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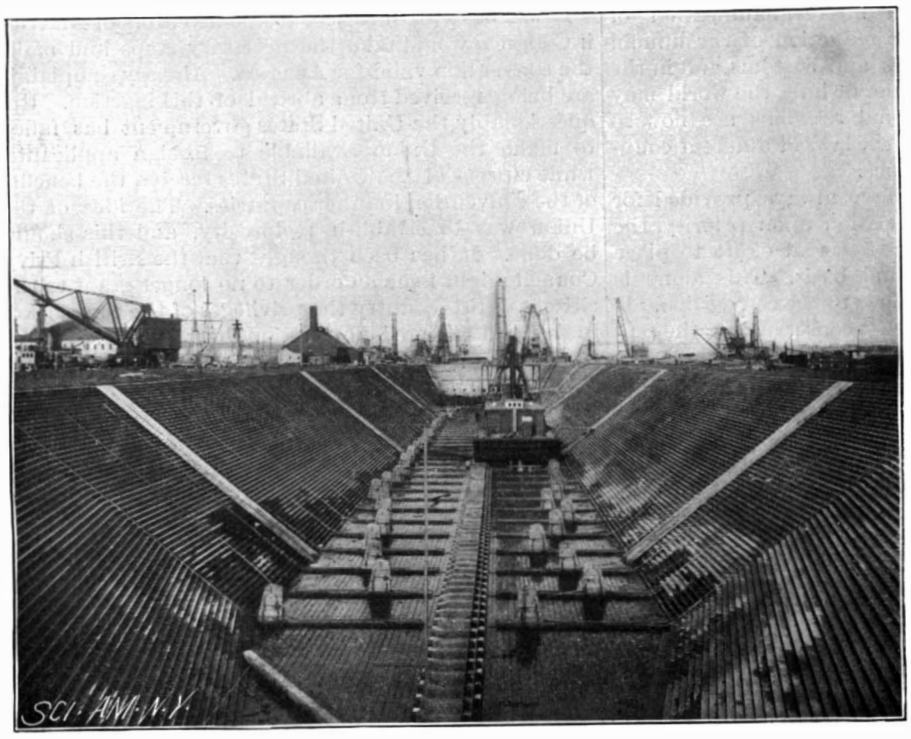

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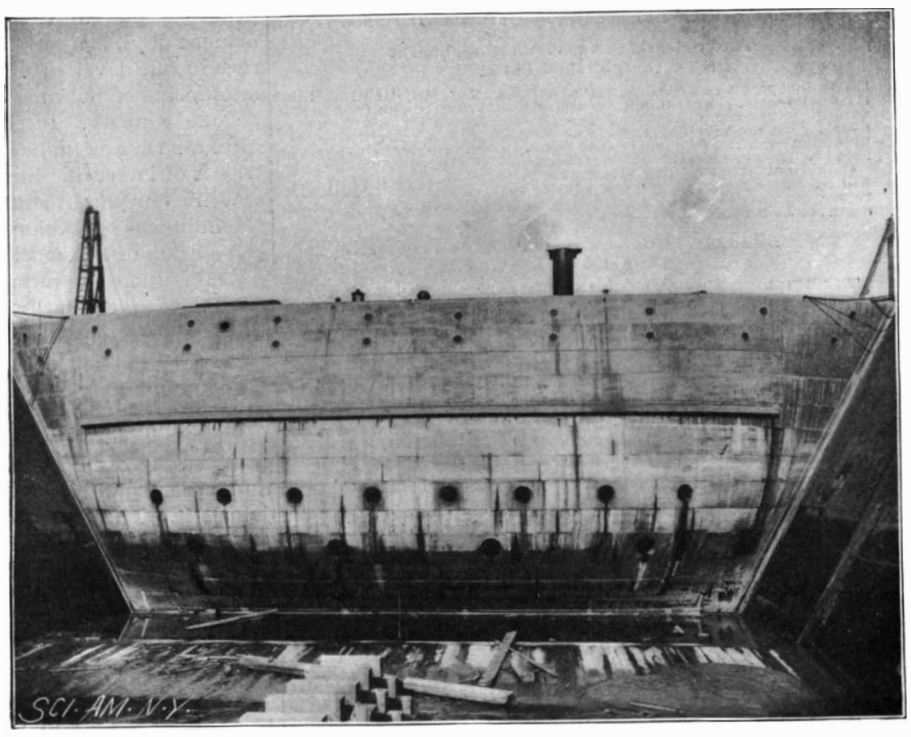

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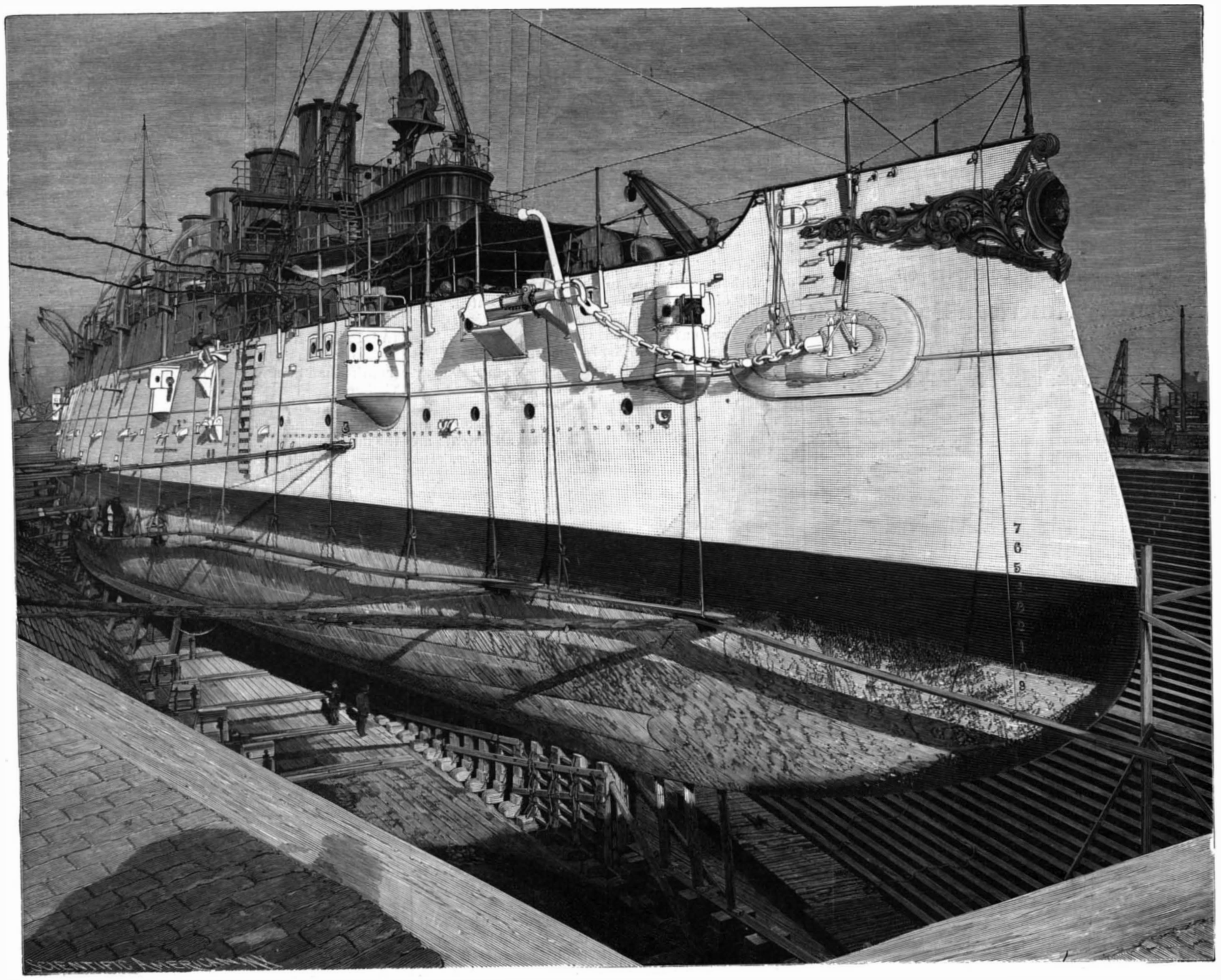

THE UNITED STATES CRUISER COLUMBIA IN DRY DOCK No. 2 BROOKLYN NAVY YARD.—[See page 120.]

Scientific American.

ESTABLISHED 1845.

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NEW YORK, SATURDAY, FEBRUARY 20, 1897.

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Scientific American Supplement

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For the Week Ending February 20, 1897.

Price 10 cents. For sale by all newsdealers.

CONGRESS AND THE INTERNATIONAL PATENT CONVENTION.

The SCIENTIFIC AMERICAN has published from time to time notes upon the International Convention for the Protection of Industrial Property. This somewhat lengthy title designates a set of international patent statutes, as they may be termed, which, as the result of exhaustive debate in several congresses of representatives of different nations, were formulated and published at Paris on March 20, 1883. Under existing conditions of rapid ocean transit and intercommunication by mail and cable, international agreements affecting trade and business become more essential than ever in the conduct of human affairs. The rapid disappearance of characteristic national peculiarities, a disappearance due to the rapid intercommunication of modern days, is a step in the reduction of the human race to one level of manners and customs and in the minimizing of nations. Sooner or later the world may be one country. International relations are now so intimate that assimilation of the laws of different countries is of increasing importance.

While our patent statutes have always provided for the influence of foreign publication upon priority, the convention of 1883 marked the first real effort to place patents upon an international basis. This alone is enough to give great importance to the convention. It was characterized by the utmost conservatism, the representatives of the different nations watching vigilantly for anything which might affect the inventors of their respective countries. After the convention had been formulated, it remained for the different countries to ratify it. Great Britain, France, Belgium, Spain, Italy and other countries have done so. Germany has not joined it. The United States joined the convention, and this fact was announced by a presidential proclamation on June 11, 1887. But this, it is held, is insufficient, the Attorney-General of the United States, W. H. H. Miller, in an opinion rendered April 5, 1889, holding that legislation was required to make the treaty binding.

Thus it has come to pass that while the patentees of the United States in their dealings with the patent offices of countries of the convention receive a direct benefit from it, and while their applications for foreign patents are numerous enough to justify the United States in maintaining to the best of its ability the terms of the agreement, the element of reciprocity is lacking for want of legislative action. The grounds for the Attorney-General's adverse view are very fully stated in his opinion, with citations from authorities. He holds that there is a class of treaties which under federal law do not become binding without legislation. As the Constitution prescribes that the legislative power over patents shall be vested in Congress, and as the convention is in the nature of a contract, the treaty must be ratified by legislation to be valid. The exercise of powers committed by the Constitution to the houses of Congress being involved in the convention, the simple proclamation of the President is insufficient to give it force.

Under existing practice, foreign patents can be taken out without reference to the convention, and the majority of foreign applications are so presented. The practice of the United States Patent Office is, fortunately, such as to make it very easy to do this. After a patent has been allowed by the United States Commissioner of Patents, it is held for issue until the payment of the final fee, and on the payment of that final fee the patent is promptly issued. Thus the solicitor can fix exactly the date of the issue, the process being still further simplified by the fact that all patents are issued on Tuesdays. Thus, in current practice, after the United States application has been prepared, forwarded, prosecuted and granted, but not issued, then the foreign patents are arranged to be applied for on the day of the issue of the American patent. This arrangement insures several things. It brings about a synchronism of dates of many foreign patents, which is at least a convenience; it also prevents any foreign patent from issuing before the American patent is issued, thereby securing the full term of seventeen years for the United States patent, which in this case will not be limited by any foreign patent.

By the terms of the convention there is a six and seven months period allowed, which sometimes is of great advantage; that is, a patent can be applied for in one country, and if within six months, or for countries beyond the sea, seven months, an application is made in another country for the same invention, the date of that application is practically set back to the date of the parent application. There are various cases in which this might be available. Thus a person might apply for an American patent and it might issue within two or three months after the time of the application. The inventor then would have four or five months within which to make his foreign application, and it would have the same effect as if dated back to the date of his United States application.

In practice this seven months term of priority, as it is termed, is frequently made use of, notably between America and England, but it is obvious that it must operate only in our favor. It is only recently, in interference proceedings in Washington, that a case came up in which the foreign inventor was estopped from taking advantage of the convention under the decision of the Attorney-General of April 5, 1889, which we have already cited and explained.

The convention affects the right of importation of patented articles. Under its provisions the importation of patented articles from abroad into any country where a patent for the same has been issued, does not involve forfeiture of the patent. This provision does not affect the obligation to manufacture where such is required under the laws of the country in question, but it avoids the radical measure of forfeiture of the patent. This forfeiture is provided for by the French patent law among others.

It will be of great service to the inventors of America if Congress would take the necessary steps and make the convention valid for America. Already complaints are being received from abroad of this inaction. Unquestionably the United States government has failed to make the Union available to foreign applicants, while citizens of the United States receive the benefits of the convention in other countries. The idea of the Union was to establish reciprocity, and this should be done. It has been thought that the British Privy Council might issue an order to no longer grant to the citizens of this country the privileges of the convention in England. There is no question that when the terms of the convention were formally made known, the general belief was that every country would ratify the terms, and the general desire of those interested was that they should be so ratified. The interests of America were very carefully safeguarded by its representative, and it seems desirable that the convention should be made valid here. It took a great deal of work, time and thought to bring about the formulating of the terms of the convention; many conflicting interests had to be considered, and all had to be done with due reference to the patent statutes in different countries. This was so thoroughly done that little or no complaint can be made by any of the interested parties, and it would seem a pity to let the result of so much labor and thought go ungathered.

The proper committees in Congress should certainly take the matter into consideration, and it would be well for the inventors of America, and it would contribute to the dignity of the country, to take definite action in approving and accepting the terms of the convention. As it now stands it does not seem very dignified in the United States to accept from other countries the privileges of the convention as a favor which under competent legal advice we are unable to reciprocate. It does not seem possible that Congress would be indisposed to reciprocate; it would seem to be a case of neglect, not of opposition.

THE ANNUAL BICYCLE EXHIBITION AT THE GRAND CENTRAL PALACE, NEW YORK.

In every annual bicycle exhibition of late years the prediction has been made that the bicycle has reached its full organic development, and that future exhibitions will show but little change except in the matter of details. The first impression made upon a visitor to the great exhibition recently held at the Grand Central Palace, New York, is that there has been less visible change in the bicycle during the past twelve months than in any year that preceded; and the conviction deepens that the present diamond frame, ball-bearing, chain-driven, wood-rimmed, pneumatic machine is destined to remain as the permanent type of the modern bicycle.

This conviction is strengthened by the fact that the present exhibition is remarkably free from what might be called the "freak" bicycle. Inventive genius, which a few years ago was making persevering efforts to devise a bicycle that should differ in its organic construction from the type which was rapidly gaining exclusive control of the field, has now directed its attention to the beautifying of its external appearance and the perfecting of its mechanical details.

Commencing with the frame, it is noticeable that the tubing is slightly larger, an inch and an eighth and an inch and a quarter being common. Nearly fifty per cent of the high grade wheels have D tubing for the rear forks, and a few use tubing of an oval section, both being adopted with a view to reducing the tread, which has been brought down to about four and a half inches in many of the wheels. A noticeable feature that adds greatly to the symmetrical appearance of the wheels is the use of the oval shaped tubular crown on the fork in place of the square pattern. The crank hanger is lower than last year, some makers dropping it as much as three inches below the level of the hubs.

There has been an all round advance in the construction of the bearings. Balls are slightly larger, and the rider who has more than his share of "nerves" will appreciate the introduction of ball retainers, which enable each set of balls to be removed with its own cup, and prevent the possibility of their being lost during a general clean-up of the machine. Much ingenuity is shown in the effort to produce a dust-proof bearing and

the felt washer is freely used. Two or three novelties in ball bearings which are meritorious are mentioned elsewhere in this issue.

The good old method of attaching the crank to the crank-shaft by means of a plain key is conspicuous by its absence. It has been thrown aside, not because it was unmechanical, but because it was so difficult to remove, especially by unskilled hands. The most common device is some modification of the jointed crank-shaft, in which the crank is formed in one piece with the shaft, the latter being spliced in the center by some form of interlocking device. In some cases the crank-shaft and one crank are formed in one piece, and a very few machines have the two cranks and the shaft in one continuous forging. Almost all of these devices allow the crank shaft to be removed without disturbing the bearings.

Despite the many promises regarding the chainless bicycle made early in the year by prominent manufacturers, there is nothing to show that it is likely to replace the chain and sprocket machine. One leading maker exhibits a bevel gear wheel which is about the same weight as the standard machine and has the compact appearance and the dust proof qualities which are the chief recommendation of this type of wheel. There are a few other chainless wheels of various patterns and excellence; but it is evident that we shall have to wait at least another year before there will be many of them seen upon the road. The large sprockets which have been in favor in England are making their appearance in this country, and as the mechanical grounds on which they have been introduced are sound and practical, they have probably come to stay. The large sprockets reduce the tension in the chain and lessen the strain upon the bearings and the frame. There is noticeable a tendency to raise the gear of this year's wheel, the change being compensated by lengthening the cranks from six and a half to seven inches. By this combination it is possible to reduce the rapidity of the pedal action and yet maintain the same tractive effort in the wheel. In general it may be said that the gear of the roadster has been raised from the 68 and 72 of last year to from 72 to 76 for 1897. There are several two-speed devices shown, most of which operate on the rear wheel. For the weaker riders who wish to ride the hills in a cross country run, the two-gear bicycle is an excellent device, and it is safe to say that it has come to stay. Before leaving the question of driving gear, it should be mentioned that several devices of considerable merit are shown which seek to overcome the sliding friction between the chain and the teeth of the sprockets. In some cases the rollers are on the chain, in others on the sprocket. Closely allied to these devices are the gear cases which are shown in two or three designs at this year's exhibition. Except on the ground of appearance and weight, the gear case has everything to recommend it, and it is quite possible that it will grow in favor as its merits are appreciated. To take such elaborate care to protect the other wearing parts of a machine and yet allow the most important parts of the driving mechanism to grind themselves to pieces in a sticky mixture of oil and mud is, to say the least, a strange inconsistency. At the same time the gear case widens the tread, adds to the weight and destroys the symmetry of the machine—and this is sufficient to kill its chances of adoption, at least for the present.

