per hour at sea. Of course, the quadruple expansion engines of these twin screw vessels will be the most interesting feature, on account of the great power they are expected to develop.

This is the first time an effort has been made to use quadruple expansion in engines of over 4,000 I. H. P., and in only one or two instances has it been applied to engines of that power. In speaking of the vessels, Mr. Charles H. Cramp, in a paper read before the American Society of Naval Architects and Marine Engineers, said: "I will not venture prediction as to their probable performance, but I will guarantee them to be perfectly safe, comfortable and economical ships. They are to be closely followed by other ships, which I will not now describe, except to say that they will not shrink from comparison or competition. The St. Louis and St. Paul have been especially arranged so as to be readily and quickly convertible into armed cruisers, carrying eight 6 inch 100 pound rapid-fire guns, and the conditions of the mail contract between the United States government and the International Navigation Company place at the disposal of the American navy these great ships, almost instantly convertible into commerce destroyers, averaging greater performance than the Columbia, which, with the three others that are about to follow as quickly as the plans can be completed, will practically re-enforce the United States navy by $21,000,000 worth of ships, and that not only without cost of building, but also without the expense of maintenance and commission in time of peace. In conclusion, allow me to say that these ships will be American from truck to keelson. No foreign materials enter into their construction. They are of American model and design, of American material, and are being built by American skill and muscle."

### Effect of the Earthquake Shock in Constantinople.

Mr. W. S. M'Gregor, the engineer of the Imperial Ottoman Gas Work at Dolma-Baghtche, sends the following to the *Journal of Gas Lighting:*

"A very severe shock of earthquake was experienced in Constantinople on the 10th of July, at 20 minutes past 12 P. M. The first shock lasted about 40 seconds; and a second shock, less severe, was felt about 5 minutes afterward. Considerable damage was done to property, and a number of houses were thrown down; while fires of a serious character broke out in different parts of the city. But comparatively little loss of life took place. At the Imperial Gas Works, at Dolma-Baghtche, the water in the gasholder tanks suddenly overflowed; while in No. 1 holder (a two-lift telescopic holder of 320,000 cubic feet capacity) the water rose suddenly and overflowed the tank, and as suddenly subsided. As the holder was cupped scarcely a sheet in the second lift, it uncupped and cupped again with startling rapidity; the girders and tie rods meanwhile shaking violently, and appearing as if they would be wrenched away from the columns. The chimney stalk of the old works was badly cracked, and a portion of the top thrown down; but beycnd this, and the flooding of the inlet and outlet pipes of the different gas holders, no serious damage was done. Various ugly cracks about the buildings testify to the serious nature of the shock; and altogether, if possible, it is not an experience that one would care to undergo a second time."

### Electric Mail Cars in Brooklyn, N. Y.

The Atlantic Avenue Railway Company has recently completed at its shops, Twenty-fourth Street near Fifth Avenue, an electric postal car designed by the company officials, assisted by the postal authorities of Brooklyn, patterned after the standard type of postal car used on steam railroad lines.

Only half of the car will be used for postal purposes, the other half being a smoking compartment. There are pigeonholes for distributing the mails, and hooks for holding the mail pouches open. Drop letter boxes are provided at each corner of this compartment.

The exterior of the car presents a very handsome appearance. It is painted white, like the United States mail cars which are run on steam routes, the smoking compartment being lettered "Smoking Car." The windows are covered with wire screens. The car is mounted on a Brownell truck.

Two of these cars will go into service immediately.

### An Improved Alloy.

Fifty parts of copper, forty parts of zinc, and aluminum in the proportion of two and a half per cent of the whole are taken. This is one example, but others may be obtained by varying the amounts of copper and zinc to the same proportion of aluminum.

The mode of preparation of the alloy varies: For a hard metal, the copper and aluminum are first mixed to form a copper alloy and the zinc added in small pieces during continuous agitation of the molten mass.

This gives a reddish alloy that takes a high polish. For a ductile metal the zinc and aluminum are first mixed and the copper then added. This gives an alloy resembling brass. In both cases the metal is claimed to be non-oxidizable, proof against sea water, and, to a large extent, against acids.—*D. W. Sugg, London.*


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## SCIENTIFIC AMERICAN SUPPLEMENT

No. 971.

**For the Week Ending August 11, 1894.**

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### THE BROOKLYN MEETING OF THE AMERICAN ASSOCIATION.

As an especial degree of interest belongs to the buildings in whose halls the American Association for the Advancement of Science is to meet next week, a brief description of them may interest the public. The opening general session and the opening sessions of the sections will be held in the Polytechnic Institute of Brooklyn, located on Livingston Street. The building is very ample and of modern construction, fully equipped for the scientific instruction of the thousand or more undergraduates who are pursuing the several courses required for the degrees of Bachelor of Science, Bachelor of Arts, or Civil Engineer, or Electrical Engineer. Alongside this main building is the Preparatory Department, which has about eight hundred pupils in attendance. This institute, indeed, was originally founded, in 1854, as an academy; but its curriculum has been steadily enlarged and extended to meet the increasing demands of a growing city, and larger buildings were required for the accommodation of the increasing number of students. Accordingly, in 1889-90, the Regents of the New York University granted an absolute charter for the Polytechnic Institute, as it now exists, with a munificent endowment and a superior faculty ready for all the higher educational work found in similar institutions elsewhere. While mathematics, the ancient and modern languages, history, philosophy, etc., receive due attention, especial facilities are afforded for the study of chemistry, electricity, engineering, architecture, the steam engine, and the natural sciences in general. The Spicer Library contains 3,000 volumes classified for special investigation and research. The gymnasium is remarkably well equipped, and the laboratories, observatory, art studio and museum of natural sciences are equal to the needs of this admirable institution. And all these rooms and their contents are for the time at the disposal of the A. A. A. S. by the generosity of the corporation.

