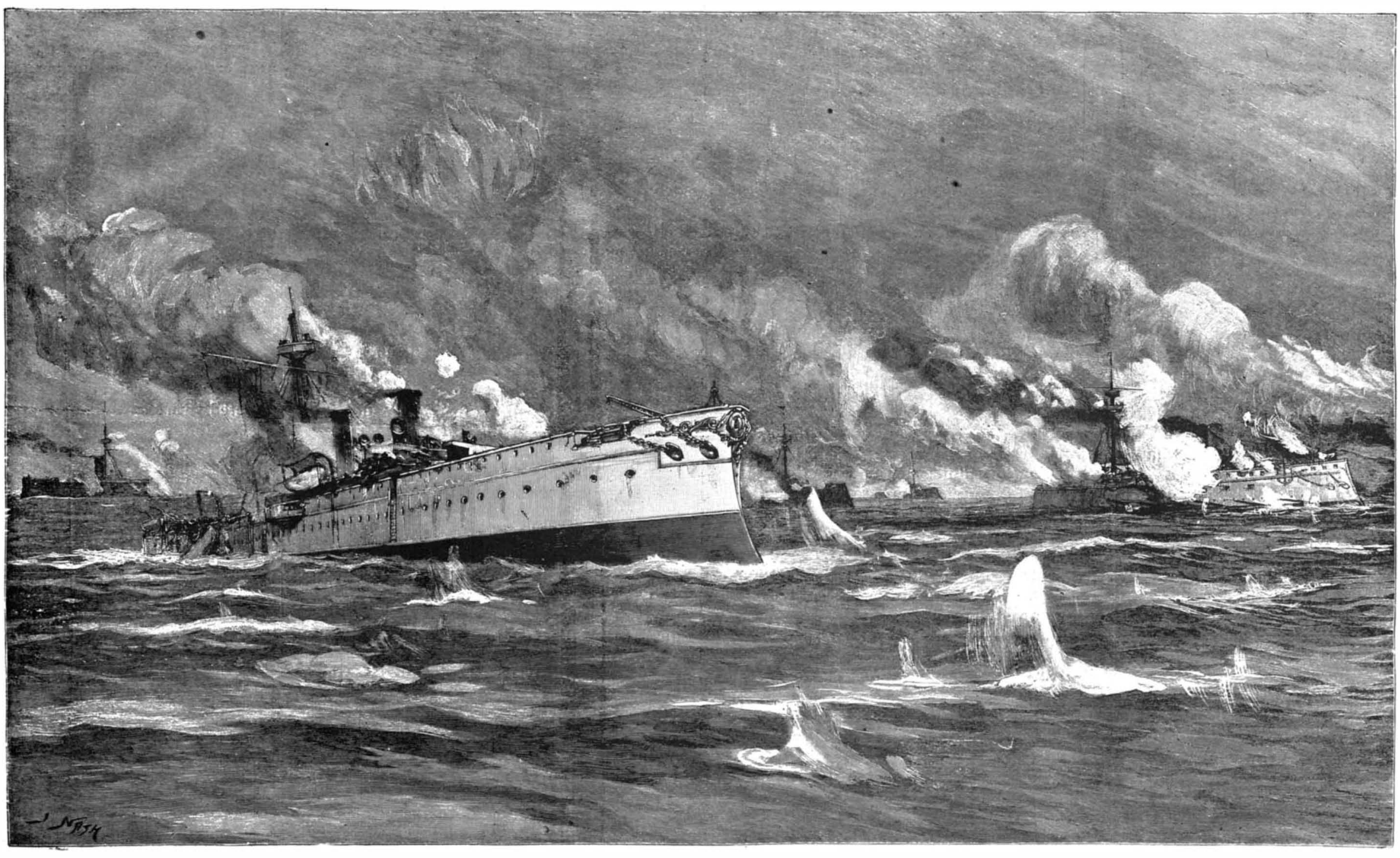
The greatest naval battle of modern times was fought between the fleets of China and Japan on September 17, 1894, while Chinese transports were attempting to land troops at the mouth of the Yalu River. When the Chinese fleet sighted the Japanese fleet it steamed out to meet it. The formation of the Chinese fleet when in the open water was that of an accentuated crescent, while the Japanese were in a single line, with the Matsushima in the center. Admiral Ito, after the first few rounds had been exchanged, signaled the Japanese ships to bring their guns to bear first upon one flank, then upon the other of the enemy. The Chinese fleet then formed in a single line, the distances varying from 7,000 to 12,000 feet. The Chinese aim was bad. The Chinese admiral soon saw that his position was desperate and ordered the formation of the line broken. He sent three ships against the Japanese line at full speed. It was about this time that the Lai-Yuen, the Chih-Yuen and the Chao-Yung were sunk. The Chinese cruiser Chih-Yuen, commanded by Captain Tang, closed with one of the enemy's ships with the intention of ramming, but was herself then attacked by four Japanese ships, which closed around her. The Chih-Yuen, under this combined fire, was ripped up by shots under the water and went down with all on board. This is the feature of the battle we illustrate. The flagship Matsushima had been the object of the Chinese attack throughout the fight. A Chinese shell struck and dismounted a quick-firing gun, and the commander and the first lieutenant were killed, 120 of the crew were also lost. Admiral Ito transferred himself and his staff to the Hoshidote, and in a short time was in the thick of the fight. The total loss of the Chinese, including the cruiser Kwang-Kai, which was blown up while making her escape, was five vessels.

The quick-firing guns gave the Japanese an immense advantage, scattering showers of splinters, occasionally setting the Chinese ships on fire and riddling everything that was not protected by armor. In the course of the action one of the smaller Japanese ships was seen with her propellers out of the water and her bow nearly under. Another was seen to be on fire, enveloped in flames and apparently sinking.

The Yoshino and Matsushima were burning fiercely. The former, after receiving two shots each from the Ting-Yuen and Chen-Yuen, was enveloped in a cloud of white smoke, which lay heavily on the water and completely covered the ships. The Chinese vessels waited for the cloud to clear and got their port guns ready, but before the Yoshino became visible their fire was diverted by a Japanese vessel of the Matsushima type, which came on at a distance of 2,200 yards on the port quarter. The guns laid for the Yoshino were fired at the newcomer, with the result that she began to burn. Whether or not these three Japanese ships received mortal injury was uncertain. In the latter part of the battle the Chinese ironclads ran short of common shell and continued the action with steel shot. This was ineffective, as the Japanese vessels had no armor. The two ironclads fired 197 rounds with 12-inch guns and 268 rounds with 6-inch guns.

About 4 o clock the Ting-Yuen was badly on fire forward, the smoke impeding the working of the fore turret. Before 5 o'clock the Japanese had ceased firing, and the distance between the fleets was rapidly increasing.

In regard to the conclusions to be drawn from the battle, it may be said that the Chinese battleships


THE GREAT BATTLE OF YALU.

proved formidable. The Chinese ironclads stood the battering of the heavy quick-firing guns admirably. Their upper structures were severely damaged, but not a shot penetrated a vital part. The barbette protection of the 12-inch guns was most effective, few men being wounded within the barbettes. Two barbette turrets were intact after the action. This fact, however, coupled with the fact that the 6-inch guns at both ends of the ships, which were only slightly protected, were also undamaged, seems to indicate that the destructive effect was due to the enormous number of projectiles from the quick-firing guns rather than to the skilled direction of the shots. The maneuvering of the Japanese first division excited great admiration. Taking advantage of their speed and the long range of their guns, they always kept at the distance which suited them, maintaining perfect order throughout the fight, attempting nothing sensational and never coming within destructive range of the heaviest guns. For our engraving we are indebted to the London Graphic.

A Frenchman's Views on the Safety Bicycle as it Now is and its Probable Future.

Mr. Henri Desgranges, in the Revue des Revues, gives a very able review of the present state of bicycle riding and bicycle manufacturing in France and also in other countries of Europe and in America, of the evolution which has led to the production of the bicycle of to-day, and the possibilities of further improvement. We reproduce the leading thoughts of his article without comment, and hope it will be interesting to our readers to become acquainted with the views of a Frenchman on this important subject.

Mr. Desgranges first recalls the various steps in the development of cycles preceding the introduction of the safety bicycle, and then speaks of the great difficulties and the intense competition on the part of makers of the old type machine which opposed the progress of the safety in France. The new machine seemed to be a very frail thing, its frame was weak, its appearance rather awkward, and improvements were coming very slowly. Still, every day some material modification was being made. At the time of the races, Bordeaux-Paris and Paris-Brest (in 1891), the task was completed in its main points; the safety bicycle, a beautiful machine at last, was thenceforth ready to fly to the conquest of the world.

Now even the most obstinate adversaries have been won over. Those who yesterday were indifferent are enthusiasts to-day. There is scarcely anybody in France, whether rich or less fortunate, and in any position of life, to whom the safety bicycle has not afforded some moments of pleasure, while to many it has been a source of real happiness.

The safety bicycle has completely revolutionized our conceptions of distances. The word mile has lost its prestige; heretofore a man could make about 4 miles an hour, now he can cover 12, 15, 20 miles and more in the same time. This possibility has for tourists an invincible attraction, an irresistible charm To go still quicker and farther, that is the inspiring aim. To produce speed by one's own strength, without anybody's aid, to be one's own motor, these are thoughts which fire our imagination and feed the bicycle passion.

Cycling as a sport is still more interesting, from a moral point of view. Quite a large number of our young men, who formerly were addicted to stupid habits, and the seeking of nonsensical distractions and vulgar pleasures, are now vigorous, healthy, energetic, and for the sake of this extraordinary machine submit themselves to an ascetic rule of life, and, induced by taste and passion, acquire habits of temperance, the imperative desire of quiet and regular living, and, most important of all, the steady exercise of self-control, by resisting their appetites and doing, without hesitation, all that is required for effectual training.

I know there are higher aims in life. One may plan greater things as a programme of one's existence Other contests are nobler and more beautiful than the contest of a race. But whatever may be the motive which actuates you, it is good and refreshing to think that in our country men are able, even for an apparently trifling purpose, to show by their actions that they do not believe the essence of life to consist in merely eating, drinking and sleeping well.

This is a thought which cannot be too much emphasized. The safety bicycle is training for us a generation of strong and healthy men, of vigorous athletes, of energetic strivers for success and improvement; it is a mighty agent in the physical and moral regeneration of our people; there certainly are not many things and ideas which deserve the same praise.

Then look at the important interests and the number of workers connected with this flourishing industry! How many men owe to it a living and prosperity!

Again, what immense progress has been made in the manufacture of cycles! By constant efforts the original type of the machine has been gradually transformed. Assiduous work and indefatigable endeavors have been necessary to bring the safety to the almost absolute perfection which it has now attained. The experience acquired every day formed a basis for the solution of the problems of the day before.

Of the various parts of the machine, the frame, the skeleton of the cycle, is, perhaps, the one which has been modified most radically in the course of several years. The bad machines with a straight body, which may still be seen in some of our provinces, were the first venture. They were, however, lacking in rigidity, and numerous modifications were introduced to remedy this defect. Although some of the "improved" frames were rather strange and ridiculous departures from the original idea, yet a gradual progress was being made toward the present frame, whose characteristic, regular, elegant and logical shape appears to be definitively settled.

To the solid tires succeeded the hollow rubber tires, making bicycle riding more comfortable. The desire of greater speed led to the introduction of pneumatic tires, and this part of the safety also, from its original clumsy and unsatisfactory shape, has developed into a light, practical and reparable tire.

These, however, are only the essential modifications. It may be said that every part of the machine was every year subjected to radical transformations. The hollow rim, the ball bearings, and the tangential spokes are important factors in the history of cycle manufacture. Considerable progress has also been made in the construction of the pedals by reducing the proportions of the parts.

It has been the constant aim of manufacturers to diminish the weight of the machine. Every year there has invariably brought a decrease in weight and a corresponding increase in speed. The normal weight of a machine four years ago was about 45 to 50 pounds, and the owner of a bicycle of 35 pounds always cautiously dismounted when he had to cross a paved road. At present, a bicycle of 35 pounds is a big heavy machine, capable of being used on rough roads and supporting a weight of 125 to 140 pounds without danger or any excessive strain. A rider of average weight can procure a safety weighing 30 pounds with all accessories. A young man may take long rides on a machine of 25 pounds. The racing machines of our sportsmen average from 20 to 23 pounds.

It seems, however, that the weight of the machines remains approximately stationary at the above indicated figures. Is it not necessary that the rider should feel that he is propelling something, and does he not require a certain coefficient of resistance for the effort he is exerting? There certainly will be made changes in the distribution of the weight in the safety; means will be contrived for reducing the weight of the wheels, but the frame, the cranks, the fork, or, in brief, the body of the machine, will remain substantially unaltered.

In order to produce a safety ready for use, special machinery of high quality is required. The leading manufacturing firms of France have invested enormous sums in such machinery, and have found their profit in it.