The wooden rim reigns supreme, and one well known firm, which last year made a specialty of aluminum rims, is offering wood rims as an optional alternative on its high grade wheels. Great ingenuity is shown in devices for preventing the warping and splitting of the rim—a defect which now seems to be fairly overcome.

There is no advance so marked as that shown in the production of a comfortable saddle. From the days of the primitive "bone shaker" the saddle has been the most faulty element in the make-up of a bicycle; but to-day the problem has been solved by designing the seat on so-called hygienic principles, and it is not the fault of the market if the 1897 rider does not sit his machine in comfort.

The single tube pneumatic tire is apparently destined to become the predominant type, though the well known double tube variety is still used by several of the leading makers.

In the matter of general attachments there is shown an infinite variety of bells, brakes, lamps and cyclometers of handsome design, and all the etcetera that go to make up the equipment of the 1897 wheelman.

THE LATE RICHARD POPE.

The death of Richard Pope, Esq., Deputy Commissioner of Patents of the Dominion of Canada, took place on February 2. Mr. Pope was in the seventieth year of his age. He was born in Toronto and was admitted to the bar of Lower Canada in 1855. He devoted great attention to the mineral and other resources of Canada, publishing important books and reports upon the subject. In 1872 Mr. Pope was transferred to the Federal Department of Public Works. For nearly a quarter of a century he has been a resident of the federal capital of Canada. He was private secretary to Sir Hector L. Langevin in 1873, was clerk of the Crown in Chancery, and in 1888 he became Deputy Commissioner of Patents.

The administration of the various public offices which he enjoyed shows an honest, active, painstaking public officer. In private life he was hospitable and considerate. A large circle of friends will warmly sympathize with Mrs. Pope and family in this hour of sad bereavement.

A NEW BUSINESS—PATENT SHARKS.

Recently a new business has grown up. Patent lawyers are advertising extensively that they will give hints to inventors, and not only secure patents for them, but place their devices on the market. There are about a dozen such firms in this city, and all are doing a rushing business. Presently some of them will be in the penitentiary. They are not all dealing on the square.

An acquaintance of mine in the West asked me by letter to investigate a certain firm for him. It had secured a patent on his invention, and was trying to sell it, as he thought, without letting him in for his rights. I visited the gentlemen, and, introducing myself as a merchant, asked if they had such and such inventions, at last mentioning that of the Westerner. Yes, they had his patent, but it was not possible just then to get at the papers. They could assure me, however, that everything was all right, and they wanted to sell. What would they take? I asked. They could not possibly say without first consulting with the inventor and patentee; they would write at once and communicate with me. I left my address.

A week later I received from the inventor a copy of a letter written to him by this firm of patent lawyers. It concerned my visit. Here is an extract:

"Naturally your device was the first shown, and he appeared to be interested, but stated that he only wished to consider inventions in that line so far as foreign countries, more particularly European, were concerned, and we informed him that, although patents had not been granted in those countries, yet arrangements had been made for their protection. He desired us to state a price on England, France and Germany, and, without being informed upon that subject, we placed at random $5,000 on these countries, and he quickly stated that those figures were out of his range. . . . We trust you will discover the importance of foreign patents, as those countries are in better financial condition than ours at the present writing."

There is a lie in nearly every word of that letter. I am strongly tempted to mention the name of the firm. It might save some fool of an inventor not only his money, but his patent. Here is an effort to belittle the value of the Westerner's invention in his eyes, and at the same time a bid for additional fees for taking out foreign patents. Let inventors take warning.—N. Y. Press, February 10, 1897.

A GOLD MEDAL FOR NANSEN.

The Royal Geographical Society held a reception February 8 in Albert Hall, London, in honor of Dr. Fridtjof Nansen, the distinguished Arctic explorer. Sir Clements Markham, the president of the society, presided, with the Prince of Wales sitting at his right hand and the Duke of York at his left.

Dr. Nansen delivered a lecture describing the voyage of the Fram and telling of his adventures in the far north. He said that the object of his expedition was not to discover the North Pole, but to explore the unknown region in its neighborhood. Upon the conclusion of the lecture, the Prince of Wales presented to Dr. Nansen a special gold medal voted to him by the Geographical Society. The recipient, in a few well chosen words, expressed his thanks for the honor accorded him.

The audience was a most exclusive one. Despite the enormous capacity of the building, the members of the press were ill provided with facilities for reporting the lecture.

STRENGTH OF WELDS.

Some experiments made at the engineering laboratory of the University of Michigan to determine the strength of welded joints are especially interesting, says the Digest of Physical Tests. Of a number of the specimens tested not one broke in the weld; as some of these were slightly larger at the weld, a new set of specimens was prepared and a cut taken from each in the lathe to reduce the piece to a uniform diameter throughout its length between the jaws of the testing machine. Common round iron was used. Three bars were taken at random; 1¼ inches, 1 inch, and ¾ inch in diameter. From each bar four specimens were prepared, one solid, one lap welded, one butt welded, and one split welded. The results show that only two specimens, both lap welded, broke at or near the weld; the fracture in one case was slightly crystalline and in the other fibrous. The strength in no case departed widely from the strength of the solid parts. It would seem from these tests that with skillfully made welds we may expect to realize nearly the full strength of the original bar.

ARCHÆOLOGICAL NEWS.

Lord Leighton's house in London is to become a museum.

Orange's Roman Theater has been completely restored and is now the finest ancient theater in Europe. Next summer performances of the Antigone and Erinnyes will be given and President Faure will be present.

The Italian government has recognized the impracticability of raising from the bottom of the Lake Nemi the two huge ships which Tiberius used as floating palaces. The government is now considering a scheme recommended by engineering experts for the draining of the lake in question, in which its waters shall have to be lowered sufficiently to bring these ships to the surface. It is estimated that the cost of the operation will not exceed $50,000.

Mr. Charles Edwin Wilbour died in Paris in December, 1896. For many years Mr. Wilbour was in the habit of passing his winters on his own boat upon the Nile, and he made many discoveries of importance, though, owing to his extreme modesty, he was prone to give the results of his investigations to other students. He was regarded by prominent explorers as one of the greatest Egyptologists. He possessed a fine library of works on ancient Egypt.

The Norwegian traveler, Sven Hedin, has contributed to a German journal, Globus, an interesting account of his journeyings in Central Asia in the district north of the Kwenlung Mountains. Ruins of large towns were discovered which had been buried by successive sandstorms spreading over a thousand years, hence very modern from a Petrie point of view. Separate houses were uncovered of very fragile construction, consisting of wooden pillars, while the walls were put together of plaited reeds covered with mud. The latter were rendered at once impervious and suitable for decoration by being coated with white plaster. Drawings were discovered on these walls, and well executed, of human figures, horses, dogs and flowers, and judging by the copies which have been brought back, of no small artistic merit. Small figures of Buddha were also dug up, as well as various fruit trees which told a tale of the bygone days when this arid surface was once made fertile by the waters of the River Kerija.

Once more there is a rumor that Signor Gianturco, the Italian Minister of Education and the Arts, has been able to negotiate with Prince Paul Borghese for the acquisition of the pictures in the Palazzo Borghese by the Italian government, says the Architect and Contract Reporter. The Borghese family, it is said, were induced to expend enormous sums in building speculations which were not profitable, and it is necessary to find an equivalent for them. Some of the famous pictures had to be sold and others were destined to follow them out of Italy when the law against the exportation of such property was enforced. In Rome there is no collection that is comparable with the contents of the eleven galleries of the Borghese Palace, and the wealthiest connoisseurs of Europe and America would be glad to compete for pictures, one of which would be enough to gain position for its owner. To possess Titian's "Amor sacro et Amor profano," or Raphael's "Deposition," Correggio's "Danae," or Domenichino's "Nymphs," would be almost equal to gaining a knighthood, while Rome itself would be poorer if they were dispersed.

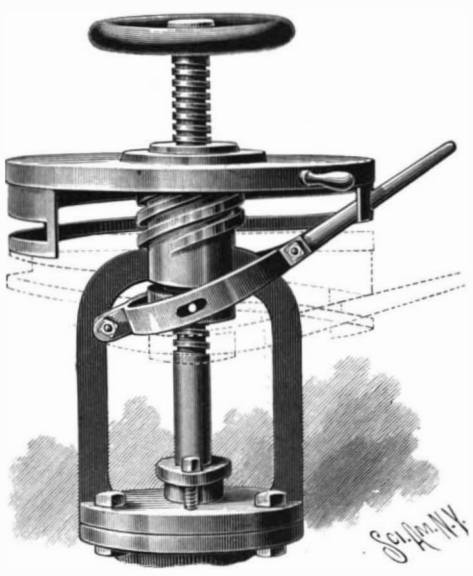
Dissatisfaction has arisen among the six hundred American members of the Egypt Exploration Fund over the recent reorganization of the American branch by the English officers, who have abolished the office of honorary secretary, held by the Rev. William C. Winslow, of 525 Beacon Street, Boston, and substituted for it an executive committee consisting of Prof. John C. Gray, Charles L. Hutchinson, Gardiner M. Lane, Charles G. Loring, Charles Dudley Warner, Sarah W. Whitman and the Rev. Mr. Winslow. The American members think that Mr. Winslow should be kept at the head of the American branch, in view of his earnest work for the Fund in years past and his general fitness for the place of leader, says the New York Sun. Then, too, they object to the manner in which the reorganization was effected, inasmuch as the action of the English members was taken without consulting the American interests as to the advisability of an executive committee to rule in place of Mr. Winslow.

The Egypt Exploration Fund was founded in 1883. It has for its purpose the promotion of historical investigation in Egypt by means of systematically conducted explorations. Particular attention is given to places where the explorations may be expected to throw light upon obscure questions of history. Much attention is given to details, and all objects discovered are carefully preserved for examination and study. Explorers are sent out in all seasons of the year to make excavations in different parts of Egypt, and so far they have obtained a great deal of valuable historical data.

The local honorary secretaries in New York are Clarence M. Hyde, of 206 Madison Avenue, Albert A. Aub, of 43 East Eighty-third Street, Mrs. E. A. Hoffman, Chelsea Square, Charles W. Sloane, 60 Park Avenue, and Mrs. Howard Crosby.

AN IMPROVED VALVE.

The illustration represents a valve which can be readily and quickly moved toward or from the valve seat, a cam wheel being arranged to move in the direction of the axis of the valve stem, and a lever controlled by the cam wheel being connected with the nut of the valve stem. The improvement has been patented by Sidney W. Sampson, of Hudson, Mass. A threaded portion of the valve stem screws in a nut fitted to slide in a bearing on a yoke attached to the casing, and the nut is engaged by a lever fulcrumed on the yoke, the lever moving the nut in its bearing in the direction of the axis of the valve stem. The free end of the lever is engaged by a groove of the cam wheel, whose hub has a nut screwing on external screw threads on the bearing. When the cam wheel is turned it imparts a swing motion to the lever, and the latter shifts the nut to move the valve toward or from the valve seat, as indicated by the dotted and full lines in the engraving. The stem may be turned in the usual manner, by means of the hand wheel at the top, to adjust the valve relative to its seat, but to quickly open or close the valve the operator makes use of the cam wheel.



SAMPSON'S VALVE.

In the Ocean's Depths.

The temperature at the bottom of the ocean is nearly down to freezing point, and sometimes actually below it, says the Nineteenth Century. There is a total absence of light, as far as sunlight is concerned, and there is an enormous pressure, reckoned at about one ton to the square inch in every 1,000 fathoms, which is 160 times greater than that of the atmosphere we live in. At 2,500 fathoms the pressure is thirty times more powerful than the steam pressure of a locomotive when drawing a train. As late as 1880 a leading zoologist explained the existence of deep sea animals at such depths by assuming that their bodies were composed of solids and liquids of great density, and contained no air. This, however, is not the case with deep sea fish, which are provided with air-inflated swimming bladders. If one of these fish, in full chase after its prey, happens to ascend beyond a certain level, its bladder becomes distended with the decreased pressure, and carries it, in spite of all its efforts, still higher in its course. In fact, members of this unfortunate class are liable to become victims to the unusual accident of falling upward, and no doubt meet with a violent death soon after leaving their accustomed level, and long before their bodies reach the surface in a distorted and unnatural state. Even ground sharks, brought up from a depth of no more than 500 fathoms, expire before they gain the surface.

The fauna of the deep sea—with a few exceptions hitherto only known as fossils—are new, and specially modified forms of families and genera inhabiting shallow waters in modern times, and have been driven down to the depths of the ocean by their more powerful rivals in the battle of life, much as the ancient Britons were compelled to withdraw to the barren and inaccessible fastnesses of Wales. Some of their organs have undergone considerable modification in correspondence to the changed conditions of their new habitats. Thus down to 900 fathoms their eyes have generally become enlarged, to make the best of the faint light which may possibly penetrate there. After 1,000 fathoms these organs are either still further enlarged or so greatly reduced that in some species they disappear altogether and are replaced by enormously long feelers. The only light at great depths which would enable large eyes to be of any service is the phosphorescence of deep sea animals.

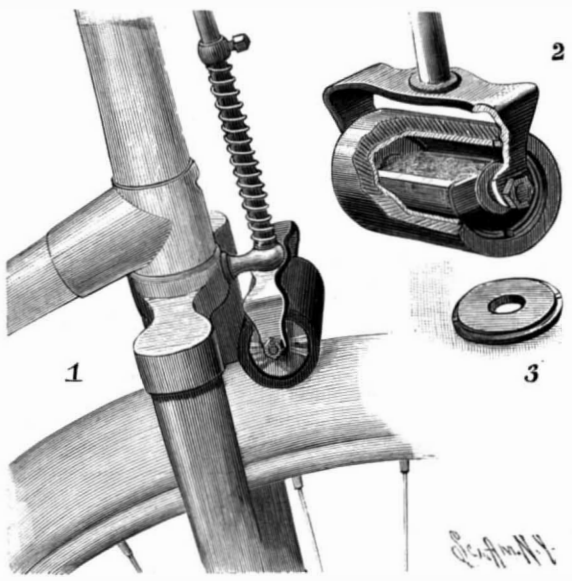
We know that at the surface this light is often very powerful, and Sir Wyville Thomson has recorded one occasion on which the sea at night was "a perfect blaze of phosphorescence, so strong that lights and shadows were thrown on the sails and it was easy to read the smallest print." It is thought possible by several naturalists that certain portions of the sea bottom may be as brilliantly illumined by this sort of light as the streets of a European city after sunset. Some deep sea fish have two parallel rows of small circular phosphorescent organs running along the whole length of their bodies, and as they glide through the dark waters of the profound abysses they must look like model mail ships with rows of shining portholes.

Jumping Beans.

Mr. Yeatman Woolf, writing to the Pall Mall Gazette, says he has had experiments in hand with the so-called "jumping beans" for the last two years, and he finds that the apparent leaps are an illusion due to the eccentric shape of the beans, and the character of certain of the complicated movements thereby rendered possible. In support of his contention he mentions that, after carefully removing the woody fiber of some beans so as to leave intact the silken bags containing the live maggots, the beans, despite the decrease of weight, although they still continued to move, did not appear to lift themselves at all from the sheet of blackened glass upon which they lay. He claims to have been able to thoroughly clear up the cause of the motive power by keeping many maggots in artificial wax houses with windows inserted. When the grub has covered up an aperture with its silk, it afterward darkens the same with juices formed out of the excreta, until it assumes a brownish color. In one instance a bean was found to contain a parasite (ichneumon) tucked up alongside the cocoon, but dead. From the fact of the interior of the bean having a silk lining similar to all those containing maggots, and from the excreta, it is presumed that the ichneumon parasite had eaten the caterpillar.

A NEW ROLLER BICYCLE BRAKE.

The great danger of injuring or destroying the pneumatic tire by using a fixed brake has heretofore been the principal reason why so many wheels have been put on the market without brakes. The roller brake, which has been used to some extent, is not open to the objection made to the fixed brake, but such a brake, which depends for its action upon friction produced simply by the bearing of the revolving roller upon the tire, has been found inefficient. The illustration represents a new and improved form of roller brake, recently patented by Wm. L. Stewart, of Wilmerding, Pa., in which the wearing friction is taken off the tire and borne by inner friction bearings within the brake roller, the latter having an outer shell of vulcanized fiber, which presents a hard and entirely smooth surface, almost entirely unaffected by heat, cold or moisture. Fig. 1 represents the improved brake in place on a wheel, Fig. 2 showing the inside of the brake roller, and Fig. 3 the cap by which the interior of the roller is made dust tight. The roller shell is lined with a cylinder turned from tool steel and case hardened, and the brake shoe, also made of steel and having on its side edges a facing of thin brass or copper, has a bearing on both sides on the inner wall of the cylinder when the brake is applied, this being effected by downward pressure on the plunger rod, the trunnions of the shoe being journaled in the opposite members of a yoke on the lower end of the rod. The brass or copper facing of the friction edges of the shoe may be readily removed and another facing inserted when necessary, and centrally in the shoe is a space in which may be placed asbestos or other fibrous substance saturated with sufficient lubricant to serve for a long period. A bowed spring on top of the shoe (not shown in the illustration) holds the parts from rattling at all times. The brake has already been extensively tried and found to work easily and powerfully to check up or preserve uniform speed of the wheel in descending steep grades.

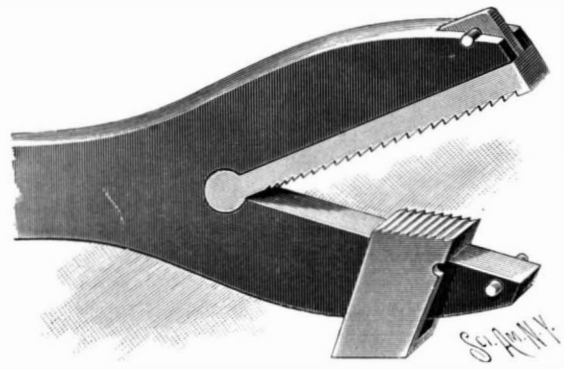


STEWART'S BICYCLE BRAKE.

A BICYCLE stable is a recent contrivance. It consists of a case into which the wheel fits snugly, and when covered up resembles a desk.

AN ADJUSTABLE PIPE WRENCH.

A wrench of the alligator style, especially adapted for gripping pipes, rods, etc., is shown in the accompanying illustration, and has been patented by John H. Jenner, of Leavenworth, Ind. Its stock is formed with forked members, in the upper one of which is a removable toothed jaw, at whose inner end is a circular offset fitting into a correspondingly shaped recess in the stock, while at its outer end is an upwardly extending lug which enters a slot in the outer end of the upper member of the stock, where it is held in place by a pin. By removing the pin the jaw may be swung inward and readily disengaged from the stock, to be replaced by a new one when desired. The lower jaw is preferably made in the shape of a casing adapted to slide on the lower forked member of the stock, and is prevented from dropping off the member by a pin, on removing which the jaw may be removed and replaced. As the lower jaw may be readily slipped or shifted along the member, according to the size of the article to be gripped, the wrench may be quickly adjusted for a wide variety of work.



JENNER'S WRENCH.

The Antiquity of Chess.

The latest excavations on the pyramid field of Sakkara have led to an extraordinary discovery as to the origin of chess, says the New York Evening Post. Hitherto it was assumed that the ancient Indians had invented the game, that it was introduced from India to Persia in the sixth century, and that by the Arabs, and in consequence of the crusades it spread from East to West. This theory was substantiated by the fact that an Indian, Persian, and Arabic influence is traceable in the character of the figures at present used and in some of the words connected with the game, such as "shah" (check) and "matt" (mate). Now, north of the pyramid of King Tetu or Teti, two grave chambers have been discovered which were erected for two high officials of that ruler. Their names were Kabin and Mernker, called Mera. The grave chamber ("mastaba") of the former consisted of five rooms, built up with limestone. Its walls are covered with exceedingly well preserved bass reliefs and pictures representing various scenes. The other grave chamber, that of Mera, is the most valuable. Up to now no fewer than twenty-seven halls and corridors have been uncovered. There are beautiful grave columns, in the chief room there is in a niche a tinted statue of the departed, about seven feet high, with a sacrificial table of alabaster before it. Among the many wall paintings in this and other rooms, hunting and fishing scenes, a group of female mourners, the three seasons, Mera and his sons, holding each other by the hand, and Mera playing chess, are to be seen. King Tetu belonged to the sixth dynasty, and his reign was assigned by Prof. Lepsius to about the year 2700 B. C. Prof. Brugsch, correcting this chronology, puts it back to still greater antiquity, namely, to the year 3300 B.C., so that chess would have been known in the once mysterious land of Mizraim something like 5,200 years ago.

Cause of Landslides.

Because of the many landslides that have occurred on the line of the Canadian Pacific Railway in British Columbia, Col. Robert B. Stanton, M. Am. Soc. C.E., and Mr. James D. Schuyler, M. Am. Soc. C.E., were lately appointed a board of experts to examine into the matter for the railway company. As a result of this investigation, an action has been brought by the Canadian Pacific Railway Company to secure an injunction against the farmers on the Thompson River to prevent them from further irrigating land contiguous to the railways, this irrigation having already caused landslides which have swept down upon the tracks of the company. Along this river the land rises in benches extending from 50 to 500 feet above the river. The soil is gravelly, with a clay subsoil. The farmers irrigate their lands by water from creeks back in the mountains, and the land is sliding downward apparently on the slippery clay subsoil. In one place 66 acres have slid down in a mass, and the experts estimate the volume of one of these slides at 32,000,000 tons. At times, says the Railway Review, the railway track has been shoved five feet out of line in one night, causing great outlay in reconstruction. The jury has found in favor of the railway company, ascribing the slides to the irrigation.

VAPORIZATION IN TUBES.

The steam boiler is certainly one of the appliances of modern industry that has received the most study, and one that has been gradually modified in its different parts in measure as experience has supplied new information. Manufacturers and engineers have especially endeavored to assure the circulation of water in order to prevent overheating and other accidents of the kind; and every one knows the interesting arrangements adopted in multitubular boilers. There has been much discussion as to the theory of these apparatus, and many explanations have been proposed, that have been based upon the differences of density of the hot and cold water, to account for the circulation that occurs. It is unnecessary to revert to these different theories, as we desire merely to set forth the results of two suggestive experiments carried out by Mr. Solignac, and easy to repeat. Let us take (as shown in Fig. 1) a glass vessel that is provided with a tubulure, E, at the side. Let us put this tubulure in communication with a metallic tube placed above a gas burner, and connect it with a glass one curved at the upper part and returning at G above the glass vessel. Let us cause the gas to burn with a moderate flame. In a few minutes, we shall observe in the vessel, at E, a disengagement of steam at the top of the tube and a re-entrance of water at the bottom. At the same time, the tube becomes red hot at the place that is exposed to the flame, and we see that a column of water is rising slowly in the prolongation of the tube, and that it but very rarely overflows at G. This first experiment plainly shows us that, with the arrangements adopted, there is no circulation of water properly so called. And yet the water in the left part of our tube is certainly hotter than that derived from the vessel. Let us not forget, either, that the part of the tube exposed to the flame becomes completely red after a few moments of heating.

Let us now very slightly modify the first arrangement by adapting, at E, to the exit orifice of the metallic tube, a pierced plug of a diameter smaller than that of the tube. This plug is seen held in the hand in Fig. 1 and placed in position in Fig. 2. Everything leads to the belief, in the first place, that since the section of the tube is diminished, the result will be that the water will have more difficulty in passing, and that it will be possible to succeed in heating to redness a tube that is traversed by but a very small quantity of water. Yet we shall soon see the red color of the tube gradually disappear, and shall be able to follow the gradual progress of the water that arises and circulates, through the shadow that we shall see advancing; for at the passage of the water the tube becomes cool.

Fig. 2 refers to this phase of the experiment. The phenomenon is so striking that we reproduce it in a cartouche so as to show perfectly what occurs in practice. After a few instants, the tube resumes its dark color, and upon withdrawing the flame, it will be possible to touch it with impunity. The temperature does not exceed over 35°. It is not without a certain amount of apprehension that the fingers are moved toward the tube at this instant, and we must confess that when Mr. Solignac repeated these experiments in our presence and invited us to touch the tube, we did it only upon seeing him act without any backwardness.

The experiment teaches still another thing. In this latter case, the hot water and the steam make their exit at G in a regular manner and in abundance. There is then, in this particular case, a true circulation of water.

These changes were effected through the putting in place of the plug, E. It must therefore be really concluded that, in order to assure a proper circulation of water in a boiler, it is necessary to reduce the diameter of the tubes at the points where they detach themselves. Under such circumstances a resistance is created near the boiler, and the liquid, through that fact, displaces itself at the opposite side. The motion once produced, as in the priming of a siphon, a circulation is established in the tube and easily keeps up. Let us remark, too, that in the second case the heating was carried as far as possible by increasing the flame, and that the highest limits, corresponding to a combustion of about 880 pounds of coal an hour and per square meter of grate surface, were attained. In the first experiments the combustion did not exceed 220 pounds of coal. In order to render the experiment still more striking, Mr. Solignac repeats these experiments with tin tubes. In the first experiment the tube is rapidly melted, but in the second it resists and withstands the heat.

In practice the consequences of this simple experiment may be important. In order to prevent accidents due to superheating and to defects of circulation of the water, it will therefore suffice, according to Mr. Solignac, to adopt the arrangements that we have just pointed out.

Mr. Solignac proposes to adapt the new arrangement

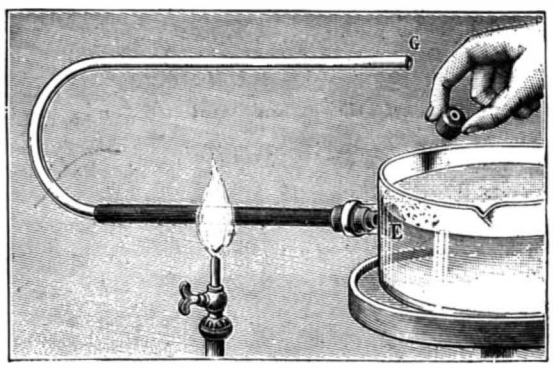


Fig. 1.—EXPERIMENT UPON VAPORIZATION IN A TUBE.

to a boiler of his devising, in tinning the tubes in order to render the demonstration still more evident. We hope that the results will prove satisfactory, and especially that they will be supported by experimen-

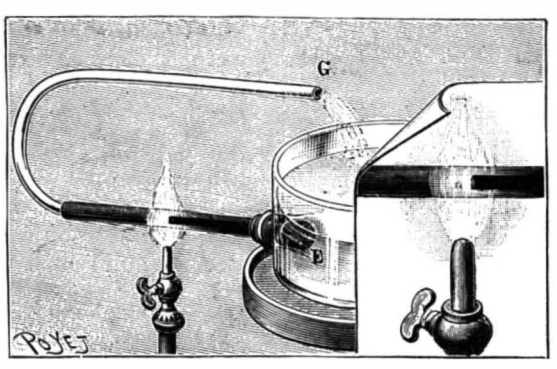


Fig. 2.—A SECOND FORM OF THE EXPERIMENT.

tally determined figures that will fix our ideas definitely as to this question, which is interesting from many points of view. We shall have here a true progress to put upon record.—La Nature.

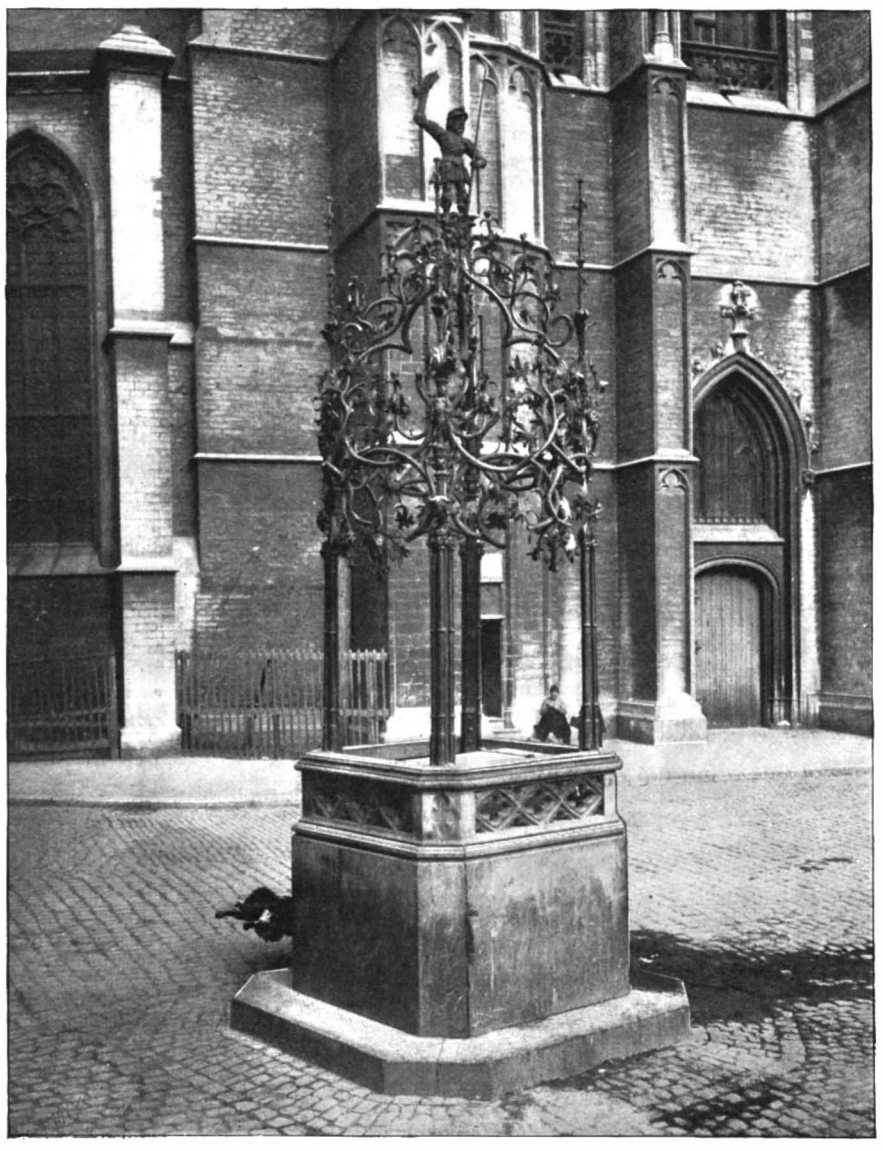
QUINTIN MASSYS' WELL.

Quintin Massys, or Matsys, was born at Louvain in 1466 and died in 1530. He was a notable Flemish painter, and in the well adjacent to the principal portal of the Cathedral of Antwerp he has bequeathed one of the finest examples of the smith's art—an example so fine that it ranks with the very foremost production of art iron work of any country and any time. At the beginning of the sixteenth century Antwerp usurped the position in the art world formerly held by Louvain, Ghent, Bruges and Mechlin. Though there are various legends as to his becoming a painter, still it is very possible that, like such a large number of the many-sided artists of the Renaissance, he felt that he could excel in various branches of the fine arts. As a painter he raised the school of Antwerp to a high plane, and he was one of the first Flemings to adopt the showy and effective Italian style, though in technical execution he did not fall one whit behind his predecessors. As a smith we must all admire his consummate masterpiece—the well of Antwerp.

This exquisite production of the hammer consists of an open canopy covering the stone well curb. The canopy is supported by four slender pillars and it is surmounted by a statue of Salvius Brabo, a mythical hero who defeated and cut off the hand of the giant Antigonus. Besides being a smith and painter, he was also a sculptor and woodcarver. Erasmus speaks highly of a bust of himself cast in bronze by Massys.

From a Latin poem of Sir Thomas More it would appear that Quintin carved medallions in wood. His intercourse with Erasmus and other scholars indicates that he was a man of some learning, and when Albrecht Dürer made his famous journey to the Low Countries he eagerly sought out Massys.

As Leonardo da Vinci, with all his appalling list of accomplishments, considered himself a painter, and as Michelangelo, the "man with four souls," considered himself a sculptor, saying that "painting was not his business," so we find Massys speaking of himself as "at one time a blacksmith, but now a painter."



QUINTIN MASSYS' WELL AT ANTWERP.

Curious Clocks.

The timepiece ordered by the Duc d'Aumale's grandfather from Bouchier for the Prince of Wales, afterward George IV of England, was recently sold in Paris. It is in the form of a negress' head, admirably modeled. Jewels are incrusted in the bronze around the neck to form a necklace, in the woolly hair, and in the bust as a clasp for the handkerchief. A pair of openwork gold earrings, long and delicately carved, hang from the ears. On pulling one of them the hour is shown on the right eye and the minute on the left. If the other earring is drawn, a set of musical bells, lodged where the brain should be, chimes out the time of day. A clock without works is a distinct novelty, yet one formerly stood in the splendid Cour de Marble at Versailles, where it was installed in the reign of Louis XIV. Its hand always pointed to the exact moment of the death of the last King of France, and it never moved during his successor's reign. Thus, as one writer has put it, it was a perpetual reminder to the most splendid of courts that "the paths of glory lead but to the grave."

In the private collection of a gentleman in the south of England is a timepiece which records the age of all the planets by an arrangement which gives the exact revolutions of each one. Besides giving the golden number, the dominical letter, and other similar information of equal interest, this remarkable clock records the time when it is high tide at various points in Europe. Some time ago a description appeared in an American journal of a Japanese clock standing in a frame three feet high and five feet broad, representing a landscape of great beauty. In the foreground were plum and cherry trees in full bloom, while in the rear was a hill, gradual in ascent, from which flowed a cascade of crystal. From this point a threadlike stream glided along, encircling rocks and tiny islands in its wanderings, but presently losing itself in a far-off stretch of woodland. In the sky turned a golden sun, indicating, as it passed, the striking hours, which were all marked upon the frame below, where a slowly creeping tortoise served as a hand. A bird of exquisite plumage, resting on the branch of a plum tree, proclaimed by its singing the expiration of each hour; while, when the song ceased, a little mouse sprang from a grotto close by, and running over the hill hastily disappeared in the distance.—The Keystone.

THE number of papers published in Japan during 1895 was 792, and the number of copies printed 244,000,000. Some papers are published in English and Japanese. Most political papers do not succeed, owing to the strict laws and numerous fines.—Uhland's Wochenschrift.

Science Notes.

The Russian Academy of Science has elected Lord Kelvin an honorary member and Lord Rayleigh a corresponding member.

The Eleventh Geographical Congress will be held at Jena on April 21-23, 1897. The subjects will include biological geography and Polar investigations.

It is said that Baroness Hirsch has announced her intention to give 2,000,000 francs ($400,000) to build a hospital for consumptive children on the Riviera.

A monument in memory of Father Secchi, the former director of the Collegio Romano Observatory, has been erected at Reggio (Emilia), where he was born. The sum of 78,000 francs was publicly subscribed for this purpose.

While Emperor Francis Joseph, of Austria, was visiting Bucharest after the formal opening of the Iron Gates of the Danube Canal, he bestowed on Queen Elizabeth of Roumania (Carmen Sylva) the order of merit for science and art.

Russia is employing the schoolmaster to secure her conquests. Schools have been established in Merv and eight other towns in the region beyond the Caucasus where the Russian language is used in teaching by the side of the native tongues.