The value of the machinery in a large factory may be estimated at several hundred thousand francs, and the number of machines necessary for the manufacture of cycles is an imposing one. Each of the parts of the safety bicycle requires several machines for its production. For the frame, which to the uninitiated appears to consist simply of eight tubes, there are machines serving to cut the tubes to the desired length, others to bend the tubes, machines for drawing the tubes, and others for flattening certain parts of the cycle, such as the sockets of the fork. The assembling of the parts of the frame must be made with rigorous exactness, and for this purpose patterns are used for each type of safety. Powerful blow-pipes are employed for brazing the pieces of the frame. In addition to the above mentioned machines, the production of the frame necessitates the use of machines for dressing the outer and inner surfaces of the tubes, for cutting and punching or upsetting the heads of the fork.

The other parts of the safety are equally complicated. The wheels necessitate apparatus for giving the rim the desired cross-sectional shape, for bending the rim, and cutting the sections thereof. These sections are then assembled similarly to those of the frame to form a continuous rim. The spokes are cut to the required length, provided with a screw thread, and flattened at one end where they engage the journal. After all these preliminary operations, the wheel can be completed by assembling the parts. Each of the above operations is performed by means of one or more special machines.

The most important feature is the manufacture of the ball bearings. The automatic machines, which produce all the axles and journals without requiring any attention, are admirable masterpieces of modern genius. The piece roughly dressed is put into the machine, and after a definite time comes out perfectly finished. After the nickel bath, the axle may be used at once.

There is besides a multiplicity of machines for making the balls, for turning the sprocket wheels and cutting their teeth, and lathes for turning the axles, cones and sockets of the ball bearings. The manufacture of the bolts, nuts and parts for putting the sprocket chains under tension necessitates the use of additional machines.

A factory with all these machines in operation is a very interesting sight, suggestive of prodigous life and activity.

The making of each individual part of the machine also is quite a complicated affair.

The tubes of the frame are connected by means of sockets first cast and then turned on a lathe. These sockets are perforated in the exact directions of the axes of the tubes. The bore is then enlarged sufficiently to receive the ends of the tubes. The outer surface of the socket is then dressed with a file and the parts of the frame are assembled upon a support or pattern. Pins are used to hold the tubes on the sockets, and by brazing, the frame is made continuous. The file and emery are then used to clean the frame, after which it is enameled.

Axles and cones are turned in a bar of steel, on engine lathes which automatically bring the various tools into engagement with the bar. The powerful files employed cut steel as if it were wood, and entire carloads of metal shavings are produced every week at the big factories.

In order to avoid delay, the several parts of the machine are manufactured simultaneously in different workshops.

In a large factory almost all the parts of the machine are made upon the premises. Exceptions are the tubes, the balls, the saddles, the chains, for the production of which special machines are required which would be of doubtful advantage in a bicycle factory.

There are other facts connected with the manufacturing of cycles which are of great interest.

The number of workmen employed in a large factory is several hundred, receiving various wages, which sometimes are high. Men having to work on certain delicate parts earn more than sixty dollars a month. Each section or workshop has its own foreman, a former workman, who knows how to deal with his men without offending them. These foremen are skillful workers, and have a fair amount of technical knowledge. Some of them have gone through the government schools.

Our readers (says Mr. Desgranges) will perhaps be surprised that a bicycle factory should turn out more than 15,000 machines annually, and spend more than $20,000 a year for advertising in Paris and in the provinces, and should be a customer capable of enriching the printer who makes its catalogues, posters and pamphlets.

First.—Ten years ago the scale of bicycles did not amount to 2,000 a year; the annual production in England was perhaps 3,000 machines.

In 1893 no less than 5,000 velocipedes have been sold in France, and about an equal number in England.

In 1894 more than 60,000 bicycles have been manufactured in France, and the same in England. In the United States last year nearly 110,000 machines have been sold.

Before the race Paris-Bordeaux, in 1891, the production in France was far under 10,000. The number of 60,000, which has been exceeded this year, includes at least 30,000 machines manufactured by the two largest French factories. About a dozen factories produce about 2,000 to 3,000 machines; a good number is capable of an annual production of 4,000 or 5,000 machines.

We have no information about Germany, and scarcely know the name of the most important firm, Opel.

Italians, Spaniards, and the states of South America are as incapable of constructing a safety bicycle as an agricultural machine. They are still infants in such matters.

Second.—Number of workmen.

The firm of Clement employs nearly 500 men during the business season, that is, from March till September. The number of workmen in the entire republic of France certainly reaches 25,000. Taking into account the industries connected with cycle manufacturing (India rubber, nickel, aluminum, saddlery), it is not an exaggerated estimate to assume that 200,000 men would be thrown out of employment in France if the manufacture of safety bicycles was stopped suddenly.

Third.—There are at least 300,000 cyclists in France; the same number was given for England two years ago, at present there probably are at least 400,000 cyclists in England. In the United States there are more than 500 000 bicycle riders.

Many interests are centered in a large factory. The newspaper press is a powerful ally, and catalogues published in several editions are largely circulated.

All sorts of advertising schemes are made use of. One that was most efficacious formerly, but now begins to lose its power, consisted in the races and the racers. What make does So-and-so ride? This used to be the first question, but now common sense and public opinion have done away with that, and if in the provinces this kind of advertisement still meets with success, people in Paris know that a good racer will always ride well on a good machine.

Such is cycle riding and cycle manufacturing considered along their essential lines. As above stated, the safety bicycle as a whole, with its characteristic features, is a definitely solved problem. In this industry truly French? We must admit that in this as in many other matters we have imitated our English neighbors. If now we are able to fly with our own wings, how many ideas have we had to take from abroad! Our machines are identical with English machines as to shape and general arrangement of parts. It is the same conception of the machine with modifications that are trifling and not sufficient to enable anybody to discern the part which belongs to each nation in this common achievement.

Americans, however, clearly have a different conception of the safety bicycle from ours. It might even be said that the difference between their machines and ours results principally from the want of exchange between the two countries. We have not yet found a practical way of creating a market for our goods in America, and the first American machines arrived in Paris but two or three months ago.

What we have seen indicates, as we have said above, two entirely different, although not opposite, conceptions. The Americans have made their machines as if they had never seen ours, and have impressed upon them the stamp of their national individuality. Our machines clearly prove that we had not known the American bicycles. We find in the latter a particular regard for comfort and practical usefulness, and an undeniable tendency toward a uniform type of machine. Some parts may hurt our æsthetic feelings, and we would almost call them rather heavy, just as we feel inclined to think a negro woman ugly, and as the negroes very likely consider us ugly.

There is no doubt, however, that the introduction of safeties of American make will bear fruit in France. There will be an exchange of ideas and views that will be profitable to all, and doubtless will lead to new modifications of the machines.

Will there be a complete revolution? We do not believe that, and it seems to us that the safety bicycle in future will substantially resemble its present type.

The safety bicycle will always be based on the direct utilization of man's strength, and we believe this is an essential condition of its existence. Obese and lazy people dream of safeties provided with petroleum motors, resembling invalid carriages, and constituting a negation of effort and action. The day the safety bicycle will enter upon this road, it will be doomed to die.

Let us leave to impotent dreamers petroleum cycles, electrical cycles, safeties with which the rider exerts no effort and spends no power, and let us keep for ourselves those adorable little machines which one must needs love with their charms, and particularly with their virtues of invincible attractiveness.

The Anaconda Mines.

The largest copper smelting property in the world is at Anaconda, Montana. During the past eleven years the magnitude of the plant and its results have been steadily increasing, till now the employes are numbered by the thousand, and the business aggregates over a million dollars a month. About 4,000 tons of ore are daily treated at the smelters, which are in continuous operation. The works constitute a little town in themselves, comprising a large number of different divisions, each subdivided into details corresponding with the requirements of the process of taking the ore from the car and turning it out merchantable copper. The concentrator alone is of vast proportions; the smelter and furnaces cover acres of ground; the eighty tank houses, power houses, storerooms, offices, etc., occupy a large area, and, in connection with this, is the proposed greater converting plant, to cost over a million dollars, and intended to be the largest and most complete institution of the kind in the country. The company's thousands of men are also employed in the Anaconda mine, near Butte, and adjacent mines, in their coal mines, fire brick, coke, etc., the payroll exceeding that of any other mine in the United States.

From 1885 to 1892 inclusive the Anaconda Mining Company has extracted from the mines in Butte district over 450,000,000 pounds of copper. Everything is on a gigantic scale and constitutes an important factor in the great industrial interests of the State.

An agreement is reported concluded between the Anaconda and Calumet and Hecla companies, under the terms of which the former company undertakes to reduce their production to the level of the latter company—say to about 5,500,000 pounds per month. As in the month of October the Anaconda Company produced 9,300,000 pounds, this reduction represents about 1,500 tons per month. The production of the other three leading Montana companies in October was 6,100,000 pounds, and that of the other leading Lake Superior company—the Tamarack—900,000 pounds, these figures about representing the extent of their present capacity. It is believed that the Rio Tinto Company have agreed not to increase their production. Copper shipments to Europe continue on a reduced scale, being about 4,000 tons for November, making the total for eleven months of the year about 69,552 tons, against 70,903 tons in the same period last year. As 22,000 tons less have been shipped in the five months from July to November this year than last, it is evident that the private stocks of American copper held on the Continent must now be less than at this date in 1893, the public stocks in England and France showing an increase of 6,068 tons. Consumption both in this country and in Europe must have been much larger this year than last, and seems likely to improve.

Profitable Fish Farms.

The practice of raising food fish for market has become of late a very profitable industry, and in some parts of the country is being carried out on an extensive scale.

The equipment of a fish farm, as it is called, is a very simple and inexpensive operation. Land which would be valueless for ordinary farming may be used for the purpose, the only requirement being a plentiful supply of good running water. The best site for a fish farm is a hilly or mountainous district where the water runs swiftly and is interrupted by waterfalls, since this serves to aerate and refresh the water. The fish farms are usually provided with three ponds, each of which is reserved for fish of about the same size. As the fish grow, they are changed from one pond to another. The fry is usually bought at the State or other hatchery, and placed in the first pond. The food for the fish is the principal expense. There are a variety of prepared fish foods on the market, but it has been found that the fish fed with prepared food have a decidedly beefy flavor. A plan very generally adopted is that of planting the ponds with an abundance of fresh water shrimp. These grow very quickly and soon provide a plentiful supply of wholesome food.

It will be seen that the fish require little attention, and the consequent income from such a crop is almost clear profit. In the season the product of fish farms sells in the market at $1.00 a pound, and out of season, if the sale be permitted by law, a much higher price may be realized.

The Return of the Columbian Relics.

The steel cruiser Detroit left New York October 18 for Cadiz, Spain. The Detroit carried the precious Columbian relics which had been loaned to the United States government for the purpose of exhibition at the Columbian Exposition by Spain and the Pope. These relics were exhibited in the convent of La Rabida and were continuously guarded by United States soldiers. The Detroit was selected as a suitable vessel to return the relics to Spain and Italy. The Detroit arrived at Cadiz, Spain, November 14. Stories were circulated that ill treatment was received by the officers of the Detroit from the Spanish authorities, but they were refuted by United States Minister Charles L. Adams, who, in a dispatch to the Department of State, dated November 17, says: "I take pleasure in reporting the cordial and generous reception tendered the Detroit and her officers by the civil, military and naval authorities at Cadiz. In addition to the customary honors and courtesies extended the vessel on her arrival, the disembarkation of the historic relics was made the occasion of a great public demonstration, in which all of the local authorities took part." From Cadiz the Detroit proceeded to Italy to deliver the exhibits loaned by Pope Leo.

The Detroit was launched October 28, 1891, from the ways of the Columbian Iron Works and Dry Dock Company, of Baltimore. The keel of the Detroit was laid March 16, 1890, the cost being $612,500, exclusive of armament. She is 257 feet long, the extreme breadth is 37 feet, and the mean normal draught is 14½ feet. The main battery consists of 9 five-inch rapid-fire guns. The secondary battery is composed of 6 six-pound rapid-fire, 2 one-pound rapid-fire guns and 2 Gatling guns. There is an open gun deck. There is extended through the principal part of the vessel a center line vertical bulkhead, which not only helps to support the water-tight deck, but adds "backbone" to the vessel.

Especially interesting is the coffer-dam protection along the entire machinery space, which is filled with cellulose made from the fibers of cocoanut husks, which has the property of absorbing eight times its weight of water. There are 500 cubic feet of cellulose in the coffer-dams of the Detroit. The speed of the Detroit is 17 knots an hour.

An Enterprise Deserving Success.

There is in progress at St. James Hall, in this city, a series of lectures on the Alps, by Mr. Garrett P. Serviss, the astronomer, well known to our readers as an entertaining writer on astronomical subjects.

The lecturer not only eloquently describes and beautifully illustrates what he has really seen and experienced, but he also gives much scientific information as he proceeds. Many of the views are artistically colored.

Mr. W. T. Gregg, who has undertaken to furnish New Yorkers with popular lectures on scientific and other subjects, has shown commendable wisdom in choosing Mr. Serviss as the first lecturer of the season.

Correspondence.

"The Position of Women in Germany."