The Paris Velo has offered prizes amounting to 2,000 francs for a motorcycle race, to take place next April. The distance will be about 60 miles over a level road, and competing carriages must not weigh over 425 pounds. It is to be regarded as a sporting event rather than a scientific test.

Prince Henri de Orleans is going to Abyssinia soon, and thence to Central Africa, accompanied by a number of French scientific men. Negus Menelik is making ready to receive him, as the name of Orleans has been popular in Abyssinia ever since Louis Philippe made a treaty with Negus Johannes. The prince has talked his plans over with Capt. Leontieff, the Russian emissary at Menelik's court.

Dr. Paul Gibier, a high scientific authority, says: "If this habit of expectoration in public could be stopped, I am sure that in time tuberculosis would die out altogether. This seems a very sweeping statement, but it is not an ill considered one. There is no question in my mind that the spread of tuberculosis is due largely to the habit of spitting. A great many people have tuberculosis without being aware of the fact. They do not know of the danger that comes from ejecting their sputum where it becomes dry and pulverized and then flies about in minute particles to be inhaled by healthy persons, who are thus inoculated with the disease. This random public expectoration is a crime."

Messrs. Harold Griffing and S. J. Franz have recently contributed an article to the Psychological Review on the physical conditions of fatigue in reading, and the best means of avoiding it. From their experiments the authors conclude that the size of type is the all important condition of visual fatigue. No type less than 1·5 mm. in height should be used, the fatigue increasing rapidly even before the size becomes as small as this. The intensity of illumination is apparently of little consequence within the limits of daylight in well-lighted rooms. Very low intensities, less than from 3 to 10 candle meters, are sources of even greater fatigue than small type, and 100 cm. may be considered a safe limit. White light rather than yellow light should be used for artificial illumination. The form of type is of less importance than the thickness of the letters. White paper should be used, though it is possible that the greater amount of light reflected from pure white paper may cause some fatigue. Additional "leading" or spacing between the lines is also recommended.

In connection with the celebration of the twenty-fifth anniversary of the Stevens Institute of Technology, of Hoboken, N. J., on the 18th and 19th of February, which has already been referred to in the column of Science Notes, there will be published a large and fully illustrated volume containing an account of the professional work of all the graduates of the institute during the last twenty-five years, together with a history of the various members of the Stevens family who were leading marine and railway engineers of their time. There will of course be a history of the foundation of the institute and an account of its progress. All these subjects will be embellished with numerous illustrations of an artistic character when the subject admits of such treatment. Thus in the early years of the institute there were delivered in the large lecture hall many courses of popular lectures on scientific subjects which were originally and brilliantly illustrated, including a vertical illuminated jet which was shown in 1871, during one of President Morton's lectures on light. The principle involved in this apparatus is exactly the same as was applied on a grand scale to illuminate the fountain at the Paris Exposition of 1889 and the Chicago Fair of 1893. The exhibition of the work of the graduates promises to be one of the most attractive features of the celebration. The demand for space will severely tax the capacity and facilities of the institute, as many of the exhibits will be shown in actual operation. The exhibits range from simple devices to a complete electric plant operated by a gas engine, the invention of a graduate.

Life in the Coffee Country.

The sun beamed on us, for the first time since our arrival on the Central American coast, at Puerto Cortez, says a writer in a letter to the Chicago Record dated Aciqualpa, Honduras, December 7. We reached there early Wednesday morning, November 25, and all were heartily glad that our long, disagreeable sea trip was over. We waited around the shambling old wharf and watched a little crowd of native laborers operate a pile driver, with which they were putting in a trestle to connect the little railroad with the wharf, while the easy-going custom house officials, assisted by an escort of dirty, barefooted soldiers, were getting our baggage loaded on flat cars to be hauled over to the custom house for inspection. The baggage was scarcely looked into, the inspection being less rigid, probably, than in any other part of the world, our guns and ammunition wholly escaping notice, although we were told on the steamer that the rifles certainly would be deemed contraband.

When it came to our outfit of farm, garden, and carpenter tools, however, it was a different story. Acting on the advice of the steamer company's agents in New Orleans, we had not visited the Honduran consul in that city to get a consular certificate attached to our invoices. We were told that all such goods belonging to intending settlers were surely admitted free, and that the taking of a consular certificate would only complicate what otherwise would be a very simple matter. This advice proved disastrous, as it cost us three days' delay in Puerto Cortez and 35 sols duty. All goods are charged for by the pound, but are divided into eleven different classes, the most valuable—as jewelry and similar articles—being charged for at the highest rate, to equalize their insignificance in weight. As all of our goods were mixed indiscriminately, we were compelled to pay the duty according to the highest rate.

The Honduras Railroad runs from the port to Pimiento, fifty-two miles distant. It is a narrow-gage affair, with a sort of toy locomotive, and runs a train every other day. The charges on our freight to San Pedro Sula, thirty-seven miles, were a trifle less than double the cost from Chicago to Puerto Cortez, a distance of about 2,000 miles. However, the officials are a jolly lot of good fellows, and do all in their power to aid Americans when they arrive in the country. The high tariff is the result of the necessity for making a slender business meet the necessary expenditures.

The railway is all there is to show for a big modern enterprise that saddled a national debt of about $30,000,000 on Honduras, and gave her in return a little more than fifty miles of very poorly constructed and worse equipped railroad. The scheme was financed in England, and consequently Englishmen have little prestige in this country. A new plan is being evolved by a Mr. Valentine, an enterprising New Yorker who has made considerable money in mining here, and who has a lease from the government on the road, to buy up the claims of the bondholders and complete the road from the Gulf of Honduras, on the Atlantic, to the Gulf of Fonseca, the magnificent port on the Pacific. This is the finest route for a transcontinental railroad on the American continent, having a very easy grade across the entire country, with two of the finest harbors in the world for termini. The total length of the projected line is only 254 miles, and, being in the direct line between the European and East Indian and Australian ports, would carry a very large portion of that trade, and at the same time undoubtedly would develop the country rapidly.

Puerto Cortez has very great natural advantages and must some day, when Honduras is better known, become a city of considerable importance. It is a very healthful place, with a large bay on two sides and the Caribbean sea and a broad, deep lagoon on the other two, while mountains of considerable elevation come down nearly to the coast within a few miles of the town. The business of the place is almost wholly in the hands of Americans, and they are exceedingly cordial in their welcome to new comers of the right stripe. The accommodations are wretched, but the resident manager of the Honduras lottery, the languishing remnant of the old Louisiana lottery, maintains a fine house, built and furnished in American style, and provides hospitably for such travelers as are vouched for by well-known persons in this country or at home.

The Honduran government maintains a military post here, and we were entertained by watching the primitive tactics of the soldiers, mostly boys in their teens. Their arms consist of 43 caliber Springfield rifles, and besides these there is quite an imposing battery of old-fashioned cannon and two dangerous-looking machine guns, one French and the other American.

Saturday the custom house people finally untangled the matter of our little outfit, which would have taken two hours in any progressive country, and allowed us to go on our way. The trip up the railroad to San Pedro Sula was most interesting. The banana plantations and rubber groves, together with the almost solid walls of matted jungle—a bank of strange tropical foliage—were full of interest for us all, and although the thirty-seven mile trip occupied between four and five hours, we were sorry when it was finished.

San Pedro Sula is the metropolis of the country on the Atlantic side, and the place where almost all the outfitting and freighting for the interior is carried on. It has quite a good hotel, kept by a woman from Montana, and has just added an artificial ice plant to its growing industries. There are about 4,000 inhabitants, and a large colony of Americans. It seemed quite like home to meet ten or twelve Americans at once, and to hear no word but English spoken.

Through the kindness of Dr. Mitchell, United States consular agent, we obtained saddle mules and a pack animal for our blankets, hammocks, and other traveling conveniences, and were ready to start the next morning, Monday, November 30. The doctor made us a map of all the principal coffee districts, and with a well-trained mozo—who is guide, servant, muleteer, and interpreter, all in one—we started for a long rough ride through the mountain trails to see the country for ourselves, to compare the facts with the glowing statements of other travelers and investigators, and to find out for ourselves the answer to the question, "Will coffee pay in Honduras?"

Saddle mules cost in the currency of the country from $100 to $150 and pack mules from $50 to $80, so that we felt that to buy them outright was too extravagant. The same mules are hired for $1 a day, both saddle and pack animals, and the mozo costs another $1. Unless stops are made, a day's work for these mules is ten leagues, and the liberality with which Hondurans treat all matters relating to land extends to their leagues. We have no complaint to make as to their failing in full measure. Meals along the road are usually charged for at the rate of two reals or 25 cents each, with another real for the tortillas and frijoles—corn cakes and beans—furnished the "muchacho," as the mozo generally is called. The mules get pasture only at night. That costs one real per head. Two or three times a week they are given a medio's worth of corn. A medio is half a real, or 6¼ cents. All these prices are in the silver of the country, which is now worth at the rate of forty-six cents in gold for one sol, or dollar. The Honduran money is all silver, and is coined in the denominations already mentioned—medios, dosreals, quatro-reals (fifty cents), and sols. It is almost impossible, however, to get the two smaller coins, so that twenty-five cents' worth is practically the least quantity of many articles that can be bought. The right to swing your hammock in the house where you eat supper is a matter of course, and never charged for.

Maladies of Gems.

CURIOUS FACTS CONCERNING THEM, FROM THE BOSTON JOURNAL OF COMMERCE.

Among infirmities to which precious stones are liable is one common to all colored stones, that of adding or losing color when long exposed to the light, says a contemporary. The emerald, the sapphire and the ruby suffer the least, their colors being as nearly permanent as colors can be, yet experiments made a few years ago in both Paris and Berlin to determine the deterioration of colored gems through exposure showed that even these suffered, a ruby which had lain for two years in a show window being perceptibly lighter in tint than its original mate, which was kept in darkness.

In the case of the garnet and topaz the change is more rapid than in that of the ruby and sapphire, but there is a curious difference in the result in topaz and garnet; for, while the latter grows lighter, the former appears to become cloudy and dull in hue, losing much of the brightness characteristic of a newly cut gem.

For ages the opal has had the unenviable reputation of being the most unlucky of gems, and it is believed that the jewels themselves are originally responsible for many of the superstitious stories connected with them, since to the polishers and setters it is one of the most troublesome gems on their list. Microtonists say that the prismatic colors and fire of the opal are due to myriads of minute cracks in the body of the stone, the edges of which reflect the light at different angles and give the hues so much admired. Opals that have successfully passed the ordeals of grinding, polishing and setting do not often crack afterward, but it is best not to expose them to even the moderate heat involved by the wearer sitting in front of an open fire, for the opal is composed principally of silicic acid, while from 5 to 13 per cent of water is a combination which renders them very treacherous objects.

A volume would not contain the stories told by expert jewelers of the misfortunes of pearls. Consisting almost entirely of carbonate of lime, they are easily damaged, and when once injured cannot be restored. Thrown into a fire, at an ordinary red heat, they are converted into a pinch of lime dust; accidentally touched with any corroding acid, they are affected precisely as a bit of marble or limestone would be under similar circumstances. They are easily cracked and broken, sometimes they lose their luster through handling, while the acids contained in the perspiration of the skin have been known to affect them.

Correspondence.

Traps for Inventors.

To the Editor of the SCIENTIFIC AMERICAN:

It became my fortune, and I expect it will be my profit, to be enrolled as an "inventor" in the official record of the United States, through the intelligent efforts of the SCIENTIFIC AMERICAN Agency; and during the few months I have enjoyed this "immortalization," my experience has fully verified the statements in the modest circular that came with the patent papers from the SCIENTIFIC AMERICAN Agency, warning new inventors against the many sharks that represent themselves as patent sale agencies. I believe there are honest and efficient houses engaged in the sale of patents, but I feel more than satisfied that swarms of these agencies come within the letter and spirit of the SCIENTIFIC AMERICAN circular. I have just read your article headed "Traps for Inventors," and know that thousands of inventors will heartily say Amen! to it.

A long experience as a newspaper man had somewhat posted me up on the wiles of portions of humanity, and this, with your circular, may have made me over-cautious and a little too suspicious, and caused me to be a little too incredulous; but I think not. Without details I wish in this simply, as a sort of appendix to your article, to say to inventors that if they have anything meritorious, with ordinary push and legitimate facilities for reaching the ears of capitalists, adopted by sensible business men, their hopes can be realized. Fake advertising, and fake tours through the country in the interest of their deluded patrons, constitute the stock in trade of the class you warn the inventors against. AN INVENTOR.

Lawrence, Kansas.

The Story of the Buffalo.

BY GEORGE ETHELBERT WALSH.

There may be a few wild buffaloes yet in the most inaccessible parts of the Far West, but, if so, their existence is not generally known, and hunters have repeatedly failed to find them. A floating paragraph in the Western newspapers occasionally mentions a hunter's encounter with one or two stray buffaloes, and the report is sufficient to call out every sportsman within a radius of several hundred miles. The nearer the species approach complete extermination, the more eagerly the lonely fugitives seem to be pursued to their death.

The herd in the Yellowstone Park, numbering probably four hundred, is the largest one known to exist in the wild state, and through careful protection these may be preserved for an indefinite time, although a part of them have recently been transferred to the national zoo at Washington, where they are better protected from the hunter's bullet than in their northwestern home.

But while the buffaloes have become nearly extinct on the Western ranges, there are quite a number of domesticated herds in this country, and experiments in cross breeding them with common cattle are being pursued with fair success. The first attempts to cross breed the buffaloes were made at Lexington, Kentucky, in 1815; but the existence of enormous herds of the wild animals on the plains at that time acted as a damper upon the enthusiasm of the early pioneers, and the work was soon abandoned. At that early date a buffalo robe commanded very little money, and, in fact, up to 1875 a bull robe was worth only $1. In 1883 robes had advanced so that a good one would net the hunter $3, while to-day the hide of a buffalo is worth $100, and the mounted head of a bull anywhere from $200 to $500.

The incentive to raise and domesticate the buffalo is thus much greater than in 1815, and the few herds that are in existence are highly valued by their owners. There is a small herd in the Texas Pan Handle, numbering less than seventy-five, and a larger one at Ravalli, Montana, owned by Mr. Charles Allard, numbering nearly two hundred. This latter herd is the largest owned by any private individual. In 1893 the Jones herd, of Omaha, was purchased by Mr. Allard for $18,000, and the thirty-one animals in it were transferred to the Montana ranch and joined with the others.

Besides breeding the pure buffaloes for museums and other stock farms, Mr. Allard has carried on extensive experiments in crossing the wild animals with the polled Angus stock. The cross breeds produced are magnificent animals, with fur that is finer and closer than that of the buffalo, and with meat that is very sweet and wholesome. Nearly all of the cross-bred animals retain much of the instinct of their wild progenitors. They are hardy and easily reared, and are able to stand storms that kill ordinary cattle.

Nature adapted the buffalo to the cold Northwestern plains, and they rarely succumbed to the blizzards that to-day destroy our domesticated cattle by the thousands. When the snow lies deep upon the ground in the dead of winter, the steers cannot paw through it to get at the natural hay of the plains, and they consequently die of starvation and cold. The buffaloes, accustomed to the fearful blizzards, bunch together in a storm and form a wedge, facing the wind and snow, with the bulls outside and the cows and calves protected inside of the formidable line of shaggy heads. Thus a herd survives the wildest storm, and when the snow has ceased to fall they paw through the snow and ice and get at their favorite buffalo grass.

The cattle, on the contrary, are driven before the storm, and often wander from sixty to one hundred miles from their accustomed range, and, unless shelter is provided, they soon sink down exhausted. The horses turn their backs to the storm and likewise soon yield to the cold. The new cross breeds, possessing many of the hardy instincts of their wild progenitors, face the cold storms, and seem to survive the coldest blizzard without great injury to their health. They have been found to be almost as well adapted to occupy the vast plains as their wild ancestors, and if they do not degenerate under too close inbreeding, they may yet roam in as countless numbers as the buffaloes did before the ruthless slaughter of the hunters decimated their numbers.

There are many hunters living to-day in the West who killed from two to three thousand buffaloes a year, and during a period of ten years or more they pursued their deadly slaughter with fearful persistence. It seems like a fairy story to recall the scenes of destruction that were enacted in the seventies. When the Union Pacific, Atchison, Topeka and Santa Fe, and Southern Pacific were completed the demand for buffalo robes suddenly began, and the wholesale slaughter of the American bison entered upon its unprecedented career. Up to this time the wild animals were killed by the thousands by the old Indian method of "running," but this was nothing compared to the "still hunt" that succeeded it. There was a spice of danger in the old method that made it sportsmanlike, and rough and ready riders entered it as much for the pleasure of the chase as for the trophies. The buffalo horses were trained to run alongside of a big bull, and at short range the hunter would spear, lasso, or shoot the animal under conditions peculiarly exciting and dangerous.

The "pot hunter," however, provided with the new long range repeating rifles, approached within several hundred yards of a herd, and concealing himself from view, he deliberately shot down the leader. The frightened buffaloes then, instead of scampering away, gathered around their fallen leader, and acted like sheep in a snow storm, while the successive "pops" of the hunter's rifle dropped one after another. If another bull should assume the leadership of the startled herd, he was marked out as the next target for the hunter's rifle. Scores, and even a hundred or more, of buffaloes were killed in this way before the herd finally scampered away across the plains. One hunter confessed to having killed sixty-three animals in less than one hour, and Col. Dodge once counted one hundred and thirteen dead buffaloes inside a semicircle of two hundred yards, all the work of one man in forty-five minutes.

In 1870 there were millions of buffaloes on the plains, and the rate of extermination amounted to over half a million a year. The pot hunter received $1 for each robe, and for this paltry sum he killed the animals by the thousands and left their carcasses bleaching on the plains. The Union Pacific Railroad cut the great herd on the plains in two, and after that they were known as the northern and southern herds. The southern herd in 1871 was estimated to number over four million animals, while the northern herd was considerably smaller, covering a more restricted territory, and moving rapidly away from the vicinity of the railroads.