To the Editor of the SCIENTIFIC AMERICAN:

Every two or three years news is making its rounds in the English press that in Germany "two women are used for dragging a plow through the fields;" also "of a woman being there harnessed to a vehicle alongside of ox, ass, or cow." If it were considered that a woman at best represents but a tenth or twelfth of a horse power, and that it takes a strong horse, or perhaps two, to drag a plow through the ground, such reports would not be published. I for many years traveled on foot throughout Germany and up and down the Rhine Valley, but never either saw or heard of the like published by "Humanitarian," who can never have seen Germany, as shown by his ignorance of its geography.

Bloomington, Ill. LOUIS MATERN.

The Russian Thistle.

It is along roadsides and in neglected fields that Canada thistles flourish. In the untilled plains of Dakota or over the leagues of tilled land where wheat follows wheat, yielding in endless successon, year after year, eight or nine bushels to the acre, the conditions are just such as invite such a sturdy intruder as this Russian weed. There are more weeds in the West than in the East because there is more waste ground.

New countries always suffer more from weeds than old ones do, because the felling of the woods and the breaking up of the prairies disturb the equilibrium of things, and every plant begins to make a fight to occupy and possess the land. Agriculture in these recently settled regions is usually one-sided, and this makes an easier conquest for the invading army. The Russian thistle will never get any dangerous lodgment in a well-tilled farm, and where it now exists proper agricultural practice will quickly subdue it. Indeed, the only way to subdue any weed is to keep profitable crops growing. Taking this view of the case, what sort of a warfare could the government wage against this Russian thistle with a million dollars? If it should hire men to pull up and burn every weed they found there would be some seed left, and in a year or two the crop would be as abundant as ever. The only way to rout the weeds is to revolutionize the prevailing agriculture, and since government is not conducting the farms of the West, it is hard to see how the owners of these lands can be compelled to practice a rotation of crops that would secure them from evil. The fact is that this trouble, like the plague of rabbits in Australia and the cardoons on the pampas, is one of those evils which always come to a new country where established conditions are overturned. It comes to remind settlers of the weak points in their agricultural systems, and although the lesson is pretty painful in the outset, it will, perhaps, for this reason be remembered longer. But, after all, the settlers in new countries take these chances, and they must help themselves. No doubt, government can do something in the way of instructing farmers how to improve their farm methods; but, in the terse words with which Professor Bailey concluded his paper, "Weeds are beyond the reach of the sheriff; laws cannot control a vacancy in nature."—Forest and Garden.

Destruction of Food Fish.

In view of the careful precautions taken by the Fish Commission to protect the fish in local waters, it is strange that so little is being done to stop the destruction of our salt water fishing interests. A gradual diminution of salt water food fish is reported all along the coast. This destruction is caused in most cases by willful violation of game laws. The fish phosphate factories, for instance, cause the disappearance of immense quantities of bluefish, bass, and scup. The gill nets at the entrance to bays and harbors have almost exterminated the striped bass, which once was very plentiful, while early every spring pound nets are set for alewives, flatfish, smelts, and flounders, and these are caught by the ton and spread upon the land as a fertilizer. The most destructive nets probably are the pounds, since they are made of fine meshed netting and cover an immense area. In some instances these nets are 4,000 feet in length and naturally catch immense quantities of canners, killies, butterfish, white perch, and young fry of the blackfish and sea bass which frequent our waters. It is to be hoped that stringent game laws will be adopted and that they will be rigidly enforced.

The Centrifugal Speed Indicator.

A liquid, partially filling a glass tube, is employed to denote the speed. The centrifugal force, when the tube is revolved, causes the surface of the liquid to change from its level position when at rest, rising on the sides of the tube and being depressed in the center. For each velocity there will be one state of equilibrium and by graduating the tube empirically the speed can be read. The device is claimed to be accurate and sensitive to rapid changes of velocity.

THE AMERICAN GAS FURNACE COMPANY'S GAS PLANT AND FURNACES.

The use of gaseous fuel in metallurgical and technical operations is a distinguishing tendency of the technics of the present day. This has led to the extensive introduction of producer gas for the larger class of metallurgical operations, while natural gas whose supplies are now fast failing, has in the past caused an extraordinary development of processes dependent on its use. We illustrate in the present issue the gas-producing plant and general apparatus of the American Gas Furnace Company, of Elizabeth, N. J., a system which has secured very remarkable results and which is every day witnessing a wider extension.

Fig. 5 shows the gas plant complete. The gas is a mixture of naphtha vapor and air. Underground at any convenient place is established a naphtha tank. Connected with the naphtha tank is a water tank at a higher level. When the water is admitted to the naphtha tank, it displaces the naphtha and forces it into the generating machine. Within the machine is a valve which regulates the height of the naphtha, shutting it off or admitting it, according to whether the level is raised or lowered. A similar valve maintains a constant water level in the tank, so that the naphtha is subjected to a double regulation.

This secures the supply of combustible. Air is blown into the apparatus from a blower, of which more will be said later, and which in the cut is seen to the left of the main apparatus. The blower maintains a pressure of over one pound per square inch. It is provided with a blow-off valve, so that if no air passes through the gas machine, it simply blows off into the room. The air is heated before it acts upon the naphtha. The gas thus produced goes through the pipes to any desired place. It will be seen that in the ordinary operation of the plant no gas holder whatever is required. The blower runs continually, and if all the gas is shut off at once, the air from the blower simply escapes.

In the plant, as shown, the blower is run by a gas engine which supplies the power required in the factory and solely for the purpose of starting the gas engine in the mornings, a small gas holder is provided. Once the engine has made a few revolutions, the gas holder may be considered out of use. The plant is a self-contained unit. The gas engine drives the blower and is operated by a small portion of the gas produced. As an extreme safeguard a trip valve is provided, which, when the gas falls below a definite pressure, shuts it off from the works.

One of the most interesting pieces of the gas-producing apparatus is the blower shown in Fig. 2. This is a four-vane rotary blower, working by a positive action. The vanes are held to their place by four segments of circles, one for each vane, which work in a circular groove on the side cover. To secure a tight fit, leather packing is used at the ends of the vanes. This outer circle of the casting is not a true circle, but is turned out to the arc of a circle for the working portion only, thus saving 75 per cent of the friction of the vanes. In all its details the blower is a result of long experimenting and its construction has even involved the installation of special tools, in order that all the work might be done satisfactorily. In Figs. 3 and 4 are shown some experiments performed with the blower in the writer's presence indicative of the high pressure that can be produced. A stream of water from a watering pot was poured into the blast and was instantly atomized into the finest spray and carried up like a cloud to the ceiling. A 10 inch file was placed in the outlet and was supported by the blast of air.

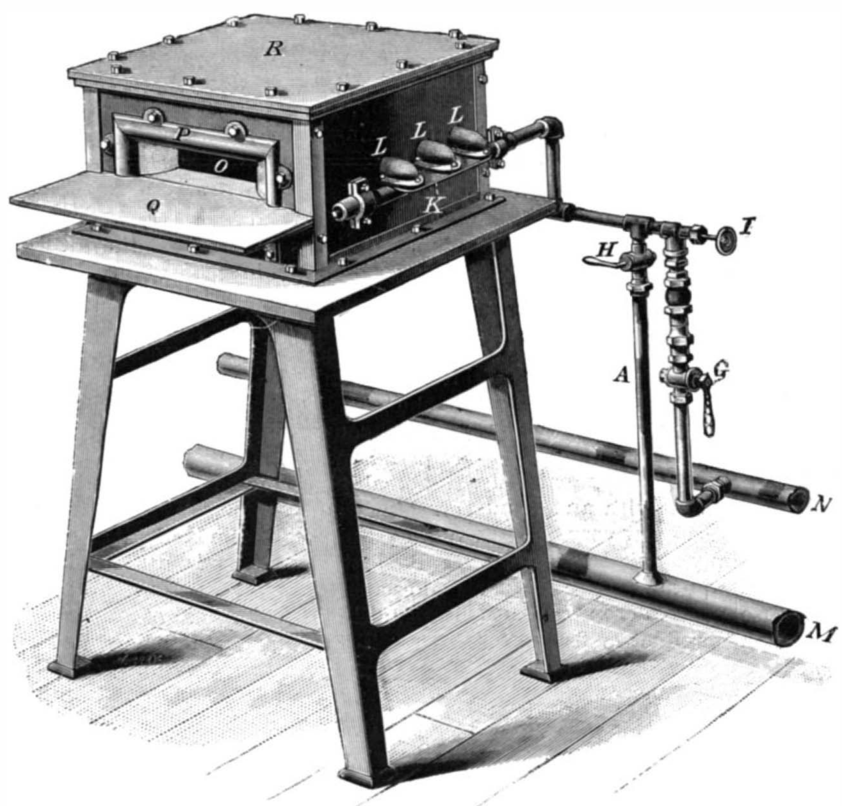


Fig. 10.—GAS FORGE.

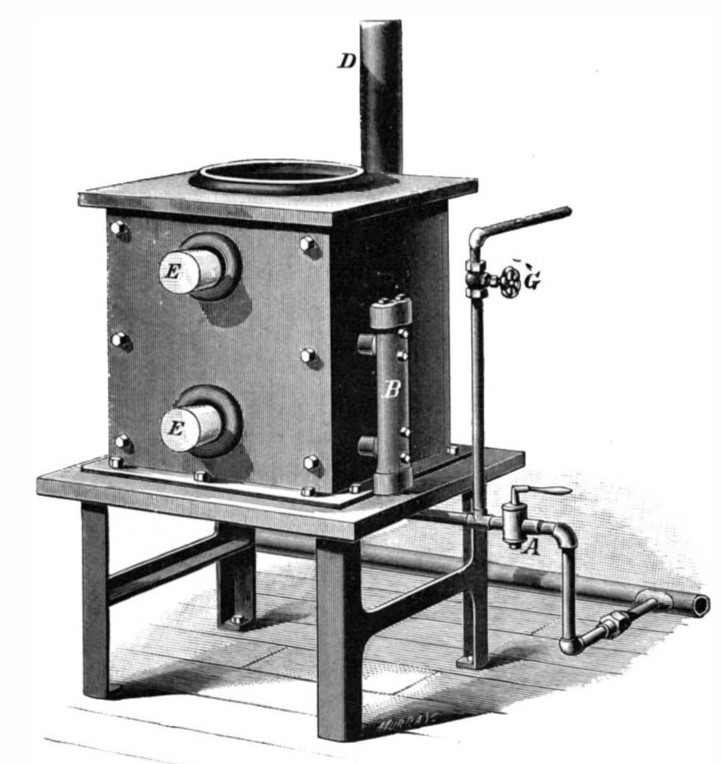


Fig. 11.—SOFT METAL FURNACE FOR LEAD HARDENING.

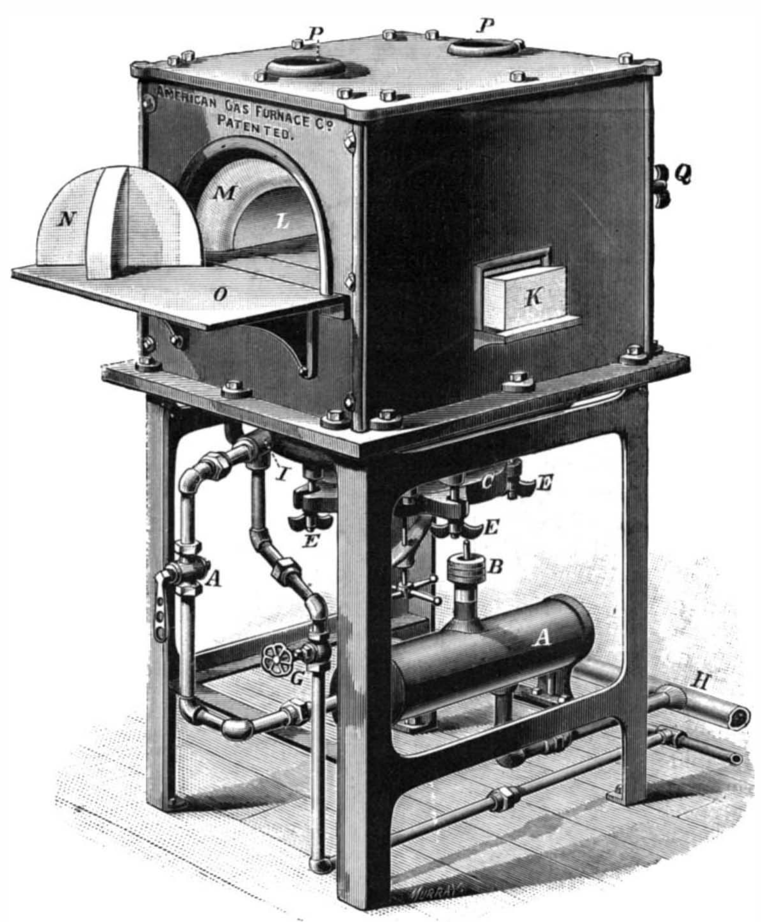


Fig. 12.—MUFFLE FURNACE.

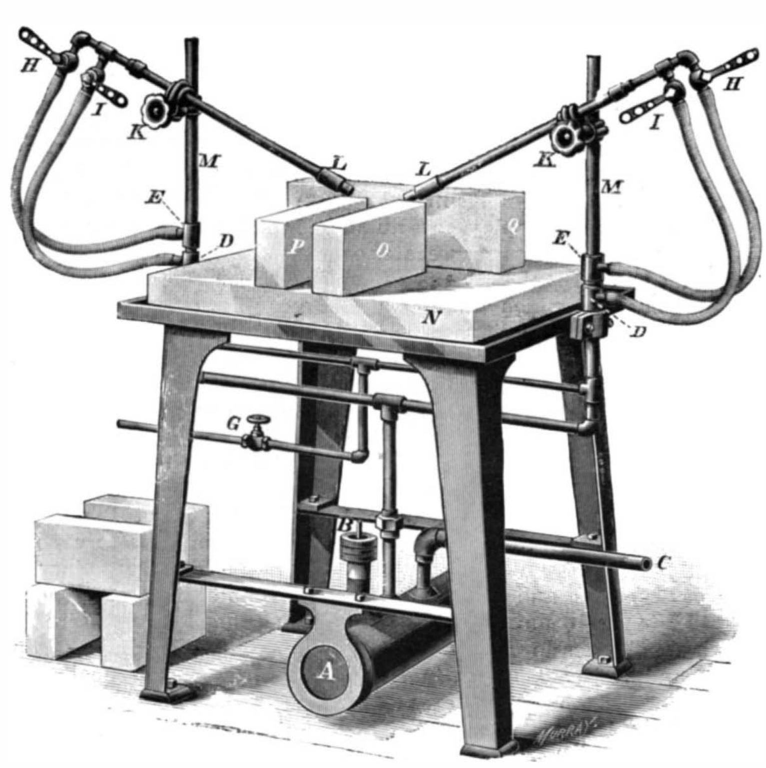


Fig. 13.—BRAZING TABLE.

THE AMERICAN GAS FURNACE COMPANY'S GAS PLANT AND FURNACES.

We may now see what operations are done by the gas thus made. In Fig. 1 is shown one of the oven furnaces, a type in which a square oblong space is heated evenly throughout. Furnaces of this class have a very extensive application for heating metal products. Cutters, dies, reamers, knife blades, saws and the like are placed on the slab within the furnace and are there brought to any degree of temperature required. The slab is of fire clay, and the peculiar whirling motion of the flame when it enters secures an even distribution of the heat. The flame is applied beneath the slab, the products of combustion rise around it. The amount of gas is regulated by a globe valve, and the articles rest upon the slab untouched by the flame. This does the work ordinarily executed in large and expensive muffles, and independent of the saving of the muffles, runs otherwise more economically than a muffle furnace.

Fig. 6 shows a large melting furnace. This is used for brass or bronze foundry work. The flame enters tangentially and with a slight downward inclination, and the products of combustion escape from the bottom of the furnace. There is no escape of gas or flame from the top, and when the metal is at its hottest, one can stand over the crucible and look down into it without inconvenience.

Fig. 7 shows one of the special furnaces to which the process lends itself so admirably. It is a modification of the oven furnace just described, and is designed for tempering mowing machine cutters. These are fed to the machine on an endless chain, their bases resting thereon, the cutters being supported in an approximately vertical position. The effect of this is to produce differential tempering, the edges being brought to the higher heat, so that as they fall into a tank of oil or water the cutting edge is made hard and the body is left soft. Fig. 8 is a soft metal furnace. In such furnaces as this Babbitt metal, solder or other of the more fusible alloys may be compounded, or it may be used for melting the more fusible metals for castings.

Fig. 9 shows another interesting apparatus, a furnace for bluing screws or other small articles, such as the parts of a bicycle chain. Within a gas furnace rotates a drum, provided with helical partitions. The screws are fed in at the back and as the drum rotates pass through the furnaces, each one in an absolutely definite time, and a constant stream pours out from the front of the furnace, all blued to the exact tint required. By varying the amount of gas used or by feeding the pieces more or less rapidly, any desired result may be obtained with certainty.

Fig. 10 shows a gas forge. This apparatus provides for the needs of a blacksmith or drop forger. For the latter especially it is designed. The piece of metal introduced at the opening, O, is rapidly brought to the desired temperature. Fig. 11 shows another special apparatus, a furnace for maintaining lead in a state of fusion to be used for hardening steel tools. In this furnace the hotter metal is kept in fusion at any desired temperature, so that uniform results in tempering can be secured by it. This furnace has vertical burners entering opposite to each other at top and bottom, so as to maintain all portions of the metal at an even temperature. Thus a long bar of steel plunged in the metal is heated evenly from top to bottom.

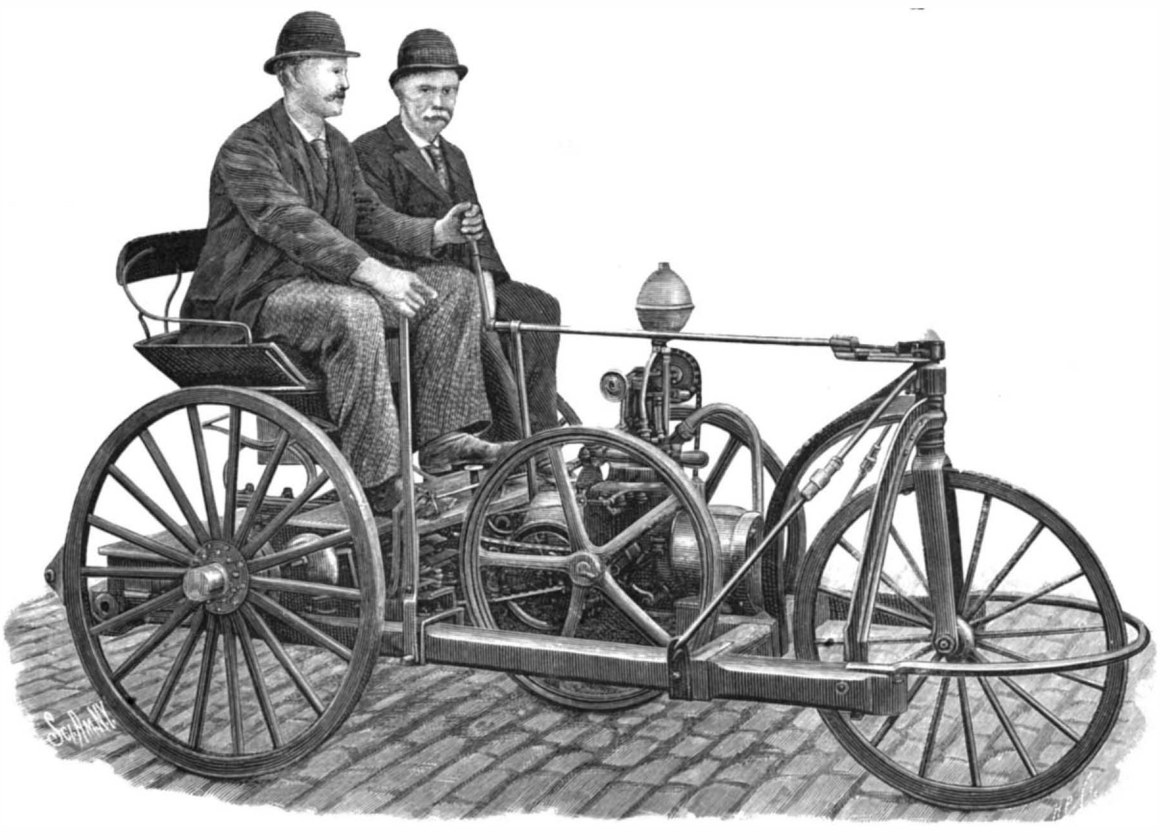
Fig. 12 shows a muffle furnace. This is a more familiar type and is used by assayers, enamelers, and in many classes of operations. It is lined with fire clay and the muffle bottom is protected by an extra slab so that it will not sag. It is found that a muffle with a gas fuel lasts much longer than in the ordinary coal furnace, which also applies to crucibles.

Fig. 13 shows the brazing table, where two blowpipes fitted on adjustable supports bring their flames to impinge on the object to be brazed. This was originally built for bicycle work, but its operations have been found to be so good that it has been adopted by the brazing trade in general. Although our illustrations represent the works at Elizabeth, N. J., the general offices are at 80 Nassau Street, New York.

Space is not permitted us to go into details of the American Gas Furnace Company's apparatus as fully as we might desire. It is enough to say that a very large variety of furnaces for every conceivable kind of work is furnished, and that by the use of their gaseous fuel a great direct economy is secured, as well as the indirect one due to a more perfect regulation of heat and to less wear and tear upon the furnace.

Every apparatus is evidently the result of painstaking care and thorough technical knowledge, and their aim appears to be to produce the best, irrespective of immediate profit. Their work has received flattering recognition from the Franklin Institute, and the fact that these furnaces have been recognized as most efficient for certain grades of work is evidenced by the fact that a number of these furnaces are exported annually to foreign countries.

In the factory at Elizabeth, and elsewhere, the gas is used to supply incandescent burners. It also is used in radiators to heat rooms. Thus the Elizabeth factory is lighted and partly heated by the gas as well as given its power.



GAS ENGINE TRICYCLE.

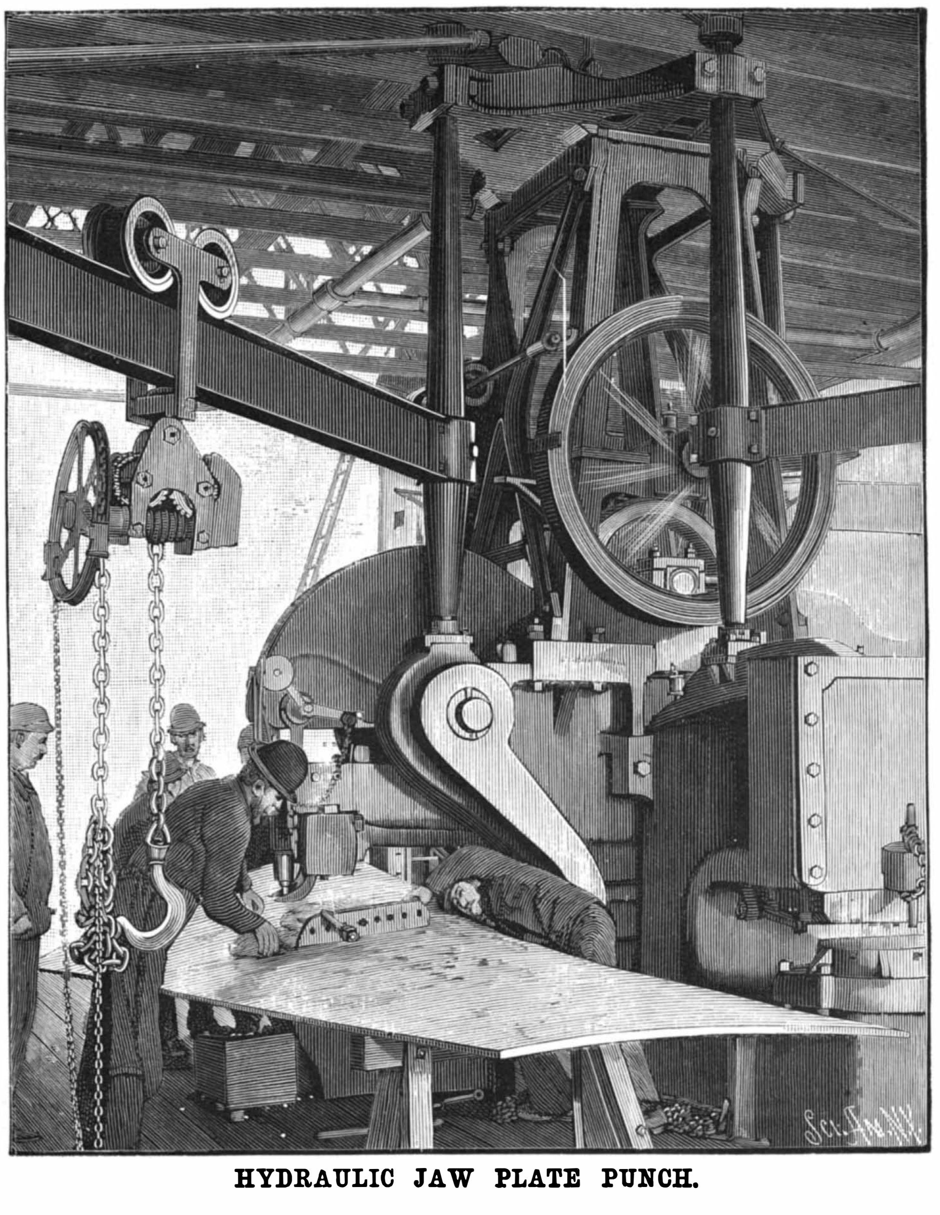
GAS ENGINE TRICYCLE.