When the Atchison, Topeka and Santa Fe Railroad was completed, the rush to the plains to kill buffaloes was almost as large and exciting as the famous travel to the California mines in the fifties. Thousands of Eastern hunters joined the throng, and the wanton killing of the southern herd proceeded at a rate never before witnessed in this or any other country. In 1873 one railroad carried from the plains 250,000 robes, 2,000,000 pounds of meat, and 300,000 pounds of bones. Two years later this vast southern herd was practically exterminated, and with the exception of a few thousand that escaped below the Pecos River, there was none left of the four millions which roamed the plains in 1870.

The northern herd escaped destruction so early on account of the lack of facilities to reach their grazing grounds. Isolated hunters continued to worry them, and to kill off a few thousands each year, but it was so expensive to get the robes to market that there was little incentive to wanton destruction. In 1882 the Northern Pacific Railroad furnished the transportation facilities needed, and then the rush began to the region between the valley of the Platte and the Great Slave Lake. The hide hunters were on the scene early, and as robes had advanced to $3 apiece, the opportunities for making more money were good. In a short time a cordon of hunters' camps practically surrounded the herd on every side, so that it was impossible for any of the beasts to escape. Fully ten thousand hunters were in the field, and those on one side drove the frightened buffaloes toward the camps of those on the opposite sides. Back and forth the animals were hunted, running directly into the muzzles of thousands of repeating rifles whichever way they turned.

The last of the immense herd, numbering about seventy-five thousand, crossed the Yellowstone a few miles from Fort Keogh, in 1883, bound for the Dominion of Canada; but a host of pot hunters were at their heels, and not more than five thousand of them ever crossed into British territory. A smaller part of the herd was located between the Black Hills and Bismarck in 1883, numbering about ten thousand early in the season, but by October their numbers had been cut down to twelve hundred. In that month Sitting Bull's Indians arrived at Standing Rock Agency, and a grand rush was made for the remnant of the noble band. The slaughter was so intense that in two days there was not a hoof left.

This was practically the last grand slaughter of the American buffalo. Hunters passed over in the Dominion of Canada, confident that great numbers had crossed the border, but they were disappointed in their expectations. Years passed, and no one had discovered any remnant of the vast northern herd. Here and there a dozen or two would be found roaming over the wildest portion of the West, and these were corraled by men who appreciated the value of the animals, and they became the founders of the present domesticated herds.

The American buffalo hunter has disappeared with the noble animal that he so wantonly slaughtered, and it is to be hoped that he will never again have occasion to practice his art in such a senseless crusade of destruction.

The story of the buffalo should end with the extermination of the northern herd in 1883, but under wise protection and fostering care it may be that another chapter is still to be written. The domesticated herds, meager though in numbers compared with those that once roamed the treeless Western plains, may yet become the founders of a stock that shall cover the vast, desolate stretches of territory which nature intended for them, redeeming the region from its present barren and profitless condition.

A small herd of twenty buffaloes is owned by the Island Improvement Company, and kept on Antelope Island, in the midst of the Great Salt Lake, where the animals have been grazing for three years in a semi-wild state. The island is thirty miles long and six miles wide, furnishing the animals with an ideal home where they are not interfered with by any one. The grasses on the island are rich and luxuriant, the natural watering places numerous, and the configuration of the surface rough and varied enough to suit the desires of the buffaloes. The animals seem to do well there, and during the present year four calves were born.

Census of the Unemployed in America.

A special report on the statistics of occupations has been made by Carroll D. Wright, of the Census Bureau, which throws some light upon the number of the unemployed in the country during an ordinarily prosperous year. The report shows that "There were 22,735,661 persons ten years of age and over who were engaged in gainful occupations in 1890, of whom 18,821,090 were males and 3,914,571 were females, and that of these 3,013,117 males and 510,613 females, or a total of 3,523,730 persons, were unemployed at their principal occupations during some part of the census year ending May 31, 1890. Of the whole number of persons so unemployed, 1,818,865 were unemployed from one to three months, 1,368,418 from four to six months, and 336,447 from seven to twelve months, which is equivalent to, approximately, 1,139,672 persons unemployed at their principal occupations for the entire twelve months, and this number would represent 5·01 per cent of the total number of persons engaged in gainful occupations in 1890. Divided as to sex, the approximate number of males unemployed at their principal occupation for the entire census year was 972,000, representing 5·16 per cent of the whole number of males at work, while the approximate number of females unemployed at their principal occupation during the same period was 167,672, representing 4·28 per cent of the whole number of females at work."

Movement of Nicaraguan Trade.

IMPORTS.

	1889.	1892.	1895.
From the United States	$141,385	$135,357	$79,033
Germany	8.769	15,536	36,645
Great Britain	42,197	32,739	36,252
France	13,207	5,434	7,183

EXPORTS.

	1892.	1895.
To the United States	$426,035	$214,404
Germany	20,102	203,202
Great Britain	114,673	52,881
France	15,492	31,010

The United States still occupy the first position among the nations with which Nicaragua trades, but Germany has made great gains, while the others have been losing, with the exception of France, who has doubled her imports from Nicaragua in three years.—Uhland's Wochenschrift.

THE TIMBER DRY DOCKS AT THE BROOKLYN NAVY YARD.

As we go to press the last few yards of excavation are being taken out preparatory to opening the great timber dry dock at the Brooklyn Navy Yard, known as No. 3, to the river, and by the time this issue is in the hands of our readers the dock will be completed and ready for the entrance of warships. In its general construction it is similar to No. 2, a timber dock lying parallel with it which was opened a few years ago; but its capacity, as will be seen from the accompanying table, is considerably greater.

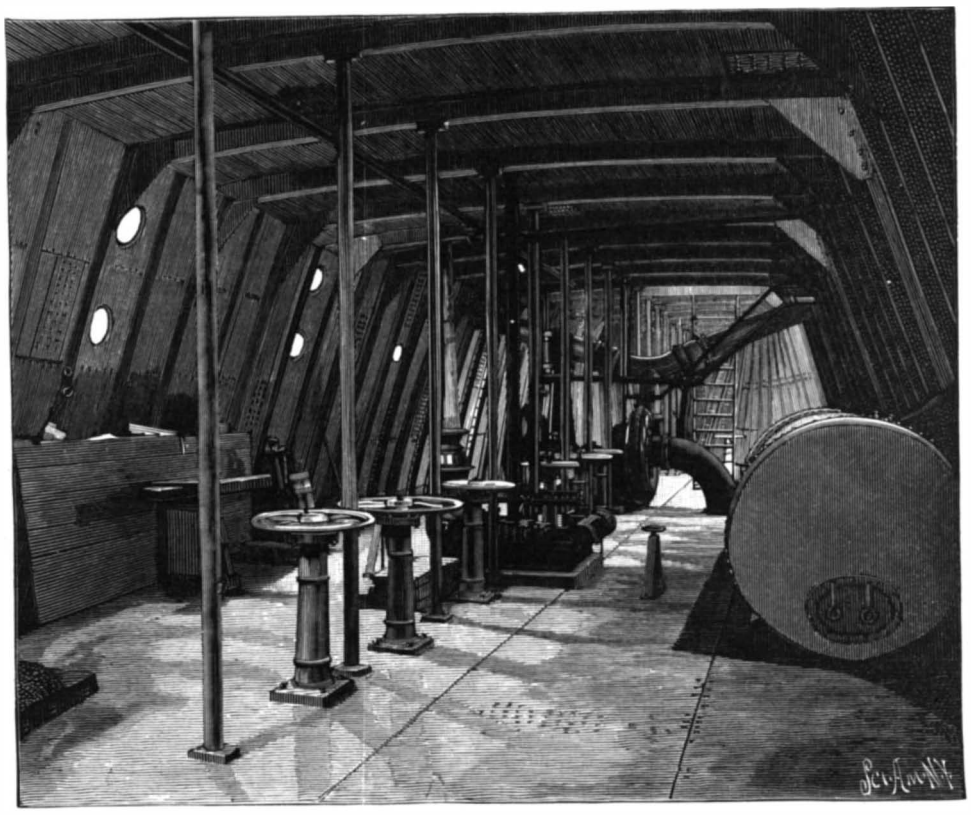
	Length on Coping.	Breadth on Coping.	Depth of Water on Sill.	Material.
Dry dock No. 2.....	500 ft.	130 ft.	25½ ft.	Timber
Dry dock No. 3.....	670 ft.	151 ft.	29 ft.	"

In some of its dimensions the new dock is the largest of its kind in the United States, its nearest competitor being the great Port Orchard dry dock on Puget Sound, an illustrated description of which appeared in the SCIENTIFIC AMERICAN of October 3, 1896. The latter dock is 5 feet longer and has 1 foot greater depth of water on the sill, but it is not so wide. These two docks are among the largest in the world, and they are likely to meet all the needs of our navy and merchant marine for many years to come. The use of timber for dry dock construction is comparatively modern, all the earlier docks having been built of stone. The first timber docks in the United States were constructed over forty years ago, and experience has shown that they are thoroughly reliable. It is true that in those waters which are infested with the teredo the entrances are liable to be eaten away; but the difficulty can be overcome by building these parts of masonry or concrete. There are advantages of increased light and working space in a timber dock, due to the easier slope of the side walls; but the main advantage lies in the rapidity with which it can be constructed and the fact that it is much cheaper to build. This is shown by a comparison of this dock with the stone dry dock at Mare Island, San Francisco. The new dock will have cost about $600,000, whereas the stone dock at Mare Island cost about $3,000,000 complete, although it is over 140 feet shorter and the depth and width are smaller in proportion.

The illustrations which accompany this article will give a clear impression of the construction of these dry docks and the manner in which a warship is carried upon the keel blocks and shored up by struts which rest upon the altars and are wedged snugly against the hull. One of the views shows the cruiser Columbia entering dock No. 2, the caisson gate having been floated away from the entrance, as will be explained later. Two other cuts show a bow and stern view of the same ship in the dock after the water has been pumped out. It will be remembered that the Columbia and her sister ship the Minneapolis are the two fastest cruisers of their size (7,475 tons) afloat to-day, the former having a record of 22·8 knots per hour and the latter having slightly over 23 knots to her credit. They are also remarkable for their arrangement of triple screws. It only requires a glance at the long, easy sweep of the lines of this ship as shown in the illustration, remembering the fact that within her hull are engines and boilers of 21,500 horse power, to understand how this phenomenal speed was maintained on a four hours' trial.

Before entering into the detailed description of the new dock No. 3, it will be well to refer to the sensational rumors which have appeared in the daily press to the effect that the dock is several inches shallower on the sill and shorter in total length than the contract calls for. If the dock is a few inches short in a length of nearly seven hundred feet, it is a small matter; but if the available depth of water on the sill is four inches less than was designed, it is a matter of most serious moment. By reference to the two drawings showing the work as first designed and as now built, it will be seen that it was at first intended to have a depth of 29 feet 4 inches over the outer sill and 28 feet over the inner sill. Before the contract was let it was decided that the 12 by 16 inch timber which forms the outer edge of the sill and takes the thrust of the caisson gate was not deep enough, and its depth was increased to 16 inches. The difference—4 inches—was deducted from the total depth, leaving it 29 feet in place of 29 feet 4 inches.

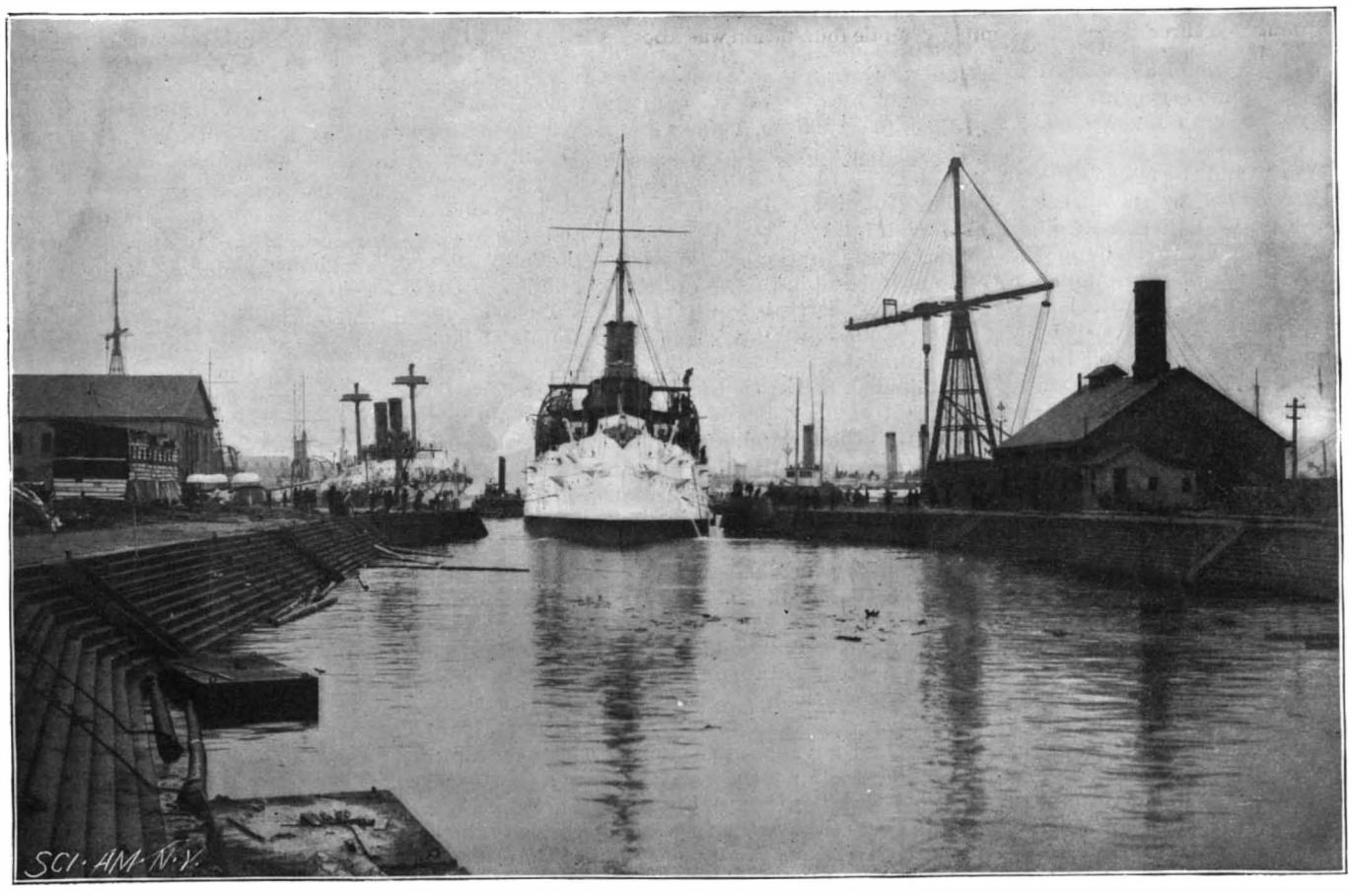
This change did not affect the capacity of the entrance, as this was determined by the inner sill, which was now one foot higher than the outer sill. It was subsequently arranged to lower the inner sill one foot, as shown in the plan, thereby giving a clear depth over both sills of 29 feet, or one foot more instead of four inches less than the original design. The value of this additional foot of depth is incalculable. It would mean that in time of war a crippled and sinking ship would have just that much better chance of crawling into dock before she sank. It is true the present sills are one foot lower than the top keel blocks; but these could be removed and working space could be obtained by taking up the planking on the floor of the dock—an expedient which could easily be carried out and would give 15 inches more head room. As regards the shortage of 20 inches in the length, it may be said that since the work was begun the dock has been lengthened 70 feet and has been moved bodily inshore 64 feet. The piling upon which the structure is built is spaced 4 feet apart longitudinally. The present difference in length is caused by the fact that, when the dock was lengthened, it was built to an even multiple of 4 feet.



DRY DOCK NO. 3 AT THE BROOKLYN NAVY YARD—INTERIOR OF CAISSON.

The plan of the dock approximates to the form of a ship, the sides tapering toward the ends and sloping toward the floor. The inner end is formed by a transverse wall which has the same slope as the side walls and the outer end is closed by a hollow steel caisson of a general boatlike form, whose keel and stems conform exactly to the cross section of the dock entrance and fit against a bottom sill and side abutments, a watertight joint being secured by means of a rubber gasket. The problem in building such a dock is to provide a deep, watertight basin which shall be able to withstand the pressure of the water when it is full, and to carry the concentrated weight of the ship and prevent seepage of water from without when it is empty.

The floor of the dock, which is 626 feet 8 inches long by 64 feet 4 inches wide, is carried upon 12 inch spruce piles 45 to 50 feet long. They are spaced 4 feet between centers except beneath the keelway, where eight piles are driven close together to take the enormous weight which is concentrated on the keel of the ship. After the piles had been cut off to the same level they were capped with 12 × 12 inch longitudinal timbers, drift-bolted to the piles, and above these over each row of piles are lateral timbers extending across the full width of the floor. Above this is laid the floor of 3 inch planking. To render the floor watertight a complete bed of concrete 4 feet thick is laid beneath it, its surface being level with the top of the longitudinal piles. Within the concrete is formed a system of drains leading to the pump well. To render the floor thoroughly secure against leakage, a complete wall of sheet piling formed of 8 × 12 timbers, tongued and grooved, was driven entirely around the outer edge of the floor. This extends 35 feet below the floor level, and the concrete beneath the floor is finished off carefully against it. The sloping side walls are carried upon brace piles which are driven 6½ feet from center to center laterally, and 4 feet between centers longitudinally. Securely notched and drifted to these are the sloping timbers forming the altar supports, which butt at their lower end against the transverse floor timbers before mentioned. Directly upon these are bolted the 8 × 13 inch stringers which form the "altars," as the steps of the side walls are termed. To prevent leakage through the side walls, over 3 feet of puddled clay are carefully tamped in around the piles and up to the underside of the altars. Back of the coping there are driven five rows



THE CRUISER COLUMBIA ENTERING DRY DOCK NO. 2 AT THE BROOKLYN NAVY YARD.

of coping piles, and 26 feet back from the coping of the side walls is driven a second wall of sheet piling. This extends 50 feet below grade, and completely encircles the dock, the bottom edge of this outer wall being 15 feet below the dock floor. This is done to prevent seepage of water through the side walls, and it is assisted in this by several transverse walls of sheet piling.

That this work has been well done is proved by the fact that the leakage into the dock was only 3 inches in twenty-four hours. This leakage was due to the fact that the trench for the suction pipe was open for alterations, and when this trench is closed the dock will be perfectly dry.

The methods adopted by the contractors, T. & A. Walsh, of New York, in excavating this great dock were entirely novel, and are of considerable interest. Excavation was begun at the inshore end, and the work of excavating and pile driving was carried out in sections. As each section was being excavated it was inclosed by sheet piling and flooded with water. This enabled floating pile drivers and excavators to be used, and the trouble and expense of continually shifting the land pile drivers avoided. After a section had been excavated and the piles driven, it was pumped out and finished off, the plant being moved to a new section.

The steel caisson which forms the gate to the dock is of special interest. It is the largest in the world, exceeding that at the entrance to Puget Sound dock. It is shaped like a double-ended boat, its length on deck being 108 feet 8 inches; depth, keel to deck, 35 feet 4 inches; length on keel, 71 feet 1½ inches; and greatest breadth, 25 feet. The keel is 24 inches wide by 17 inches deep, and on each side of it and on each side of stems are strips of plank, to which are fastened rubber gaskets 1½ inches thick by 6 inches wide. These bear against the side abutments and the bottom sill, and under the enormous pressure of the water make a tight joint. The framing consists of 4 × 4 inch angles, spaced 2 feet apart, and the plating varies from ¾ inch at the garboards to ⅜ inch at the sheer strake.

The caisson is strengthened by longitudinal stringers from 20 to 24 inches deep, which are riveted to the frames. Twelve feet above the keel is the lower deck, which consists of 8 inch deck beams, riveted to every other frame, and tied together by longitudinal stringers of ⅝ by 24 inch plate. Each beam is tied to the bottom framing by three 3 inch stanchions. Twelve feet above the lower deck is the main deck, which is the one shown in our accompanying view of the interior of the caisson. It is covered with plating ½ inch and ⅝ inch thick. Above this is a top deck of wood, which is level with the coping of the dock.

In the bottom are placed 200 tons of concrete ballast, to give the caisson stability when it is floated away from the abutments. The space below the main deck is utilized for water ballast which is taken in for regultaing the draught. Water is admitted by two 16 inch gate valves, one at each end of the caisson, and it is removed by the 12 inch centrifugal pump seen in the engraving of the interior. The donkey engine in the center of the deck operates a capstan on the upper deck which serves for warping the gate into position.

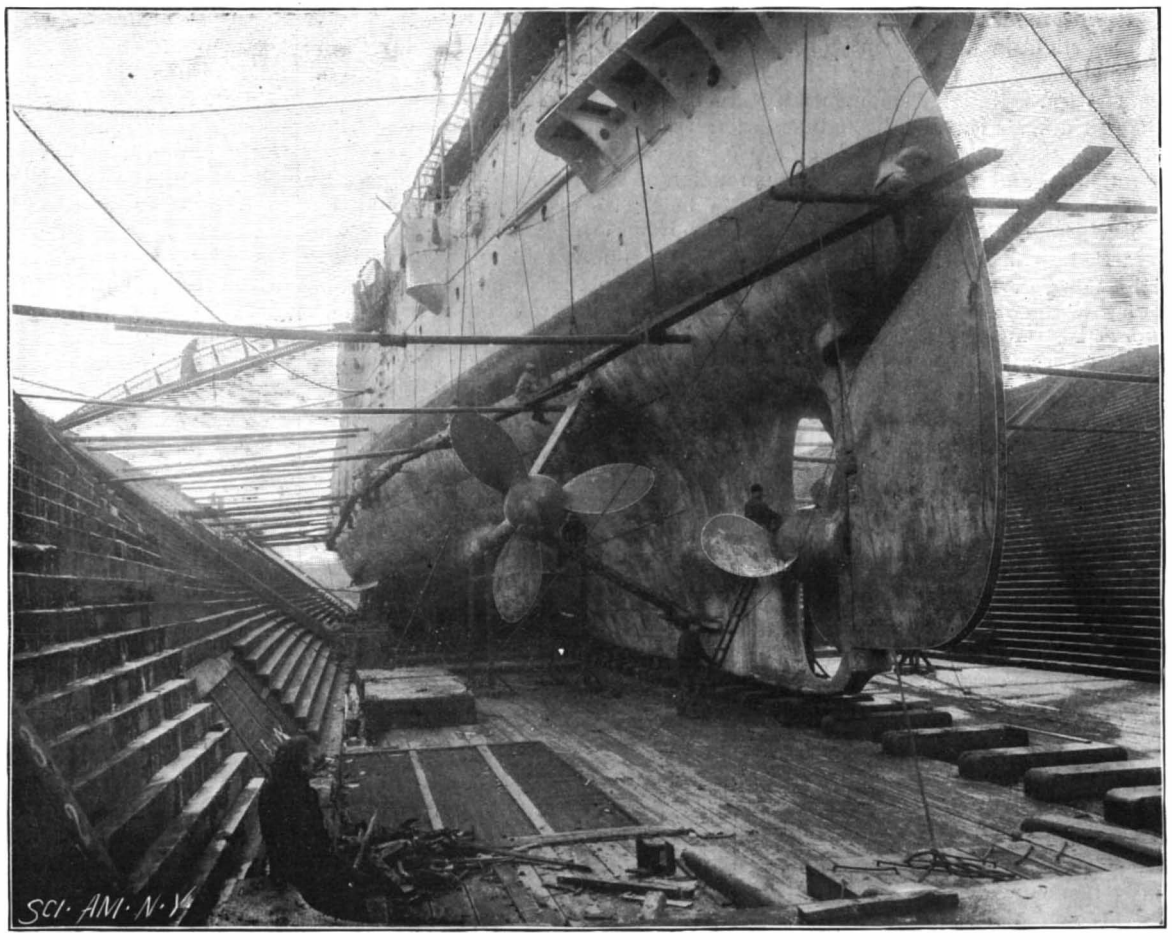
Arranged down the center of the deck are twelve hand wheels which operate as many large gate valves for admitting water to the dock when a vessel is ready to leave. The valves are placed midway in a dozen pipes, which pass clear through the caisson. They are in two rows, the lower pipes being 24 inches and the upper row 20 inches in diameter. The large tank seen in the foreground holds 20,000 gallons of fresh water for the boiler, which is located on the main deck. The caisson was built by T. S. Marvel & Company, of Newburg, N. Y.

The pumping machinery for emptying the dock is located in a building near the dock entrance. It was put in when dock No. 2 was built and will now be doing double duty. It consists of two 42 inch centrifugal pumps driven by two vertical engines with cylinders 28 inch diameter by 24 inch stroke. The plant was built by the Southwark Foundry and Machine Company, of Philadelphia, and the pumps have shown a service capacity of 95,000 gallons per minute. There is also a 15 inch pump with a capacity of 7,000 gallons per minute for drainage.

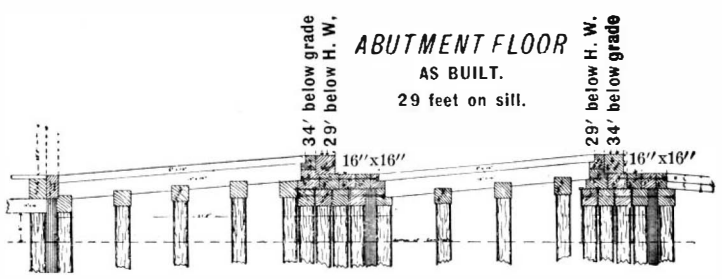
The figures of the total quantities are necessarily large for a dock of this size. They are as follows:

Twelve inch spruce piles	18,000
Twelve inch oak piles	290
Yellow pine timber	2,893,446 B. M.
White pine timber	115,000 "
Oak timber	128,000 "
Screw bolts and drift bolts	657,000 pounds.
Cast iron suction pipe	290,000 "
Barrels of cement	8,600

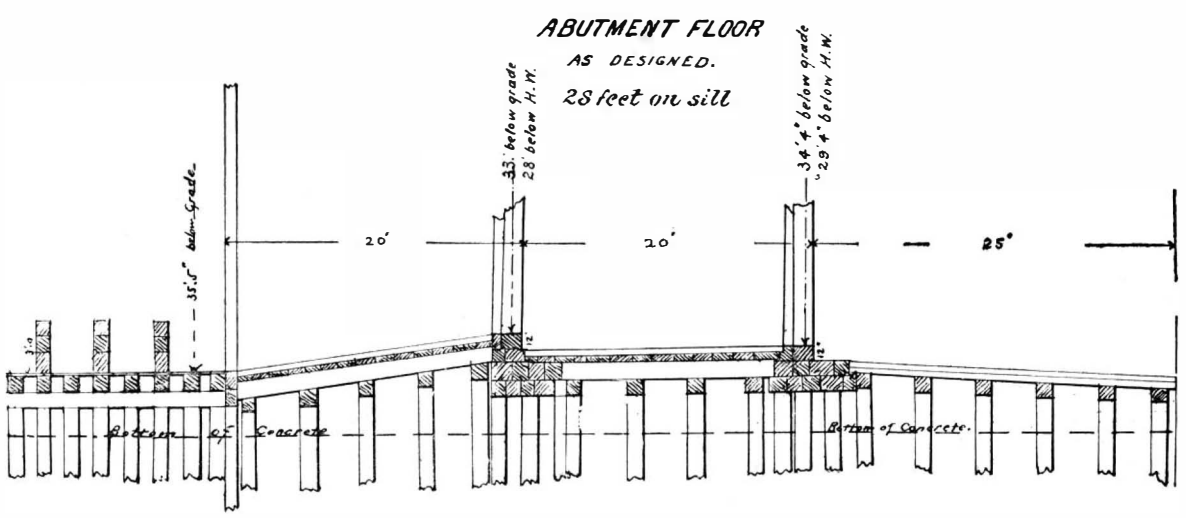
The total cost of the dock including the track around the coping and pile foundation was about $600,000. We are indebted for our particulars to the courtesy of Mr. C. M. Bird, the engineer for the contractors.



CRUISER COLUMBIA IN DRY DOCK NO. 2, BROOKLYN NAVY YARD, SHOWING THE ARRANGEMENT OF TRIPLE SCREWS.



CROSS SECTION OF DOCK ENTRANCE AS BUILT.



CROSS SECTION OF DOCK ENTRANCE AS DESIGNED.

A Rope from the Ocean.

The largest marine plant, and probably one of the highest plants known on this globe, is a gigantic seaweed, the nereocystis, the stem of which has been found to grow as much as 300 feet long, says the Mining and Scientific Press. It was first discovered not far from the Alaskan coast, but has since been found floating in various parts of the Pacific Ocean along the American and Asiatic shores. This seaweed grows in a very curious manner. Large quantities of it are found at a little distance from shore, and at depths not exceeding 300 feet. On loamy bottom large thickets of this plant take root, and a stem of the thickness of ordinary cord grows upward. At its top there is a pear-shaped balloon, which grows with the stem, and when it reaches the surface of the water it often measures 6 feet and more in length, with a diameter of 4 feet 6 inches. This balloon has, of course, an upward tendency, and keeps the stem growing until it floats on the surface of the water. From the top of this balloon a large tuft of strong, thick, spade-like leaves grows out, which originally are not more than 2 feet long, and which grow and split until from the balloon a rose-like growth of from 50 to 65 feet in diameter covers the water. This gigantic weed grows in such quantities that near the shore large meadow-like islands are formed, which impede navigation. The natives of the Aleutian Islands make manifold usage of this plant. From the strong dried stems they make rope 250 feet and more long, while balloons of this weed furnish them with large vessels after they are dried, the smaller ones being used in their boats to bail out water. The long leaves, after being dried, are cut into narrow strips and used for wickerwork, the making of baskets and similar furniture.

Minerals in Servia.

According to the Revue d'Orient, Servia is rich in mineral products. Gold is found in a pure state in the beds of some rivers. such as Thenarcka, Pek, Timok, Rasina and Poustarek, streams in the neighborhood of Pirot. All the mineral districts of Servia contain silver in a greater or less proportion, in lead, arsenic, manganese, zinc and copper. Quicksilver is found chiefly in quartz and serpentine, the chief vein being near the village of Ripany. There is a little copper almost everywhere, but chiefly near Pojarevatz and Valievo. The antimony is good, and is found in the provinces of Belgrade and Valievo. Zinc exists in all the mineral districts most frequently mixed with sulphur. Nickel is also found, but in small quantities, mixed with quicksilver. Chrome has been discovered in serpentine, and the government works a mine of iron chrome near Valievo, of which great things are predicted. Coal is met with in nearly all tertiary formations of the kingdom, and all the Servian coal fields have by no means been yet explored; there are very few parts where researches have not brought new beds to light. Hitherto the best coal has been found at Verkachanka, between the Pek and the Timok. This is coal of excellent quality, in seams four to sixteen meters thick. The mine is connected with the Danube by a railway.

A MEMORIAL statue to Dr. Parke, who was the surgeon of Stanley's expedition in Africa, has been erected at the south side of Leinster Lawn in Dublin.

A NEW HOUSE BICYCLE.

Is the use of the bicycle, which is now so general, an excellent thing, as some people claim? Or must we see therein a deplorable habit capable of distorting the limbs and spine of children through a vicious attitude, and of causing in woman certain local symptoms of a serious nature, due in great part to the incessant vibration that occurs even in the most perfect machines? Our conclusion will be brief. The healthiest exercise becomes injurious and dangerous by abuse. Open air sports are the dispensers of health, but on the essential condition that they be practiced with moderation. Muscular exercise carried to a feeling of slight lassitude in a healthy man quickens the elimination of the special toxines due to cerebral superactivity. Rational cycling, like hunting and horseback riding, is thus a genuine repose for men who lead a sedentary life. It excites the general phenomena of nutrition and quickens the destructive assimilation and consequently the incessant repair of our cells. It is entirely different with jading. Muscular exercise carried to fatigue is dangerous and injurious to the highest degree. In fact, jading causes such a hyperproduction of the toxic properties of destructive assimilation that the organic poisons accumulate, since the normal excretions are powerless to throw them off.

The intelligence of the jaded becomes enfeebled in the long run, the individuality disappears, and the man, trained in every sense of the word, is no longer anything but a machine, worthy of but little interest at an epoch in which machines and electricity are loading us down with so many wonderful instruments.

We can therefore counsel the use of the bicycle with moderation only, and to a degree in which it is a relaxation to a man who is habitually submitted to assiduous cerebral work. Woman will also derive benefit from such exercise if she does not allow herself to be trained for contests of speed and records of distance, which she will very quickly pay for with her beauty, shape and health. Rational and methodical cycling is likewise a great pleasure to many men of a certain age.

It permits them to maintain the dexterity and vigor of their muscles and the liberty of their joints.

Bicycle exercise has naturally led manufacturers to get up house apparatus analogous to home gymnastic apparatus, but provided with pedals and the same saddle that is used on the bicycle.

How fortunate it is that racers have the power of training themselves at home, and, at the foot of their bed, to pedal from 30 to 60 miles, to climb ascents and to exercise their muscles by means of a brake. It was with this object in view that was constructed, after other apparatus now abandoned, the veloroom, which a few years ago was presented as the type of the house bicycle. This is an excellent training apparatus; but is it adapted to the sick, to convalescents, to weak persons, to rheumatics, and to the gouty, whose joints are swollen and painful for weeks at a time? Experiment very quickly answered this question. The use of this apparatus, which necessitates a real muscular stress, could not be tolerated by the very susceptible tissues of the gouty, scarcely ever an acute attack. It was after personally experiencing the grave inconveniences of an exaggerated exercise, in the course of a convalescence from an attack of rheumatism, and after trying upon himself the advantages and disadvantages of the veloroom, that a person of great intelligence soon found that every effort, however slight, occasioned a return of his articular pains—a real aggravation.

The motion itself seemed to be beneficial, but the stress necessary to put the apparatus in action could not be tolerated for more than a minute or two. Was it not possible to devise a home apparatus that should be truly practical and capable of taking the place of those wonderful Swedish gymnastic apparatus that every one may see at the Imperial Baths of Carlsbad? The new apparatus that we have just examined, and that is constructed by the person just alluded to, is a great improvement upon everything that has been devised up to the present for the same purpose. It is simple, inexpensive, demands no appreciable expenditure of muscular strength from convalescents, and permits those who wish to get rid of fat to take a sweat or a daily spin with windows wide open. This machine, called by its inventor the "Hygienique," is therefore in every respect a medical apparatus that does away with all danger of jading.

But what makes it perfect is, before all else, its extreme simplicity. The Hygienique, in fact, is composed essentially of a saddle of variable shape and height and of sprockets connected by a chain with a double crank carrying a brake. Its rolling should be perfect. Such is the apparatus which permits any one, well or convalescent, to pedal at home without any effort and without fatigue if he desires to take a little exercise in bad weather, or else to give motion to joints made stiff by a recent attack of gout or rheumatism. The return of strength and mobility soon permits of increasing the length of the exercise and, through the motion of the arms and legs, of obtaining a moderate and salutary sweat.