Verily, the field of usefulness formerly held by the horse is narrowing daily. To steam, electricity, and the ubiquitous bicycle comes an ally in the form of explosive gas, so cunningly applied to the propulsion of vehicles as to threaten his utter rout. The accompanying illustration shows the latest improvement in adapting the gas engine to the running of wagons on ordinary roads.

This tricycle is propelled by a two horse power Golden Gate balanced gas engine. It has been tested on the streets of the city under varying conditions as to grade and roadway, and has proved in every instance satisfactory, being easy to control as regards starting, regulating speed, turning, stopping, etc.

The machine is calculated to carry three persons on the single broad seat, though operated by one, with surplus power sufficient to trail one or two buggies or a loaded wagon, according to the character of the road. It carries twelve hours' supply of gasoline, or two and one-half gallons, and can easily attain a speed of from ten to twelve miles per hour on favorable ground. Being geared in such a manner that the movement of a lever increases or decreases the speed enables the driver to climb grades of considerable pitch.

It is claimed to be perfectly safe and is simple in construction, the design of the inventor being to have as few pieces and parts as possible. The wheels and frame supporting the engine are strong and the entire machine is constructed in the most substantial manner, as if intended to withstand hard usage. It was built on an order from a gentleman in Santa Maria, Cal., by A. Schilling & Sons, 211–213 Main Street, manufacturers of the Golden Gate gas engine.—Min. and Sci. Press.



HYDRAULIC JAW PLATE PUNCH.

HYDRAULIC JAW PLATE PUNCH.

The accompanying illustration represents one of the powerful hydraulic jaw plate punches in use in the William Cramp & Sons Ship and Engine Building Yards in Philadelphia. The punch is one of many similar punches used in constructing the great war ships and merchant marine vessels for which the Cramps have gained a great reputation. This particular form of punch is used to cut the plates which are to form the hulls of the vessels to the desired shape. The punch is situated in the ship yard near the immense stays which hold the great vessels while in course of construction. The illustration has been made from an instantaneous photograph taken while the punch was in operation.

Before placing the plates in position for punching, the exact form of the plate desired is marked on the original plate by a wide chalk line. The plate is then carried to the punch by means of an ordinary traveling hand crane and pulleys, which are clearly shown in the illustration, and to aid in holding the plate in a horizontal position several ordinary wood trestles are generally employed. The steel punch consists of a knife with a very blunt edge which cuts or punches out disks of metal one inch in diameter. By punching the plate so that these disks overlap one another it is of course possible to cut the plate quickly and neatly to the desired pattern. The illustration shows the punch at work in cutting a plate of steel one inch thick. The friction produced by the punch passing quickly through such a plate is so great that it is necessary for an attendant to throw water on the metal as each punch is made. The heat produced by the punch is so intense that each time a cloud of steam arises.

Hydrogen Peroxide.

Anhydrous hydrogen peroxide, says Nature, has at last been isolated by Dr. Wolffenstein in the laboratory of the Technischen Hochschule at Berlin, and the somewhat surprising fact demonstrated that this substance, which has hitherto been regarded as possessing but little stability, is capable of actual distillation with scarcely any loss under reduced pressure.

In attempting to concentrate solutions of hydrogen peroxide in vacuo by the method of Talbot and Moody, and also in the open air upon the water bath, a solution as strong as 66 per cent H_2O_2 was obtained, but with a loss of over 70 per cent of the original amount of peroxide employed. Moreover, it was found that when the common commercial 3 per cent solution is concentrated, the percentage of H_2O_2 may be brought up to 45 without the loss of any considerable quantity of the peroxide by volatilization, but that as the concentration continues to rise above this limit the volatilization of the peroxide increases at a very rapid rate. For the great loss was proved not to be due to decomposition, but to actual vaporization of the substance. Evidently hydrogen peroxide is remarkably stable at the temperature of a water bath. An attempt was therefore made to actually distill it under reduced pressure. A quantity of commercial peroxide which had been further concentrated until it contained about 50 per cent H_2O_2 was first purified from all traces of suspended impurities, and at the same time still further concentrated by extraction with ether. After evaporation of the ether the solution was found to contain 73 per cent H_2O_2.

This solution was then submitted to distillation at the temperature of the water bath and under the reduced pressure of 68 mm. of mercury. The distillate was received in two fractions, boiling at 71°-81° and 81°-85° respectively. The first fraction contained 44 per cent H_2O_2, while the latter was found to contain no less than 90·5 per cent. Upon again fractionally distilling the latter product, a large proportion distilled at 84°-85°, and this fraction proved to be practically pure H_2O_2, containing over 99 per cent of the peroxide. The liquid thus isolated is a colorless sirup which exhibits but little inclination to wet the surface of the containing vessel. When exposed to the air it evaporates. It produces a prickly sensation when placed upon the skin, and causes the appearance of white spots which take several hours to disappear again. As regards the much-discussed and disputed question of the reaction of hydrogen peroxide toward litmus, Dr. Wolffenstein finds that even when the pure liquid is made strongly alkaline with soda and again distilled, the distillate exhibits strong acid characters, so that the acid nature of hydrogen peroxide must be regarded as fully established. It is finally shown that the use of ether in assisting the concentration is by no means essential. Ordinary commercial 3 per cent peroxide can be immediately subjected to fractional distillation under reduced pressure, and a fraction eventually isolated, consisting of the pure substance boiling at 84°-85° under a pressure of 68 mm.

Coin Alloy.

For every bar which is in the vaults of the mint at Philadelphia there is a record on the books of the superintendent. That record shows the weight and fineness of the bar. Many of the bars on storage were bought in 1890, when the Sherman law went into effect. They have remained untouched from the time when the stamp of the assayer was put on them. Now they will be taken out and melted with copper to form an alloy.

The exact proportion of silver to copper should be nine to one, but in melting a little less than the measure of copper is used, so that by adding copper later in small quantities the alloy can be made as nearly as possible of the exact standard. It is easier to work the alloy down by adding copper than it is to work it up by adding silver.

The copper and the bar silver are put in the crucible together. The crucible for melting silver is of hand-wrought iron. These pots cost $45 each. Each of them will hold about 1,000 ounces at a time. Each pot is good for 250 melts. It will cost the mint about $4,500 for crucibles to melt the 42,000,000 ounces of silver.

Gold is melted in a black lead pot which costs about one-tenth as much as the iron pot, but the black lead pot is good for about only thirteen melts.

No silver passes through the iron crucible. A little is absorbed by it and this is recovered when the crucible is melted after it has seen the last of its usefulness. Nothing that could yield any of the waste silver is allowed to get away from the mint without chemical treatment to extract the precious metal. The melting pots, the slag, the ashes from the furnaces, and even the outside pickings from the black linings of the furnaces, are ground and sifted to obtain metallic grains, and these grains are refined.

The residue from the sieves is put into a sweep machine, which extracts the smaller particles; and the very minute particles of metal pass in the water of the sweep machine to settling vats and wells. These wells are cleaned out at very long intervals, and they always yield a little gold and silver.

Peters—Denza—Ranyard.

Astronomical science has lost three of its votaries during the present month. Dr. C. F. W. Peters died on December 2, and Father F. Denza, as well as Mr. A. C. Ranyard, passed away on December 14.

Dr. Carl Friedrich Wilhelm Peters, director of the Konigsberg Observatory, died on December 2, after a protracted illness. He was born on April 16, 1844, at the Pulkowa Observatory, where his father, Prof. C. A. F. Peters, held an appointment under the Russian government. In 1849 his father was appointed to the Chair of Astronomy at Konigsberg, and in 1854 he was made director of the Altona Observatory, which was afterward transferred to Kiel. The son studied astronomy and mathematics at Berlin, Kiel, Munchen, and Gottingen, and was placed on the staff of the Hamburg and Altona Observatories. Between 1869 and 1872 he made some valuable pendulum observations, chiefly for the Prussian government. As Privatdocent at Kiel University he undertook a long series of chronometer tests for the German navy, in the course of which he proved that they are influenced by changes of humidity as well as by changes of temperature. In 1880, upon the death of his father, he edited the Astronomische Nachrichten for a year, after which he was appointed Extraordinary Professor at Kiel University. In 1883 he undertook the direction of the Naval Chronometric Observatory at Kiel, whence he proceeded in 1888 to the directorship at Konigsberg, where he terminated a useful and laborious career.

Father F. Denza died at Rome on the 14th ult. from cerebral hemorrhage. He was well known to the scientific world by his works in astronomy, meteorology and terrestrial magnetism, and at the time of his death was president of the Italian Meteorological Society and director of the Observatory at Moncalieri, which he founded in 1859, as well as of the Vatican Observatory, which was established by the Pope in 1891. It was owing to the untiring energy of Father Denza that the Corrispondenza Meteorologica Italiana was established in connection with the Alpine Clubs, and that the results of observations at a large number of stations in the Alps and Apennines have been regularly published in the organ of the Italian Meteorological Society. He was elected an honorary member of the Royal Meteorological Society in 1870.

In astronomy his chief work relates to the observation of meteors. For several years he issued instructions to observers of meteors previous to every important shower, and he published numerous tables and papers on the observations carried on under his guidance, both in Comptes Rendus and the Monthly Notices of the Royal Astronomical Society. When the Directorship of the Vatican Observatory was taken by Father Denza, a very comprehensive programme was drawn up, embracing investigations in meteorology, terrestrial magnetism, geodynamics, and astronomy. Observations in each of these branches of knowledge have increased in number every year since then, and the fourth volume of the Pubblicazioni of the Observatory, received by us on the same day as the news of Father Denza's death, is even greater in bulk than any of the previous ones. Father Denza was chiefly instrumental in making the Vatican Observatory one of those co-operating in the production of the photographic star chart. He devoted his best energies to the advancement of the scheme, and to the progress of astronomical photography. The reports to which reference has been made contain evidence of his knowledge of what had been done in other astronomical observatories, and of his ability to direct and further the advancement of celestial photography. His services to astronomy have earned for him an honored place in our memory of the sons of science.

Mr. Ranyard was born in 1845. He was educated at Cambridge University, and was called to the bar in 1871. He was one of the founders of the London Mathematical Society, of which he was originally joint secretary with Mr. George de Morgan, Professor Augustus de Morgan being president. He became a fellow of the Royal Astronomical Society in 1864. In 1870 he was assistant secretary of a joint committee of the Royal Society and the Astronomical Society, which organized the expedition dispatched to Sicily, Spain, and Oran to observe the total solar eclipse of December 21. On his return to England he undertook to assist Sir G. B. Airy in the preparation of the report of the observations of the total eclipses both of 1870 and 1860. Ultimately Sir George Airy transferred the work entirely to Mr. Ranyard, and in 1880 the report was published by the Royal Astronomical Society as vol. xli. of its "Memoirs." He observed the total eclipse of July 29, 1878, from Cherry Creek, near Denver, Colorado, and the total eclipse of May, 1882, from Sohag, in Upper Egypt.

In addition to papers on the corona and matters connected with physical astronomy, he also published papers on the "Early History of the Achromatic Telescope," and on "Photographic Action." In conjunction with Lord Crawford and Balcarres, he undertook in 1872 a series of experiments on photographic irradiation; and in 1886 he demonstrated by a series of experiments that the intensity of photographic action varies directly as the brightness of the object photographed, and directly as the time of the exposure. The "Old and New Astronomy," designed by Mr. Proctor, was completed in 1892 by Mr. Ranyard, who contributed to it some very important sections on the structure of the stellar universe.

Protecting Peach Trees.

Many experiments have been tried in attempting to protect peach trees during the winter by covering them with canvas, corn stalks or similar material, or by applying some adhesive substance to the branches themselves. Such attempts have never proved satisfactory, however, and the only practical means appears to be by laying the trees on the ground and covering them over with soil or coarse material of some sort. To many people this, like many other operations with which they are unfamiliar, seems a great task. Experience proves, however, that it is comparatively inexpensive in practice. In setting the young orchard on the college farm last spring this matter was kept in mind, and part of the trees were set with the roots spread out on opposite sides as much as possible, with the intention of laying these trees down every winter as long as they live, if it is found practicable to do this. At least it is hoped to determine how old a tree must be before it becomes too unwieldy to handle in this way. To put down these young trees this fall was a very simple operation. Fifty-five trees were laid down and snugly covered with about four hours' work, thus costing only about a cent a tree. Indeed, the ease with which it was done raises the question whether it would not be well to lay down all young trees for the first year or two, until they become thoroughly established and better able to withstand the winter. Of course, the cost will rapidly increase with each succeeding year until the trees reach their full growth.—Fred W. Card, in Garden and Forest.

English and American Incomes.

The following figures, taken from the last English census, reveal some interesting facts concerning the economical situation of Great Britain.

About 250,000 persons in Great Britain have an annual income of $1,000, and 2,000,000 have an income of $500. Thus it would appear that only one Englishman out of every five is capable of supporting a family. It is to be borne in mind that $500 a year amounts to only $1.37 a day, which is not very much for a family of four persons. On the other hand, there are in the United Kingdom 123,000 families having an annual income of about $3,000, and 5,000 families with an income of more than $25,000.

In the United States, according to the statistics compiled by T. G. Shearman, we have 400,000 families (or about two millions of people) whose annual income amounts to $2,000, and more than 10,000 families having an income of more than $25,000.

Taking into account the difference in population between the United States and Great Britain, it still will be evident that not only can America boast of a greater number of rich people than the United Kingdom, but that wealth is more equally distributed and less centralized in the United States.—Revue des Revues.

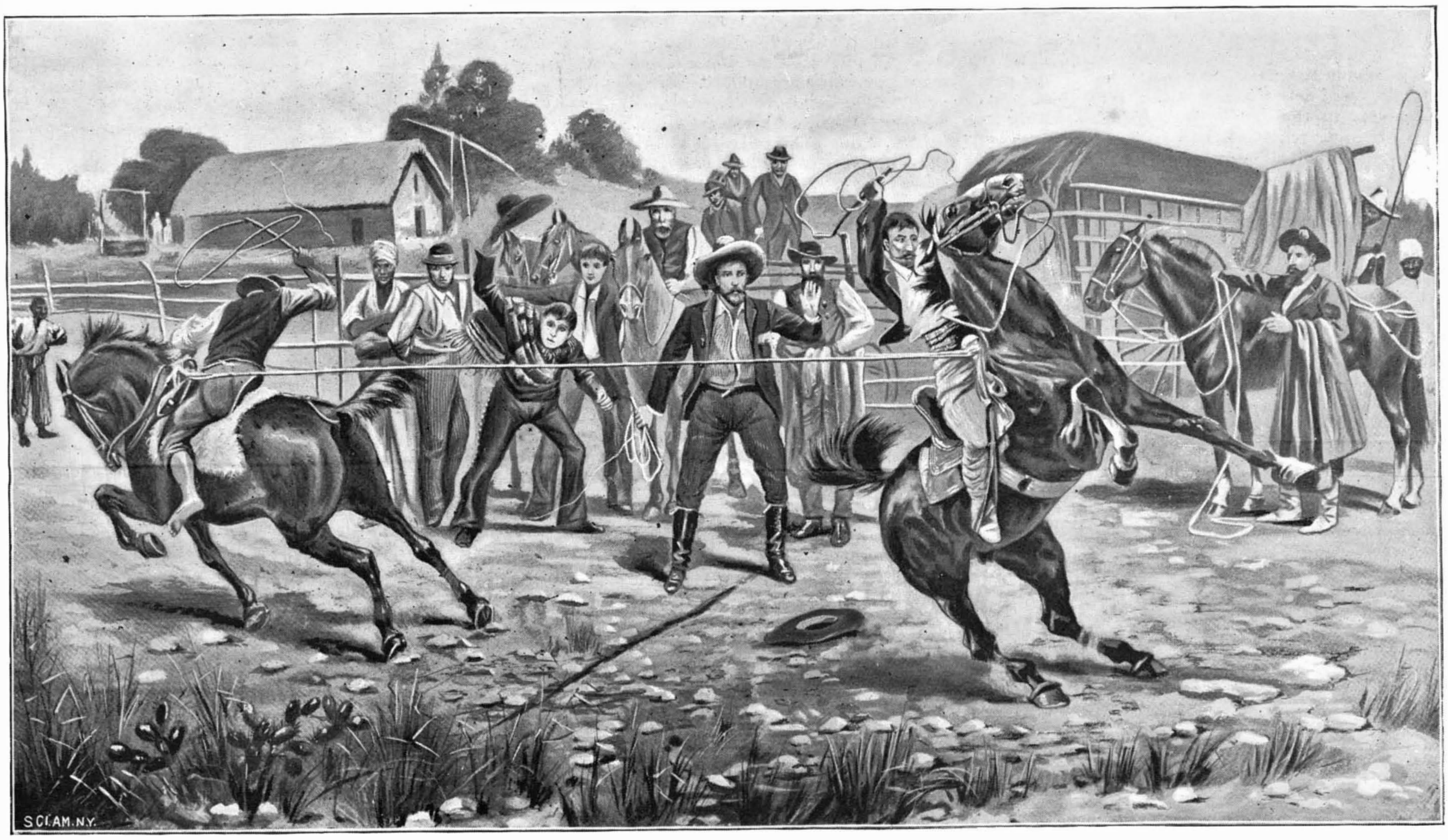
Railroad Building in 1894.

According to the records of the Railroad Gazette there has been much less railroad building in the United States during 1894 than in any year since the civil war. Some 1,761 miles of new track have been laid in the year, which makes an addition of less than one per cent to the railroad mileage of the country, which at present is 177,753 miles. From 1880 to 1890 an average of 5,000 miles of new track were laid per year, but from 1890 to 1893 the average has dropped to 4,000 miles. In the three years previous to 1892 the largest percentage of new roads were built in the Southern States. Since 1892, however, the advantage has been held by the Northern States east of the Mississippi River. Illinois, Arizona and Pennsylvania lead in the number of miles of new tracks laid, over 120 miles having been laid in each of these States during 1894. In Maine, Texas, and Montana about 100 miles of new track have been laid in each State. It is reported that the new year will witness a marked revival in railroad building.

THERE are in the United States at present 6,000,000 farms. About one-half the population of the republic or over 30,000,000 people live on them, and these farm dwellers furnish more than 74 per cent of the total value of the exports of the country.

LIFE IN THE PAMPAS—A TUG OF WAR.

The pampas are the great plains of South America which extend from Patagonia to the Bolivian frontier. They cover an area of 600,000 square miles. The southern portion forms a great desert, dotted here and there with sand pools and marshes. The northern portion is occupied by the vast unexplored territory of the Gran Chaco. The salient feature of the northern and northwestern parts of this huge territory are plains furnishing magnificent pasture lands. These plains are interspersed with dense timber forests, lagoons and rivers. The growths of clover, thistles and pampas grass are most remarkable. On these huge plains millions of cattle roam which are attended by many thousands of cowboys, who herd them mounted on their sturdy mustangs. This wild, nomadic life is arduous in the extreme, but even the lazy cowboy has his holiday. In our illustration, for which we are indebted to Black and White, one of their diversions is represented—a tug of war between two cowboys, or gauchos, as they are called. Each is mounted on a powerful horse of the country, the high horns of the so-called Mexican saddles are connected by a lasso or rawhide. Both horses are urged in opposite directions by their drivers with whip and spur. The gauchos and Indians applaud and make bets, the lasso tightens, then there is a sound of straining of the saddle girths. If they hold, one of the horses is pulled up on his hind legs, while his fore legs paw the air. An instant more and he is down, while the rider extricates himself as best he can. The gauchos seldom stay for any length of time in one place; they are very lazy and only work when they see fit. Many of them come from the Argentine Republic.



LIFE IN THE PAMPAS—A TUG OF WAR.

Flywheel Accidents.

A curious accident took place in a Swiss electric lighting establishment not long ago. The dynamo machines in this particular station are driven by turbine wheels, of which there are four. The main driving wheels, which are attached directly to the turbines, are large open pulleys, with six spokes, made in two pieces, bolted together. The ordinary speed of these pulleys is about two hundred revolutions per minute. A few days before the accident, to make some test of the turbines, the belts were thrown off, and the turbines and attached pulleys allowed to revolve as they would. In general, as Professor Escher, of Zurich, who writes the account to the Schweizerische Bauzeitung, says, the speed of a turbine without a load is about double what it is with a load suited to its capacity; and, by actual count, the large pulleys revolved, at the maximum, 425 times a minute. Some days later, while no one was in the room, all four of the wheels burst, nearly at the same moment, sending fragments through the floor and ceiling. Professor Escher, thinking that an explanation of this curious accident may be of value, shows that, as the centrifugal force increases with the square of the velocity, the throwing off of the belts brought an outward bending strain on the rim of the wheels nearly five times as great as that to which they were normally exposed, and, as he proves, dangerously near the point of rupture of cast iron; and the fact that all the fractures took place near the spokes proves that they were caused by the outward bending of the unsupported space between the spokes. Curiously enough, the accuracy of these observations was attested later. A spare pulley was mounted, in place of one of those destroyed, and was set at work to drive a portion of the electric light machinery. For some reason, the load for a short time was thrown off this turbine, and then restored. The next morning the pulley was found cracked in two places, just where the others had given way; and, if its use had been continued, there is no doubt the cracks would have spread until the wheel came to pieces like its predecessors.

Transparencies.

A good transparency, sometimes called diapositive, from a good negative, is probably the most technically beautiful of all the products of the camera, and, at least by some of the methods of production, the most permanent, burnt-in enamels perhaps excepted. Why, then, are they not brought more to the front? It is difficult to say.

Photographers, like farmers, are chronic grumblers, and yet here they have something lying at their hands, in their own line, easily produced, always attractive, and waiting only the supply to create the demand. In the reception rooms of most, or, at least, of many, are to be found a variety of articles, all more or less connected with the art, but never, or hardly ever, a transparency; and yet we believe that a proper selection of them would be more attractive and bring more grist to the mill than anything else they handle.

Lantern slides, for example. We cannot remember, in all our wanderings, ever to have seen a lantern slide among the stock of an ordinary photographer, and yet they are now and have long been probably the most popular of photographs. True, the professional slide makers cater remarkably well, but they cannot include everything, and there are few photographers who have not some local surroundings from which interesting slides could be made that would readily find buyers if exposed in showcase or reception room.

Then there are transparencies for decorative purposes, for which there are pretty metallic frames up to 14 by 17 inches, at least in the stockhouses, comparatively cheap. A few of those hanging about the reception room, especially of local scenery and local celebrities, would meet with a ready sale; and if the photographer, whenever he has the luck to make a fine negative of a pretty child or group of pretty girls, would make and frame transparencies from them on "spec," in nine cases out of ten they would be gladly taken and well paid for.

Another excellent piece of bread to cast upon the waters would be a plate of glass about the length of the breadth of an ordinary window, say about 20 by 36, framed in mahogany or white enamel, and on which has been transferred an enlarged landscape, an attractive residence surrounded by groups or single figures of the inhabitants, etc. Such panels would make very attractive lower window shades, and although, especially if of plate glass, they would be somewhat costly, we believe that, to a man of taste and ability, they would afford profitable employment for many a leisure hour. And that is one of the many advantages of such work: it would not interfere with the regular work of the studio, but could be taken up and laid down at any time.

In the various methods by which transparencies may be made, the photographer has an ample field for choice. Lantern slide plates would, for most modern men, be most convenient for slides, and commercial transparency plates on ground glass should probably be selected for much of the smaller decorative pictures. Very convenient, too, especially for enlargements for the panels, is Eastman's transferotype paper, which indeed lends itself readily to the making of all kinds of transparencies.

But probably best of all, and as simple as any, is the carbon or pigment printing method, as in technical beauty it is not excelled by any, while, although monochromatic, tissue may be had in all the colors of the rainbow.

In short, we believe that in the hitherto almost neglected field of transparency making, photographers might find opportunity for much profitable work, occupation for leisure hours, and an excellent means of advertising themselves.—Photo-Beacon.

Half-Tone Photo Work.

The firm of Le Page has made improvements in their glue for this process, and now send out a specially clarified brand which leaves nothing to be desired in the manufacture of a printing solution.

The formula, as it now stands with the trial of nearly three years, is as follows:

Clarified glue	2	ounces.
Water	2	ounces.
Merck's bichromate of amm.	120	grains.
Water	2	ounces.
Albumen (dried)	¼	ounce.
Water	4	ounces.
Chromic acid (C. P.)	10	grains.

This prints quickly, develops easily, and gives every detail there is in the negative, and for a high average of work cannot be beaten.

The methods of burning in are now so well known that it is unnecessary to go into details, but no one need be afraid of a lifting in the etching solution.

The whole process is one of the utmost simplicity.—The Photo-Beacon.

The Vanilla Bean.

The so-called vanilla bean is not a bean at all, as is well known, but the fruit of a climbing orchid, Vanilla planifolia, the capsule or pod of which is about three-eighths of an inch in diameter and from six to ten inches long, and has a certain resemblance to the so-called catalpa bean. The plant in its native home, in Mexico and tropical America, climbs over trees and shrubs by means of slender rootlets sent out from the joints of the stem. It is not a true epiphyte, however, but always maintains its connection with the soil. In its wild state it climbs to a height of twenty feet, but in cultivation it is kept within bounds, so that the unripe pods are not injured when the others are gathered. A late number of Popular Science News contains an interesting account of the method of growing the vanilla, in which it is stated that in Mexico the plant is propagated by cuttings and then trained over some rough bark trellis work in partial shade.