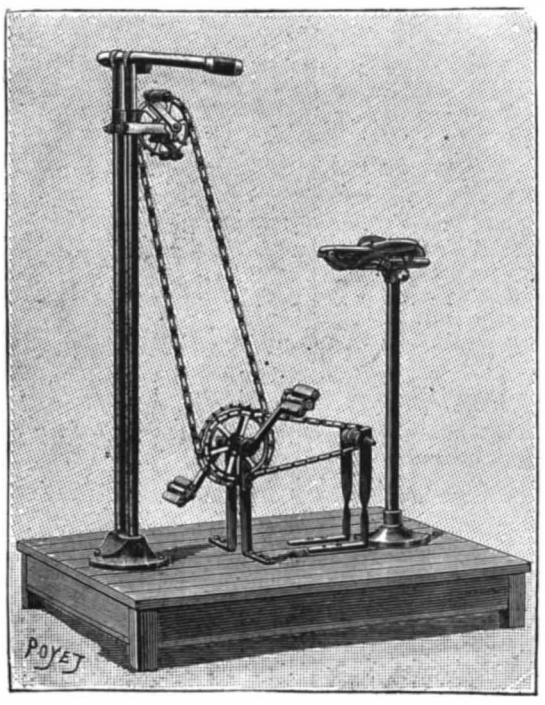
The hands that hold the double crank can, in fact, either simply follow the motion of the feet or cause the motion thereof, the legs remaining passive, or else obtain a great muscular output from the latter through a contrary stress.

This apparatus is therefore destined to render the greatest services to those who may have need of a moderate daily exercise.

What is there better for reducing flesh, if it is impossible to take a spin every day after a meal, than to pedal for a half hour or an hour at home without excessive fatigue and protected against rain and snow? Open the window, and you will be in the open air. A gouty or a rheumatic person can thus, every day in the year, take all the exercise that is necessary to keep his momentarily anchylosed joints in condition, and through sudation prevent a recurrence of those acute crises that are so justly dreaded.

The common action of the arms and legs permits an active person, in being his own brake, to proportion the strength that he wishes to exert. Even those who wish to combat obesity ought to know by experience how injurious jading is to them, and what profit, on the contrary, they can derive from a regular regimen and a daily muscular exercise after every meal.

The apparatus just described permits any one to effect, at home and in bad weather, such cures as are



A NEW HOUSE BICYCLE.

usually due to out of door exercise. We therefore believe it destined to give physical vigor and youth to a host of persons of all ages.—La Nature.

NOTES AND SKETCHES AT THE ANNUAL BICYCLE SHOW, NEW YORK CITY.

Riders of the wheel whose experience dates back to the early eighties will remember that the first ball bearings were provided with an annular separator which prevented contact between adjoining balls. In course of time this device was discarded, and the races were filled up with balls whose adjacent surfaces were free to touch one another. This contact, unlike that between the balls and the cones, is not a rolling but a rubbing contact, the adjacent surfaces of the balls moving in contrary directions, and it must develop a certain amount of friction, which will increase in proportion to the pressure upon the bearing. In a few of the machines at the show the old time separator has made its appearance. The Sartus hub, shown by G. E. Strauss, of New York City, is provided with a retainer which rotates with the balls and keeps them from frictional contact. The Comet cycles are fitted throughout with a three-ball bearing, shown in Fig. 1, which is provided with a separator, the pockets being equidistant around its periphery. The separation of the balls, however, is not the chief point aimed at in this construction. Mr. F. L. Howe, the inventor, claims that just three balls are necessary to give an even distribution of pressure at all periods of the revolution, and that this will be secured, even if the balls vary in size. The bearing is designed broadly upon the principle by which a three-legged stool will take a stable bearing when one with four legs will not. The machine fitted with these bearings appears to run with remarkable smoothness and silence.

A notable device for reducing friction in the bearings is that adopted by the manufacturers of the Racycle machine, Fig. 6, who seek to lessen the pressure upon the crank-hanger balls by placing the bearings outside the sprocket and about the same distance apart as the crank centers. In the Racycle the bearings are 3¼ inches apart as against about 2⅛ inches in the other machines. The increased width is obtained by enlarging and dishing out the hubs of the cranks and extending the barrel of the crank hanger within them. It is claimed that on the principles of the lever the pressure transmitted to the bearings through the joint action of the cranks and the sprocket is less the farther the bearings are removed from the center of the crank hanger. The increased distance between the bearings enables a narrow tread to be used, and the Miami Cycle and Manufacturing Company, of Middletown, Ohio, show a Racycle machine with the exceptionally narrow tread of 3⅝ inches.

A fine exhibit of non-splitable built-up rims is shown by the Keene Wood Rim Company. The rim, Figs. 2 and 3, is built up of five layers of wood. The two outer layers and the center layer have their grain running in the length of the rim, and the grain of the two intermediate layers runs across the rim, the whole material being specially prepared so that it will absorb the glue freely and form a thoroughly compact piece. The alternation in the direction of the grain serves effectually to prevent warping and splitting, and the value of the device is shown by several short lengths of rim which are exhibited with half a dozen six inch wire nails driven through them an inch apart. The outer and inner layers are usually of rock elm, with maple or birch for the inside longitudinal layer, and the two crosswise layers are of walnut or birch. The tendency of the upsetting is to cause the ends of the joint to open, and to prevent this the form of joint shown in the cut is adopted. A diagonal saw tooth lap joint is made, and each tooth is curved in cross section to give a more intimate overlapping of the fibers. It is cut by special machinery, and the work is so perfectly done that when the ends are brought together and glued the point of contact is scarcely discernible. The design and workmanship are admirable and will commend themselves to the practical mechanic. The makers are old established furniture manufacturers and their experience has been used in turning out one of the most useful exhibits in this year's show.

A pneumatic whistle, Fig. 5, the invention of a locomotive engineer, is shown attached to the head of a bicycle. A small roller provided with an upwardly projecting connecting rod is pivotally attached by means of a short lever to the crown of the front forks of a bicycle just above the tire. The roller is carried at the end of a vertical rod, and, when not in use, is held out of contact by a coil spring. Attached to the rod is a single acting air cylinder containing a plunger which is worked by the connecting rod above mentioned. The device is operated by pressing upon the button at the top of the rod, thereby forcing the roller in contact with the front tire, when the air is forced through the curved pipe and down through the whistle, which is of the ordinary steam whistle type. By varying the pressure the note may be made intermittent or loud and continuous. It is shown by the Leibe, Hall & Droege Company, of Newark, New Jersey.

The Circle Cycle Company, of New York, shows the greatest novelty in frames, the diamond being replaced by a complete circle of tubing, Fig. 7. The method of making the joints is peculiar, and it is claimed that a stronger and more reliable construction is secured than is possible with the common drop forgings and brazed joints. The ends of the tubing are brought together and the larger tube of the joint piece is slipped over it and double pinned. Plugs are inserted each side of the joint and a molten aluminum alloy is run in. The connections with the head, post, and crank hanger are made of the same alloy, and it is claimed that a lighter and specially strong and tough frame is the result, the ladies' wheel for the road weighing only 21 pounds.

The Saturnalia bicycle, Fig. 10, shown by Crittenden & Rollo, New York, is provided with an interchangeable gear in the form of four sprockets—two on the crank axle and two on the rear axle. The larger sprocket on the crank axle is in alignment with the smaller sprocket on the rear axle and vice versa. To change the gear the chain is shifted from one pair of sprockets to the other, the change being made, of course, when the machine is at rest.

Electricity is brought into the service of the wheelman by the Acme Electric Light Company, which shows a compact and beautifully finished electric lamp, Fig. 4, which is claimed to be the only absolutely dry battery lamp of its kind. The body of the lamp contains a charge of four cells, sufficient to run the lamp for from 10 to 14 hours. The recharge of four cells is put up in a cardboard case, and can be slipped bodily into the lamp when the other is withdrawn. Attached to the front face of the body is a cornucopia reflector, into the base of which is screwed the small incandescent bulb, connection with the battery being made when the bulb is screwed home. The front of the reflector is closed by a hinged glass; the effective power of the light and reflector is rated at three candle power. The body of the lamp is provided with a hinged cover in which is a switch for regulating the volume of the light.

The greatest novelty in lamps is shown by the Wizard Manufacturing Company of Chicago and New York, who exhibited the Wizard gas lamp, Figs. 8 and 9. It looks like the very refinement of ingenuity that a bicyclist should carry his own gas-making plant with him

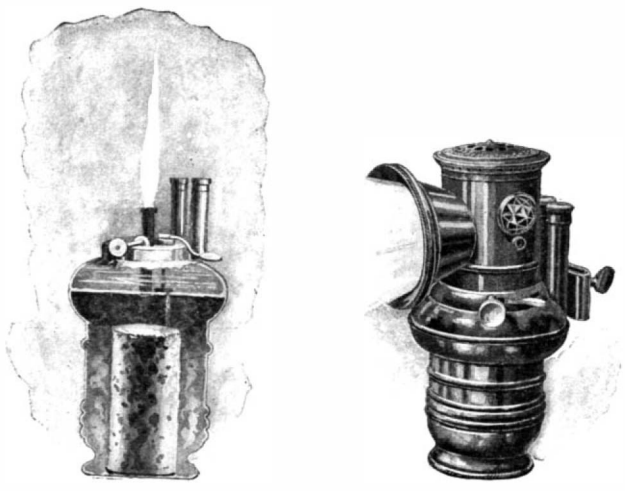
on the wheel, yet this is what this lamp involves, the acetylene gas being produced by the dropping of water from an upper tank in the lamp upon a block of calcium carbide contained in a gas-generating compartment below. By reference to Fig. 8, which is a sectional view of the lower half of the lamp, it will be seen that the metal case is divided by a horizontal plate into two compartments, the upper one being filled with water by means of one of the vertical tubes seen at the back of the lamp, the lower one containing the block of carbide. Water is allowed to drop upon the carbide by shifting over the small lever on the top of the tank,

Washington Railway Terminals.

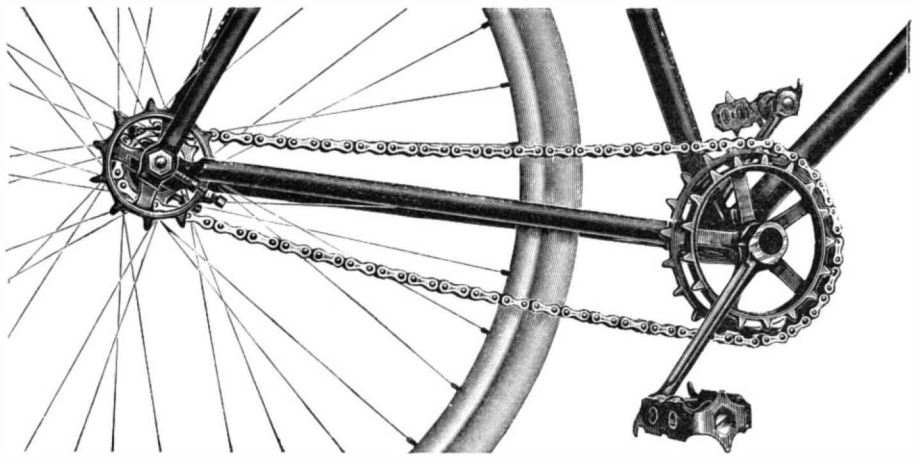
There are good grounds for believing that several million dollars will be spent by the railroad companies entering Washington in improvements within the next few years. At present, says the Manufacturer's Record, three different plans are being considered. One is by the Baltimore & Ohio Railroad Company for terminals, which will be either above or below the grades of the principal streets, and which will necessitate the construction of an extensive viaduct of masonry or steel and the probable enlargement of its present depot. A bill is now pending in Congress providing for a new system of terminals for the Pennsylvania Railroad Company, by which the tracks of the system are to be depressed from a point in the suburbs to the present depot. The bill also provides for the construction of a new bridge across the Potomac River in place of the present wooden structure. It is understood this measure is not favored by the railroad company, but that it is considering a plan for a union station, which will be a very elaborate affair, and which will be located in a different part of the city from the present depot. To construct this building and the necessary tracks leading to it, it is understood, will require an outlay of several million dollars. While no details of the plan have been made public as yet, it is understood that the several railroad companies which now use the Pennsylvania depot will be interested, and that it will be a union station for the Southern, the Chesapeake & Ohio, possibly the Atlantic Coast Line, and the Norfolk & Western, as well as the Pennsylvania lines.

Tests for Government Crockery Ware.

The United States government tests of crockery ware, as required by Philadelphia depot of the quartermaster's department, Schuylkill Arsenal, Major Charles W. Williams, quartermaster, U. S. A., is boiling from ten to fifteen minutes and then being transferred to water at as near the freezing point as can be obtained. The crockery must not craze nor crack in this test. For tumblers they are placed in water at about 192–4° for one minute, and then transferred to water at 42–44° Fah. If they crack under this test, they are rejected.



8 and 9. Acetylene bicycle lamp.



10 Two-speed gear.

1. Three-ball bearing. 2. Non-splitable rim. 3. Joint for non-splitable rim. 4. Electric bicycle lamp. 5. Automatic whistle. 6. A device to reduce friction. 7. The circle cycle.

BICYCLE NOVELTIES AT THE ANNUAL EXHIBITION, NEW YORK

which controls a valve in the bottom of the tank. The gas is led to the pinhole burner by a vertical pipe passing through the tank, the size of the jet being regulated by a thumb screw. A safety valve opens from the gas chamber into a vertical pipe at the back of the machine. The light may be varied from a small bead just discernible to a ¾ inch flame. If water is fed at the rate of four drops per minute, the lamp will burn for ten hours. It is recharged by inserting a fresh block of carbide. Apparently the light cannot be jarred out, the exhibitor dropping it on the floor and giving it other rough usage to show its good "staying" qualities. We defer to a future issue further mention of other novelties observed at this comprehensive show.

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RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM SCRAPER.—John Austin, San Francisco, Cal. From a drum forming a part of a hoisting machine, according to this improvement, a cable extends around a sheave anchored at a suitable distance in advance of the scraper, with which it is connected by a pulling line, a cable from a second drum on the same machine passing around a sheave to the rear of the scraper, and being connected therewith by a hold-back line. The latter line is connected with a dumping line, arranged in connection with a gear shaft, pinion, and crank in a frame at the rear of the scoop, whereby the dumping line may be made slack or taut, as desired, to insure the tilting and dumping of the scoop whenever required, but always preventing the upsetting of the scoop while it is being filled.

Railway Appliances.

CAR FENDER.—Edmund West, San Francisco, Cal. This inventor has devised a spring-controlled rocking fender, with hinged and spring controlled wings at each side of the back member of the fender, there being a keeper carried by each of the wings and engaged by extensions from the bottom portions of the fender. The device provides a spring-like bed adapted to receive without injury a person caught in the path of a moving car, and wings or gates are arranged to automatically close over the fender and prevent the person from falling off.

REPLACING DERAILED CARS.—James H. Malone, New York City. To facilitate the moving back on the track of derailed trolley or horse cars, this inventor provides a sectional device which may be carried on the cars, and with which the cars may be replaced on the tracks by the power ordinarily employed to propel them. It comprises a body section having clamps adapted for attachment to a rail, a portion of the body extending beyond the side of the rail and having channels communicating with a main channel, while lateral rails or branches made in detachable sections are pivotally connected with the main section, each branch rail being capable of lateral movement and having a channel communicating with a collateral channel on the main section.

Electrical.

TROLLEY.—George L. Campbell, Shunk, Pa. To enable the trolley to more effectively retain its position with relation to the wire is the object sought by this patentee, whose invention provides that there shall be pivoted on the spindle on which the trolley wheel is mounted, in the fork at the upper end of the trolley pole, blocks carrying pivoted arms adapted to swing up at the sides of the wire, whereby the trolley will be kept continually in engagement therewith, the arms also freely swinging downward to permit the passing of obstructions, such as insulators, cross braces, etc, The trolley pole is otherwise controlled as usual.

BATTERY.—Walter S. Doe, Brooklyn, N. Y. To furnish sufficient electricity for bicycle lamps and similar uses, the compact battery described by this patent is arranged to be conveniently and easily recharged, and is made with a number of perforated carbon cylinders and perforated hard rubber tubes occupying compartments of a suitable casing, the tubes extending into an exciting fluid and being each adapted to receive a depolarizing cartridge. The latter comprises an anode consisting of a zinc cylinder split longitudinally and adapted to receive a solid chemical, preferably made of fused nitrate of soda, the cartridge being readily inserted into each tube on removing a cap, and being of a length proportioned to the time the light is to be burned. When a cartridge is entirely dissolved it may be readily replaced by a new one, the exciting fluid in the battery lasting for a number of cartridges in each tube.

Agricultural.

FEEDER FOR HAY CUTTERS.--George W. Bischof, Mallala, South Australia. To provide an automatic continuous feed, adjustable to the capacity of the cutting apparatus of chaff-cutting machines, this inventor has arranged a driving mechanism in connection with a slotted table where two series of packers have a vertical and a back and forth motion, one series alternating with the other, while stop arms are movable through the slots of the table, above which are holding arms between the packers and stops, and an endless carrier moving in a receiving trough at the front end of the table. The machine packs the loose hay into suitable condition to be delivered to the feed band, and sends it in a constant and well distributed stream to the feed rollers.

Miscellaneous.

ICE TIRE FOR BICYCLES.—Jefferson L. Atkinson and Leonard Branchaud, Potsdam, N. Y. A quickly applied or removed ice tire, for the prevention of the slipping of a bicycle wheel on ice, is made, according to this invention, of a narrow strip of leather whose outer surface is provided with a series of spurs or sharp points, riveted in place. A narrow strip of sheet metal, curved to fit the outer curve of the tire, receives the shanks of the spurs, and the spur-studded belt, which is of a length proportionate to the circumference of the wheel, is attached thereto by short leather straps, there being at the ends of the belt a locking device. The belt is preferably secured upon the tire when the latter is deflated, its inflation then firmly holding it in place. The belt is light, and may be easily carried upon the person, its attachment or removal taking but a very short time.