When the plants were first introduced into the West and East Indies, they grew vigorously and produced an abundance of flowers, but no pods. It was discovered that the particular moth which fertilized the flowers in Mexico was absent from its new home, and artificial pollination was resorted to, after which the plants produced abundantly. With a long splint of bamboo the lip of the flower is lifted away and the pollen is transferred from the pockets and applied to the stigma. The work is so easily done that one person can fertilize a thousand flowers in a morning. The pods require a month to reach full size and six months more to ripen. The process of curing is long and complicated, and the aroma of vanilla is said to be produced only by fermentation. In the island of Reunion, in the Indian Ocean, where the plant is grown extensively, the pods are placed in a basket and plunged for half a minute in hot water, then placed on a mat to drain and exposed between woolen blankets to the sun for six or eight days, and kept in closed boxes during the night to promote a slight fermentation.

When the pods are perfectly cured, they are a dark chocolate color, pliable and free from moisture. When finally prepared, the pods are tied up in bundles, packed in air tight boxes, and when in prime condition they are covered with a frosting of needle-like crystals of vanillic acid, which, when pressed between the fingers, gives off the characteristic odor. The supply sent to New York is produced in Mexico, and is regarded as of the highest quality. The amount imported amounts to something like 150,000 pounds a year, while on our Pacific coast a portion of the supply is derived from the island of Tahiti, although the quality of this is much inferior. The supply of London comes largely from Mauritius and Seychelles, and the greater part of the vanilla imported into France comes from Reunion. Three years ago more than 500,000 pounds were imported into France from this island, which was twice the amount produced in all the rest of the world.

Nearer to the Stars.

BY PROFESSOR E. E. BARNARD.

In speaking with Alvan G. Clark (the sole survivor of the firm of Alvan Clark & Sons, and the discoverer of the companion of Sirius) in April of 1893 he expressed himself as ready, just as soon as the forty inch was finished, to begin a five-foot object glass, and I rather inferred from his conversation that such was only waiting the completion of the forty-inch. He was then at work on the forty-inch disks, one of which lay on a bench covered with an old piece of sacking near a low window, which on the outside was level with the ground. A careless stone from a still more careless boy's hand could easily have dashed through the window and smashed the lens, but Clark didn't seem at all put out when this was mentioned as possible, and simply remarked that the object glass was insured for $60,000. Perhaps he had more confidence in the Cambridge small boy than I had. An accident to the glass now would doubtless delay the great telescope from three to four years.

What Americans cannot do in the way of great glasses by the Clarks and by Brashear, and what mechanical difficulties they cannot overcome in mounting these great glasses through the genius of Warner & Swasey, is certainly not worth while undertaking elsewhere.

It is possible, however, that our great telescopes of the future—I speak now in point of actual size—will be some form of the reflector, such for instance as the one projected by the French for their exposition of 1900, and that which Sir Howard Grubb has but recently proposed.

The question now arises: Is there any limit to telescopic power, or can we continue to make and use bigger and bigger telescopes yet? To most intelligent people this question will at once resolve itself into two parts. First, Will it be possible to make much greater lenses? This question our native opticians will answer for up to six or seven feet. Second, Can the mechanical difficulties encountered in mounting these great telescopes of the future be overcome? When we have made a perfect object glass six or eight feet in diameter, can we mount it in a slender steel tube 100 feet or more in length so rigidly that when it is turned to any point of the heavens there shall be no strain upon it sufficiently great to destroy the perfection of the image, and which shall move by the most delicate mechanism and follow uniformly the motion of a star?

This question was even a consideration in building the Lick thirty-six inch, but Warner & Swasey satisfactorily answered it. That they have done the same for the forty-inch no one will question. But there must be a limit even to their skill. Just where that limit may be I shall not attempt to say, for there is something else still more potent to deal with in out future great telescopes, and over which man has absolutely no control.

The atmosphere itself, which is so necessary for our very existence, is the greatest foe to the future great telescopes, just as it is already to those of to-day.

The ideal place for a great telescope would be that one which had no atmosphere at all. But such cannot be found on our planet, and if it could a new kind of observer would have to be invented to run the telescope. Therefore we must be content to work with our atmosphere just as it is.

It is not the clouds that float in our atmosphere and which intercept our view that we have most to dread, though of course if continuous these alone would be sufficient cause for complaint. The real trouble oftenest occurs when the air is very clear. (The clear, crisp wintry night, when the stars are bright and sparkling, is the worst possible time for a telescope, for on such a night the images are a mass of boiling and quivering light.) We are at the bottom of a great ocean of atmosphere that covers the entire globe. To see the stars and the other heavenly bodies we must look at them through this vast ocean of air. If this aerial ocean would keep perfectly quiet while we looked, it would be all right. But unfortunately that is its last intention. Sometimes it is fairly quiet, but in general it is very unsteady. Often it is in a fearful commotion. The result of this disturbed condition of the air is to more or less totally destroy the image of a celestial body when looked at in a great telescope.

As I have said, there are nights when the air is almost perfectly quiet. If under this condition we look at a star through a powerful telescope, it glows with a steady and beautiful radiance. On such a night everything that is at all within the reach of that telescope can be seen with it. The finest and most delicate details upon the surface of a planet, the faintest star or satellite, all come out with a distinctness that permits the most delicate and accurate observations to be made. If this condition always existed, the work of an observer would be exceedingly pleasant and profitable, but such seldom occurs, and its occurrence is rarer the bigger the telescope, and when it does occur it does not last for any great length of time; a couple of hours of such perfect seeing and then the air becomes disturbed and the image more or less tremulous and blurred. The delicate details are lost and the faint satellite is blotted from view. If the observer has the run of several different sized telescopes, he will appreciate this peculiarity of the atmosphere.

There will be nights on which he can successfully use a 6-inch glass that will not permit a satisfactory use of a 12 inch, and which would wholly for bid the use of a 36-inch. In this case the tremors present in the air would not be sufficiently magnified by the 6-inch to affect the clearness of the image. But with the 12-inch (four times as powerful) these tremors would be so magnified by the greater power of that glass as to spoil the clearness and definition of the image. The yet greater power of the 36-inch (thirty-six times as powerful as the 6-inch) under these conditions will so increase the effect of this disturbance as to totally destroy the image. Such nights have occurred where features could be seen in the 12-inch that were entirely blotted out in the 36-inch. But let the conditions be the best for observing with the air steady, and the 36-inch is far ahead of the 12-inch. It is very seldom, however, that the tremulousness of the air is not more or less apparent in the 36-inch, and under such conditions it is difficult or impossible to use the highest powers of the telescope. One has to wait and watch patiently and snatch a moment here and there of steadiness to do his best work.

Now let us increase our aperture to, say, four inches. The atmospheric conditions being the same, then this quivering of the air, which has been objectionable in the 36-inch, will, through the greater power of the 40-inch, have become far more objectionable. Now let the two instruments remain under the same conditions, but let the air grow more tremulous. We shall notice the effect soonest on the 40-inch, and after it has become unbearable in that telescope it will still be tolerable in the 36-inch, and, much later, in the 12-inch. Now, let us imagine another telescope still more powerful, say several times as powerful as the 40-inch. The effect of a slight disturbance in the air is multiplied just so many times more, and we should have to look long and often during a year to find a night that would permit only a few hours of good observing with that great telescope. In general it would be so crippled by the unsteadiness of the air that its effective power would much of the time dwindle down to that of the 40-inch, or even below it. But when a few hours of the best seeing come, what marvels that glass would show!

Let us now go still a little further and make our telescope still more powerful. We rapidly diminish the number of hours in the year that the atmosphere would permit its use at all. Still, let us increase the size and power of our telescope—for we may suppose our American ingenuity unlimited—and we shall never find an hour during which our instrument can be used to perfection, because the slight tremors ever present in our air would forever baffle the use of such a telescope.

So, looking at the matter in this light, we can see how, though the optical and mechanical difficulties may be overcome, the atmosphere itself is going to limit the practical use of great telescopes in the future, and in the end, if successfully made large enough, will prohibit their use at all, or at least make them inferior to smaller telescopes.

However, though I am confident the working hours of the future great telescope will be much diminished, yet I believe much bigger telescopes will be made and successfully used, but in the end the atmosphere will limit the effective work before the optician and the mechanician give up.

Of course, it is unnecessary to say that a favorable site upon the earth's surface for a great telescope will aid much in making its powers effective.

As for the telescope proposed by a Chicago man—a large lens made up of many smaller ones, like the eye of a fly—it is safe to say that no great telescope will ever be built on that plan, and if it should be (and we don't know what people may do nowadays), it will be absolutely safe to say that it will never be successfully used.—Examiner, San Francisco.

The Trolley Postal Service.

The plan of employing trolley cars to assist in distributing the mails has been tested recently in Brooklyn with very satisfactory results, and it is thought that this success will lead to the introduction of the practice in other cities. The trolley cars were first used to transport mail bags between the several post offices. The bags were intrusted to the motorman or the conductor and were carried on the platforms of the ordinary passenger cars. The postal trolley cars were then introduced to make it possible to sort and arrange the mail on the way from the central to the rural post offices. The ordinary trolley car was partitioned off into two compartments for this purpose, one section being used as a post office and the other as a smoking car. The part of the car reserved for the post office is especially fitted up for this purpose. The equipments of this novel traveling post office are similar to those ordinarily used. Several postal clerks accompany the cars, and they open the mail bags and sort and arrange the mail on the route. This saves time, it will be seen, and relieves the pressure of work at the regular post offices. Along the entire route these cars stop to take on and let off passengers in the usual way. The cars are run directly into the post office yards to load or unload the mails. In this work the trolley lines are looked upon as regular mail routes and are regularly engaged and paid by the government. It is said that the postal authorities look with considerable favor on this adjunct to our mail service and that it is probable very general use will be made of this novel plan throughout the country.

Celebration in Honor of Helmholtz.

A memorial celebration in honor of the late Prof. Hermann von Hemholtz was held in the hall of the Sing-Akademie at Berlin on Dec. 14. An immense bust of Helmholtz, almost buried in flowers, stood in the center of the stage. The exercises began at noon. Joseph Joachim, the celebrated violinist, took part in them. The eulogy was delivered by Prof. Bezold. The audience was composed of the most celebrated men of Germany and included a large number of the members of the Reichstag and the municipality as well as the Faculty of the University of Berlin. Prof. Helmholtz was specially honored by the presence of the Emperor and Empress.

Porous Glass for Windows.

The latest hygienic craze in Paris is the use of porous glass for windows. This is declared to possess all the advantages of the ordinary window framing, and, while light is as freely admitted as through the medium of common glass, the "porous" further admits air too, the minute holes with which this is intersected being too fine to permit of any draught, while they provide a healthy, continuous ventilation through the apartment.—The Hospital.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

SECTIONAL JOURNAL BEARING.—William J. Tripp, New York City. This is an improvement on a formerly patented invention of the same inventor, providing a revoluble bearing more specially designed for car wheels and axles, reducing the friction and taking up lateral thrust. The car wheel has an annular exterior recess in its hub, which is inclosed by a journal box having an annular interior recess, there being rollers in the recesses between the journal box and hub, while the wheel also has in its web recesses at a greater distance from the wheel center, there being in the recesses of the web balls adapted to bear against the journal box.

CAR BRAKE.—Russell W. McKee, Clifton, N. J. An emergency brake has been designed by this inventor, adapted for use in connection with other brakes, especially on trucks of trolley and cable cars. The truck is provided with curved guideways, shoes provided with pins working in the guideways, there being springs secured to the shoes and to the truck frame, while bell cranks above the shoes have one arm engaging the shoes and the other arm adapted for connection with an operating lever. It is designed that with this improvement the car may be stopped so suddenly that the use of safety fenders will not be necessary, the stoppage being also effected without disagreeable jar.

Mechanical.

INDICATOR.—Joseph H. Scott, Aspen, Col. This invention is especially designed to indicate accurately at all times the position of a cage in the shaft of a mine. The indicator consists of a traveling chain belt driven from the hoisting drum through the medium of sprocket wheels. The length of the chain belt is proportioned according to the depth of the mine, and the sprocket wheels are also regulated to insure the proper movement of the chain belt. The front run of the chain belt runs through a vertically disposed guideway. Indicating plates are secured on the chain belt and denote different levels of the mine shaft. The pointer is secured to the guideway and is adapted to indicate the levels in connection with the indicating plates as they pass through the guideway.

SHAFT TUG. — Arthur Edwin Hart, Broken Hill, New South Wales. This invention is designed to supply a more durable and ornamental shaft tug than those already in use. It consists of a tug body which is formed of one outside piece of leather joined and stitched externally, and packed internally with scrap leather, and the stitches and joints being so placed and formed that they are not exposed on the wearing surface. The tug body is connected to the buckle by a strap, and it is stiffened by metal plates, the buckle being so hinged and secured that the tug retains its shape and the buckle is held securely.

THILL COUPLING.—Daniel Parker, Calvert, Texas. This improvement comprises an axle clip having forwardly projecting lugs and a base plate having its front end projecting beneath the lugs and a resilient block whose lower end rests on the base plate between the lugs. The thill iron has a knuckle thickened at the back and is adapted for pivotal connection with the said lugs in advance of the resilient block, and there is an abutment plate on the back of the thill projecting beyond the back of the knuckle and above the yielding block.

TRANSMITTING GEAR FOR WINDMILLS.—Frank J. Brown, Alfred Allen and Solomon Allen, of Halstead, Kansas. To the driving shaft is secured a pinion. Fastened to the rod which transmits the power to the ground are parallel vertical guideways provided with an elongated internal rack and with an adjustable auxiliary segmental rack at top and bottom. This rack, which is thus made continuous, meshes with the pinion of the driving shaft. By adjusting the segmental rack and lengthening or shortening the guideways the stroke of the rack and consequently that of the rod can be readily increased or diminished. Friction rollers on a fixed support hold the rack in engagement with the pinion.

BUGGY TOP ATTACHMENT.—John D. Axline and James L. Baillie, Shawnee, Ohio. The object of this invention is to provide a new and improved buggy top attachment which is comparatively simple and durable in construction and is arranged to permit of conveniently raising or lowering the buggy top without the operator leaving the seat and without much exertion on the part of the person in the buggy. It consists of a spring-pressed shaft journaled in the body of the buggy and provided with arms on its ends and links pivoted to the arms and having their upper ends pivotally and slidably connected with the forward stays of the top. To the shaft is secured a segmental ratchet wheel engaged by a pawl, which is connected with a handle which terminates at the top of the seat. By the means of this mechanism of pawl and ratchet the top is easily manipulated through the medium of the shaft and arms.

PACKING DISPLACER. — Joseph Matthews, New Bedford, Mass. This invention relates to packings contained in glands and abutting on a fixed sleeve supported in a bonnet. The object of this device is to provide an improved packing displacer which is durable and which is arranged to be used without the use of hooks and similar devices. It consists principally of a pushing device adapted to act on the packing, on moving the gland longitudinally, to push the packing out of the same, so that the operator can readily mend or renew the whole packing and without damaging it.

Agricultural.

CORN HARVESTER.—Henry M. Cox, Palmer, Nebraska. The object of this improved corn harvester is to provide a harvester which, when driven between two rows of corn, will cut the corn from each row and whereby further the cut stalks may be placed upon a shock platform and be bunched or held in a bunched position while the platform is tilted to dump the shock upon the ground and also to provide a means whereby the binding twine will be carried by the machine and be near at hand for use by the operator tying the shocks.

Miscellaneous.

COAL AND GAS BURNING STOVE OR RANGE.—Albert Stecke, of Osnabrück, Germany, assignor to Walter C. Eymann, of Anaheim, Cal. The object of this invention is to provide a cooking stove adapted to be heated by either coal or gas or both. The gas burners are arranged at various openings in the stove, as the ovens, and are provided with means for protecting the same when solid fuel is used. The stove has an opening in the top above the passage for the products of combustion. A gas burner is arranged below this opening and is provided with a covering plate fitting into the opening and with a tubular extension into which the burner projects.

PAPER FOR BANK NOTES, BONDS, CHECKS, ETC.—David N. Carvalho, New York City. The object of this invention is to provide a safety paper for checks, bonds, etc., so that when any chemicals which will remove ink are applied they will instantly and permanently discolor the paper, producing thereon a stain wherever the chemicals have touched it. The paper is charged with bismuth iodide and sodium iodide. The reaction which takes place by the action on this compound of an oxidizing reagent is, in general terms, to liberate the iodine, and there may also be effected the formation of some definite compounds of iodine with the metals, the stain produced being of a high degree of permanency. For coloring matters suitable for use in this process, primulin, congo red, or the solution of a benzidene dye may be cited.

ANIMAL TRAP. — Victor J. Scherb, North Pasadena, Cal. The object of this invention is to produce a trap which is of such open structure that it does not resemble a trap. It has a pair of jaws to catch the animal, the jaws being arranged in such a way that the animal enters between them without fear. The trap is easily sprung and can be made cheaply. It consists, in brief, of a pair of jaws somewhat resembling a pair of tongs made of heavy spring wire. The jaws are held apart by a tripping plate with a bait hook thereon. This tripping plate is easily dislodged by the animal, who is immediately caught by the spring jaws.

INHALER. — Edmond Souchon, New Orleans, La. This invention relates to an improvement in devices for injecting an anæsthetic vapor into an orifice of the head in such a manner that nothing but the vapor can be introduced into the head and which can be operated with one hand and which shall also be cheap and durable. It consists of a bottle containing an absorbent substance which holds the anæsthetic so that the vapor only can be ejected. The bottle is closed with a stopper provided with two tubes, one for the air which is forced into the bottle by a rubber bulb, the other to allow the anæsthetic vapor to escape. Both tubes are provided with stop-cocks. The rubber tube for administering the vapor is pointed at its free end and is provided with a side opening through which the vapor issues.

MAGAZINE OR BOOK HOLDER.—Frank Barwick, of Honolulu, Hawaii. This is a magazine or book holder adapted for use in libraries or public places where magazines may be read but not removed. The device may be quickly adjusted to hold books or papers of varying thicknesses. Two parallel serrated jaws are provided of a size slightly greater than the magazine. One of these jaws is provided with offsets which contain a device for adjusting the holder to the size of the work. This adjustable device can only be operated by those having the key to the holder. The holder cannot be opened and the magazine removed without a key.

TROUGH.—Adam W. Haag, Fleetwood, Pa. The object of this invention is to provide an improved metallic trough which shall be of a light and strong construction without sacrificing durability. It is also less costly to manufacture, and is less liable to be broken in transportation than a cast iron trough. The improved trough consists of a sheet of metal bent to form the bottom and side portions of the trough, and having the upper edges of the side portions formed with hollow scrolls and separate end pieces, each provided with bottom and side flanges adapted to be secured to the sheet metal bottom and sides, and having about its upper edge a bead corresponding in arrangement to the scrolls of the sheet metal sides, and projections at the ends of the bead arranged inside and adapted to fit the end portions of the hollow scrolls on the sheet metal sides.

Designs.

DESIGN FOR A NUT. — John G. Lane and George Lane, Poughkeepsie, N. Y. The leading feature of this design consists in a nut having two parallel ornamental flanges, the lines of which depart laterally from the body at the bottom and near the top respectively and present each a many-armed figure. The minor features of the design consist in the cylindrical body, and the ornamental arms of one flange extending outward slightly beyond those of the other flange. The arms of one flange further overlap at one side the arms on the other flange.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

A DISCUSSION OF THE PREVAILING THEORIES AND PRACTICES RELATING TO SEWAGE DISPOSAL. By Wynkoop Kiersted. First edition. New York: John Wiley & Sons. 1894. Pp. xiv, 182. Price $1.25.

The subject treated by our author is one of great importance at the present day, when so many of the smaller towns and villages throughout the country are introducing sewage systems. The work, in a certain sense, is discouraging, as the author points out the faults and weaknesses of the different systems in use and does not devote the book to taking an optimistic view of any one of them. He very sensibly states that the different methods of sewage disposal meet different cases, and that it is not worth while, at the present day, to pin one's faith entirely upon one way of solving the problem. This is the general gist of the book, as far as we have seen it, and it is characterized by a general advocacy for the adoption of one or the other of the methods or of combined methods according to circumstances.

CLOUDLAND: A STUDY ON THE STRUCTURE AND CHARACTERS OF CLOUDS. By Rev. W. Clement Ley. With numerous colored plates, photographs, charts, and diagrams. London: Edward Stanford. 1894. Pp. xiv, 208. Price $3.

This very pretty book with colored illustrations, as well as very fine half tones in black and white, treats of the meteorology of the clouds and of the relation of their forms to atmospheric movements, such as cyclones. The ground covered is one certainly not satisfactorily treated up to the present, and it is believed that this work does adequately describe the phenomena it relates to and the atmospheric movements producing such. We have all heard of the "mackerel sky," and it is a satisfaction, at least, to find in this book the representation, in color and in black and white, of types of "stratus maculosus."

THE CENTURY ILLUSTRATED MONTHLY MAGAZINE. May, 1894, to October, 1894. New York: The Century Company. London: T. Fisher Unwin. Vol XLVIII. New series, Vol. XXVI. Pp. viii, 960. Price $3.

ST. NICHOLAS: AN ILLUSTRATED MAGAZINE FOR YOUNG PEOPLE. Conducted by Mary Mapes Dodge. Vol. XXI. Part I., November, 1893, to April, 1894, and Part II., May, 1894, to October, 1894. New York: The Century Company. London: T. Fisher Unwin. Pp. viii, 1104. Price $4.

Among the scientific books of more or less dry aspect which we have to review in this column, the Century and St. Nicholas may seem out of place. We are however glad to have a chance to notice them, to observe the elegance of their make up, and testify to the excellence of the matter they contain. The world is becoming so scientific now that even in these publications for children of lesser and larger growth much science will be found and some excellent scientific articles.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6345) A. L. asks: 1. Where can I get chloride of silver sticks with silver wire fused in? A. Address Queen & Co., Philadelphia, or other of our advertisers. 2. How many cells, one volt each, or say about two volts each, and in what way connected, will light up an incandescent lamp, 50 volts, and if one lamp can be lit up, can more lamps be applied to the same current at the same time, and how many? The lamps should be 16 candle power. A. It depends on the resistance of the cells. Probably 100 will supply a single lamp. 3. If I had enough of Leclanché batteries, could they be used for electric light purposes? I mean so that the batteries would furnish strong enough current to last four or five hours? A. They could, but a very large number would be required and some special device would be required to compensate for polarization, with consequent reduction of current.

(6346) G. T. asks: 1. What is the best kind of carbon to use on an electric telephone leadout of a large pencil or carbon they use in electric lights? A. Carre electric light carbons are very good; if you cannot get these, use common lamp carbons. 2. I am making a telephone, but I have to use two wires; how can I do away with one of these? A. Use a single wire and ground the ends by soldering to gas or water pipes. 3. Which is the best for short distance—a carbon or magneto transmitter? A. The carbon transmitter. 4. Where can I get iron for diaphragms? A. Get ferrotype plate from a photographer.

(6347) C. E. L. writes: 1. How can I get instructions on electrical calculations? A. Consult our advertising columns for correspondence schools. We also recommend Sloane's "Arithmetic of Electricity," which we can supply for $1 by mail. 2. I am trying to learn how to figure out induction coils to produce certain voltages. If you can give me any light on this, let me know. A. For induction coils divide the number of turns in the secondary by the number in the primary and multiply the original voltage by the factor thus obtained.

(6348) F. E. B. says: 1. I want to make an induction coil for a telephone transmitter. How many layers, and what size wire shall I use, and how long to make the spool? A. Wind the secondary of your induction coil to 80 ohms with No. 36 wire; the primary to ½ ohm with No. 20 wire. Make it two inches long on a quarter inch diameter core of pieces of thin iron wire. 2. If I coat the inside of wooden battery cells with common yellow beeswax, will it make them acid proof? A. Coat cells with a mixture of 4 parts resin, 1 part gutta percha, melted together with a little boiled oil. Apply with a hot iron. 3. Why is it that they use finer wire to wind an armature than they do to wind the fields of a dynamo? A. The armature wire works in parallel, and would be much shorter than the field wire, if of same size. A definite ratio of resistances must obtain. 4. I have some small articles that I want to nickel plate. I have four gravity batteries. How can I do it? A. See our SUPPLEMENT, Nos. 310, 436, and many others.

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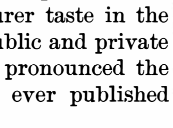

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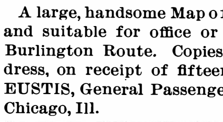

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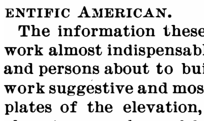

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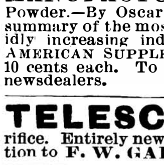

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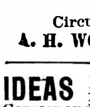

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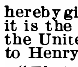

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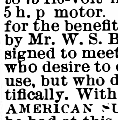

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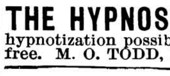

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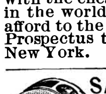

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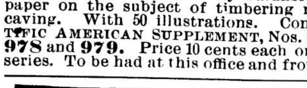

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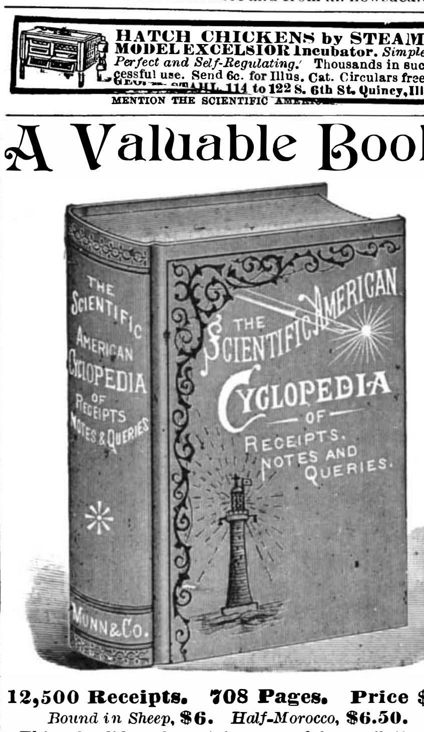

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