WASHING, SCOURING AND DRYING GRAIN.—Milton T. Gibbs, Mayville, North Dakota. To facilitate the washing and rinsing of grain the desired number of times in such rapid succession that the kernels will not be soaked before drying, this inventor has devised a process of rapidly removing the water from the surface of the kernels by force, instead of by evaporation. The grain is first subjected while in motion to the action of jets of water, to loosen the impurities on the kernels, and is then moved upward and delivered by centrifugal force against a sieve, where it is subjected to the action of an air blast, forcing the impurities through the sieve on which the grain rolls down for further scouring. A stationary screen or sieve is inclosed in a revoluble drum in which the grain is received at one end, a scraper removing the grain from the inner surface of the drum and guiding it to the sieve.

WATER HEATER FOR BATH TUBS.—William Gunn, Indianapolis, Ind. For quickly heating water in a bath tub, a small heater is arranged at one end according to this invention, having a metal shell or casing and end chambers, there being within the casing easily cleaned water tubes, below which is a perforated shell forming a gas burner, the device affording a large heating surface by which the water passed through the tubes may be quickly heated. The connections are such that the circulation is maintained by the hot water rising in the tub, and when the water is discharged from the tub it is also drained from the water tubes, thus preventing damage by freezing.

DOOR OR WINDOW FASTENER.—John T. Nagle, Butte, Montana. This is a simple device which may be carried in the pocket and conveniently applied to fasten doors or windows, being readily removed when the door is to be opened or the window raised or lowered. It consists of a block in which slides a locking bar engaged by pawls carried by the block, there being at the outer end of the locking bar a foot with teeth which are brought into engagement with a door jamb by the closing of the door, or with one of the meeting rails of the sash in adjusting a window, the block being then moved and held in locking engagement with the bar by the pawls.

WINDOW FRAME AND SASH.—David W. Trotter, Butte, Montana. To make windows almost entirely dust and wind proof, and to dispense with inside stops and parting beads for the sash and frames, rendering the sash also more readily removable than under the present system, the sash is, according to this invention, made with grooves in its side and bottom edges, and L-shaped yokes are fitted with their longer portions in the vertical grooves and their shorter portions in the horizontal bottom grooves, there being at the upper extremity of each yoke a plate lying snugly against the upper edge of the sash, preventing the accidental downward movement of the yoke. The upper extremities of the yokes are extended above the sash, and each has a slot forming a hook adapted to carry a weight cord. With this improvement, a groove only is made in the vertical jambs of the window frame instead of the ordinary sash grooves.

CHAIR.—Harris W. Stern, Vincennes, Ind. This invention is for an improvement in chairs designed to be readily changed from a sitting to a reclining position, or for use as a rocker, the several changes being easily made by a person sitting in the chair. The chair has a rocker body in which slides an adjustable foot rest, the rockers being held from movement by simple devices, while an upholstered seat is designed to be swung upwardly with relation to the rockers, as desired. Pivotally connected to the rear portion of the chair is an upholstered back, with the side bars of which the arms are pivotally connected at one end, their opposite ends having pivotal connection with arm braces extending to the rockers.

AUTOMATIC WAGON BRAKE.—Joseph S. Elliott, Eddy, Texas. This is a brake which sets itself by the movement of the wagon forward on the team as the wagon descends a grade, and is furnished with devices by which the action of the brake may be suspended while backing the team. The brake setting rod or connection movable forward in setting the brake is provided with a bolt or projection, and a stop is movable into position to engage the projection and limit the forward movement of the rod, the stop being moved by means of an operating cord which extends up within convenient reach of the driver.

ATTACHMENT FOR VEHICLE BRAKES.—Joshua H. and W. W. Edwards, Stephenville, Texas. This is a device particularly applicable to brake levers placed on the bodies of vehicles to which extra side boards are attached, as for conveying cotton from the field to a gin, etc. It consists of two connected members, each terminating in a socket, one socket receiving the back lever and the other the front lever of the brake, and an extension handle is so attached that the brake levers may be operated as conveniently and as positively from a point high above the main body of the wagon as when the operator is on the wagon seat.

THILL COUPLING.—Bertus J. Yeager, Montague, Mich. For buggies and light vehicles, this inventor has devised a coupling by which the shaft may be readily attached or detached, and which obviates all rattling. In a suitable frame a clip supports in one side a bolt for the eye of the shaft, the free end of the bolt being adapted for engagement by a pivoted arm forming part of the frame and locked in place by a locking plate pivoted on the clip frame, this plate having a spring engaging the eye of the shaft.

NEGATIVE EXAMINER AND CAMERA OBSCURA.—William A. Eddy, Bayonne, N. J. This is a device for the use of photographers in the examination of negatives or lantern slides, and which may be readily changed to a camera obscura, the invention providing means whereby the negative, whether wet or dry, may be minutely examined and a reflected light thrown on it or the slide to highly illuminate it. A reflector box is made with an apertured rear wall and inclined apertured support at its front end, a mirror at the bottom throwing the light entering through the rear aperture on an article placed on the support. A stationary closed section, on which slides an outwardly movable sight section, extends up in front of the inclined support. The article on the support may be illuminated in two ways, either directly or by reflection by the mirror, the light falling on the article being regulated as desired in either case.

BOBBIN THREAD TWISTER.—Edward C. Gerstenberger, Brooklyn, N. Y. A twister adapted to rapidly and conveniently twist threads while filling a bobbin for sewing machines has been devised by this inventor, the invention consisting principally of a revolving arm adapted to carry the spools, the threads from which are gathered by a fixed eye, a driving mechanism for the arm being engaged and driven by the twisted thread wound up by the bobbin. The operator may thus quickly twist a number of threads to form a stronger twisted thread for filling the bobbin of the shuttle, and the device is very simple and inexpensive.

SAFETY GUARD FOR SPRING LOCKS.—Max B. Guenther, New York City. This guard consists of a plate adapted for attachment to a door jamb and having a flange to engage the stop bead of the jamb, the guard being adjustable on a keeper having a face plate whereby the device may be readily adapted to doors of different thicknesses. It will effectually prevent a knife, needle or similar implement being introduced between the door jamb and stop bead to open the latch. It may also be conveniently used in connection with the keeper for spring latches, preventing the opening of the latch by a knife or other instrument, even when an auger or similar tool is used to produce openings leading in the direction of the latch.

SAFETY RAZOR.—Albert L. Silberstein, New York City. This device comprises a basket frame made of a single piece of sheet metal formed into a curved bottom and having at its front edge a bent-over flange to form a guard for the cutting edge of the blade. Secured to the back and extending forwardly and downwardly in the frame are flat springs, at the forward free ends of which are L shaped clips adapted to engage and press on the top of the blade, the clips yielding to bring their sides in firm contact with the ends of the blade. The razor blade may be conveniently inserted and securely held without danger of its cutting edge projecting too far beyond the guard.

SHEARS OR SCISSORS SHARPENER.—Olof L. Stadig, Connors Station, Canada. On a small board or other suitable base, according to this invention, is held a flat grindstone, over which is an inclined guideway made of bent wires, and the placing of the knife or scissors blade in the guideway insures the presentation of the cutting edge to the stone at the proper angle. A spring presses on the back of the blade to hold it down to the stone, upon which the operator moves the blade back and forth. The stone is preferably reversible, and has an oil face and an emery face, the latter for use when the shears are very dull.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

MACHINE SHOP ARITHMETIC. A pocket book containing some of the problems of every day shop life and the way in which they are solved. By Fred. H. Colvin and Walter Lee Cheney. First edition. East Orange, N. J.: The Practical Publishing Company. 1896. Pp. 88. Price 50 cents.

This excellent little work covers a ground which, in its limitations, is somewhat new. It gives just enough of arithmetic to cover the cases arising in machine shop practice, such as calculating the gear of a lathe for cutting screws, squaring, cubing, extraction of roots and the like. The print, though small, is very clear. The little volume will form a most useful companion to the professional machinist, who wants to do more than merely guide the tools which he operates. We warmly recommend it also to the amateur machinist.

AN AMERICAN IDYL. By the Countess Di Brazza (Cora Slocum). Boston: The Arena Publishing Company. Price $1.50.

The accomplished author, who so gracefully bears the title and does honor to the station of a countess, has in this little prose poem interwoven a fabric of sentiment with vari-colored threads of science. The hero is a scientist visiting northern Mexico in the pursuit of studies authropological, zoological, geological, etc., and his assistant, the heroine, is a young Indian maiden. As together they try to collect data which may be of assistance in solving some of nature's mysteries, their mutual interest in each other becomes of far greater moment to both of them than the work itself. It is the old, old, but ever new story, narrated with a felicity of expression, an amplitude of illustration, and a psychological insight into character, similar perhaps, though in such a widely different field, to that shown by Corinne in her conversations with Nevil, in the great work of Madame De Stael. The book also presents, in text and illustrations, a good deal of new and valuable information about the Pima Indians of Northern Mexico.

THE DOG. By "Stonehenge." Revised by George Armatage, M.R.C.V.S. London and New York: Frederick Warne & Company. Illustrated. Pp. 267. Price $1.

The work of "Stonehenge," which has long formed a standard, is here enlarged, and much additional matter presented therewith, in compact form, and well adapted for use by all who would best serve their canine friends by good management when in health or their proper treatment in disease. To one who justly appreciates the high intelligence, the affection, the faithfulness, the companionability of a good dog, this book affords a most serviceable manual to assist in discovering and developing his natural capabilities, increasing his sphere of usefulness and enlarging his intrinsic worth. The engravings are of the best, and some of them are faithful portraits of celebrities.

JAHRBUCH DER DEUTSCHEN LANDWIRTHSCHAFTS-GESELLSCHAFT. Herausgegeben vom Directorium. Band 10. 1895. Berlin. Pp. xvii, 523.

To agriculturists familiar with the German language this work will present a wonderful picture of the intellectual activity of the German farmer. In it are treated, with numerous illustrations, the many topics of industry that arise in German farm practice in the way of machinery, fertilizers, and all methods and adjuncts of the agriculturist's art. The book is closely printed, there being no waste space, its upward of 700 pages containing a vast amount of text on all subjects relating to farming.

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.

(7106) W. S. E. asks: 1. What are the ingredients used in the porous cups in Leclanche batteries? A. Good graphite with the dust sifted out and manganese dioxide, both of good quality, in about equal parts, or 4 parts graphite to 5 parts manganese. 2. Would the carbon pencils used in arc lights broken in small pieces do for filling, provided the copper is scraped off? A. Not satisfactorily.

(7107) E. C. H. asks: In the simple electric motor described by G. M. Hopkins in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, would not castings be as good, or better, than the iron wire and Russia iron, for the fields and armature? A. Castings would answer for the field core, but not for the armature core. The latter should be laminated, and the more thoroughly, the better.

(7108) H. J. B. writes: I have been contemplating the making of a Tesla-Thomson high frequency coil as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1087, but cannot get part to come out as described. The figures will not check. Will you help me out? 1. A 2 inch iron pipe has an outside diameter of 2⅜ inches, which, when insulated and wound with primary, give 3 inches. You will notice the difference in description in paper. A. By 2 inch pipe the author means a pipe of 2 inches external diameter—not what the gas and steam fitting trade term a 2 inch pipe. 2. There are 10 coils each 1⅛ inch with ⅛ inch insulation, but this lacks 3⅝ inch of covering primary coil. What is to be done with the rest of primary coil? Would you put in enough secondary coils to cover primary? A. By reading the article, you will see that each 1⅛ inch coil is taped. This taping so increases its length that ten such coils with the cardboard insulation and a little allowance for lost space will fill the 16 inches pretty fully. 3. The secondary coil of transformer has an outside diameter of 6 inches, while inside diameter of secondary coil of high frequency coil is 8 inches. What is to be placed between coils? Should not all coils be placed as close together as insulation (proper) will permit? A. Air fills the space—it is an air gap, designed to prevent perforation or jumping across of sparks. 4. Description does not state how thick last coil above is to be wound. Should it be to inside diameter of next coil? A. One layer of wire is prescribed. 5. Should primary high frequency coil be wound with 4 coils of 14 layers each No. 8 wire? This would make a 28 inch coil with proper insulation. Could not smaller wire be used on primary with fewer coils? Would it not be better to have an odd number of layers, that wires might end on opposite ends of coil? How is an oil insulation used? A. There are 14×4=56 turns of No. 8 wire in primary coil of H. F. transformer. This wire is laid in one layer, four leads in parallel. No. 8 wire is 0·128 inch thick; therefore, the wire alone represents 0·128×56 or 7 inches. The two turns of cord (p. 17378), the insulation and the looseness of winding make up the difference, An oil insulation may be used by immersing the coil in a tank of resin oil. We do not advise a departure from the proportions of the coil shown, unless an entirely new one is designed. 6. How large should this coil be when completed? A. The drawings and text answer this question; a little over 12×18 inches.

(7109) C. E. P. writes: Will you answer in your columns a few questions relative to the Thomson-Tesla coil, described in SUPPLEMENT, No. 1087? I have just completed a Ruhmkorf coil, which gives a six inch spark from four pounds No. 36 on secondary. But as I have the fifty-two volt alternating current in my house, would prefer to use it; and do not want to make

any mistake in constructing the apparatus. Have not missed a copy of the SCIENTIFIC AMERICAN or SUPPLEMENT for four years, and consider it of more benefit to the workman, in the advancement of science, than all others, treating each subject as it does in common, every-day phrases. 1. The number pounds No. 31 on secondary high tension transformer. A. About ¾ pound. 2. Is it necessary to insulate between each layer? A. There is only one layer. 3. Would there be better results if wound in twenty sections? A. As there is only one layer, it cannot be wound in sections. 4. The diameter of paper cylinder, for secondary of high frequency coil, is eight inches, and of the primary twelve inches. Is more than one layer of No. 31 required? If not, is the space between the primary and secondary an air space? Or is it filled with some insulating medium? A. See preceding query. 5. To what particular part of the machine does the statement apply "between wires of different polarity, as an extra precaution, two layers of cord are wound"? A. To the primary coil of H. F. transformer, Fig. 5. Four wires in parallel are wound in a spiral. The four lie close to each other and the two cords come in between their turns. Thus four wires come close together, then two cords, then four wires and so on. 6. In assembling, we take first the high tension primary, over it place the ten coils or secondary; next, over that place the secondary of the high frequency coil, and over all the primary of the same, or do we keep the high tension and high frequency coils apart, as two distinct apparatus, making connection with condenser as shown in diagram? A. Mount as two distinct apparatus.

(7110) H. B. asks: Will you please answer in the correspondents column the following questions? 1. Kindly give me the receipt for the preparation used in photographing on enamel buttons. A For information on enamel photography we refer you to articles in SCIENTIFIC AMERICAN, No. 19, vol. 71, also SUPPLEMENT, Nos. 429 and 1039; price 10 cents each by mail. 2. I am making the induction coil, described in SUPPLEMENT No. 160, and want to know whether the same size spark and results can be obtained by using 2 pounds of No. 30 silk covered wire instead of No. 36. A. Not unless you use the same length of wire, or about fifteen and one-half times the weight of the No. 36 wire. 3. When will the 1897 addition to "Experimental Science" be published, or is there none to be issued? A. The new revised and enlarged edition of "Experimental Science" contains a supplement of 120 pages and numerous illustrations published in 1895. Price $4 by mail. No new supplement to it is in immediate contemplation. 4. How many lights can I get from a dynamo with four fields each 2½ inches high wrapped with No. 12 wire and an H armature 2⅝×3 inches with No. 20 wire, or what is the best size wire to use? A. The armature capacity is 3 to 3½ amperes; the data given are insufficient for anything more than an approximation, but we do not think it would give more than two or three candle power. A laminated drum armature is preferable to the H armature.

(7111) S. R. says: Can you give me the recipe for cleaning gloves, kid and suede, in quantities? A. Damp them slightly, stretch them gently over a wooden hand of appropriate size, and clean them with a sponge dipped in benzole, recently rectified oil of turpentine, or camphine. As soon as they are dry, withdraw them gently from the stretcher, and suspend them in a current of air for a few days, or until they cease to smell of the cleaning liquid used. Heat must be avoided. The cleaning liquid should be used liberally, and the first dirty portion should be sponged off with clean liquid.

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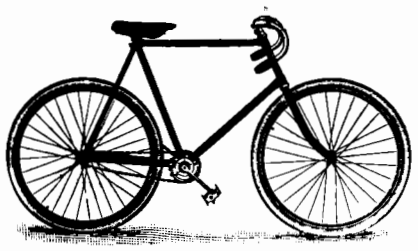

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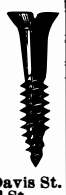

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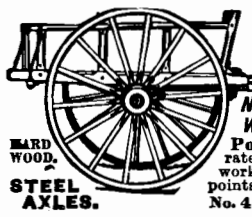

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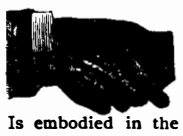

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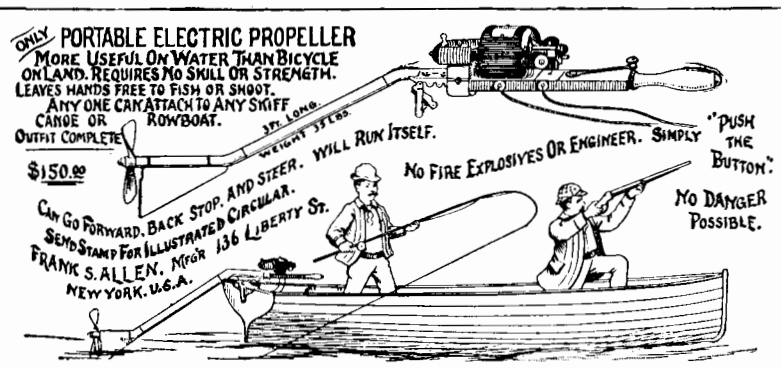

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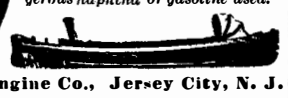

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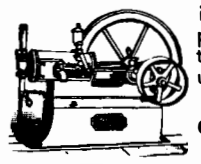

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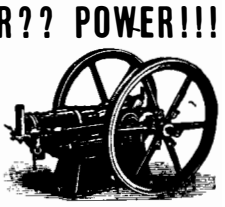

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