The Packer Institute is located on the corner of Livingstone and Joralemon Streets, in ample grounds, with spacious lecture rooms, fine laboratories, libraries and scientific collections. This college is for young ladies, of whom nearly 1,000 are in attendance during term time. Its graduates enter the senior year of such colleges as Smith and Vassar. The building being near that of the Polytechnic Institute, some of the sections will be assigned to rooms here.

The evening addresses, receptions and closing session will be held in the Academy of Music and Art building, Montague Street. All these buildings are near each other and are within a block of the City Hall Square.

### THE WASTE OF COAL MINES AS A SOURCE OF POWER.

The readers of our columns have been kept informed of the work in progress at Niagara Falls for the utilization of some of the power now running to waste over the great precipice. Recently the project has been attacked by our contemporary, *Electricity*, and the assertion has been made that there is little chance of its paying for some time to come, and that it has a dangerous rival in the culm heaps of the Pennsylvania coal regions. Every coal mine in the anthracite region produces enormous quantities of coal dust, known as culm, which keeps on accumulating, as it has accumulated for many years, about the mines and coal breakers. This culm has good, calorific value, and recently manufacturers have begun to use it under their boilers. It can be bought for twenty-five cents a ton. Mr. D. B. Atherton, the secretary of the Scranton Board of Trade, has given figures to show that with culm firing a horse power per annum will cost but $3.93. At Niagara Falls a horse power will cost, it is said, $15 per annum. It is evident that the culm bank is the cheaper.

Of course this apparent difference is offset by other considerations. No account is taken of the capitalization of the steam and electric plants required to utilize culm, but the difference in the quotations given is so great as to certainly give the economic advantage to culm as a source of energy. In utilizing culm we are disposing of a waste product and of an accumulation of man's operations. In burning coal we are disposing of the accumulation of Nature's riches. Natural gas is already on the wane, and sooner or later coal will become exhausted. Then will be the time for Niagara Falls and similar natural sources of power to do their part in the work of the world. But to day there is at least a suspicion that the heavy capitalization of the Niagara Falls works will restrict greatly its domain of usefulness.

Another point made is that the anthracite regions are more favorably situated for the distribution of power than are Niagara Falls. On the whole, a very strong plea has been made for the culm bank as opposed to the great cataract.

Repeatedly in modern industries the question of capitalization has determined the success or failure of enterprises. At Niagara Falls the power primarily costs nothing; the capitalization and harnessing of the force of the cataract constitute the elements of cost.

### The Growth of Cities.

The comparative growth of American and foreign cities is one of particular interest to the American, to whom the increasing size of American cities is a matter of great pride. It appears, however, that according to statistics the growth of great foreign cities has been even more rapid than our own. In a recent number of the *New Review*, Mr. Stead makes the assertion that the growth of Chicago is by no means as remarkable as the growth of London; while Dr. Shaw, in the *Century*, gives some interesting comparisons which have been epitomized by the *Sun*. "Beginning," it says, "with the capital of the German Empire, Mr. Shaw points out that in 1860 it was smaller than Philadelphia; since then it has added a million to its population, while Philadelphia has added but half a million. In 1870 Berlin had considerably fewer inhabitants than New York, the figures being 800,000 against 950,000. In 1890, according to the official enumerators, Berlin had 1,578.794 inhabitants, against 1,515,301 in New York. Passing to the German city next in size, we find that in 1875 Hamburg had only 263,540 people, whereas Boston had 342,000. In 1890 Hamburg had 569,260, while Boston had but 448,000. Again, in the early seventies Hamburg and Baltimore were of equal size; in 1890 the German city had beaten its American rival by more than 134,000. The third German city in respect of population is Leipsic, which has grown from 127,000 in 1875 to 355,000 in 1890, having considerably distanced San Francisco, which was the larger in the year first named. In the same period Munich and Breslau have both beaten Cincinnati. Among the gains which we are wont to think remarkable during the decade from 1880 to 1890 may be mentioned that of Cleveland, from 160,000 to 261,000; that of Buffalo, from 155,000 to 255,600; and that of Pittsburg, from 156,000 to 238,600.

All of these were surpassed by Cologne, which in the same time increased from 144,800 to 281,800. The comparison is carried out by Mr. Shaw in great detail, and might have been pushed even further with substantially equivalent results. We cite a few more notable examples of progress on the part of German cities. In 1880 Dresden had 220,000 inhabitants and New Orleans 216,000; ten years later the former had grown to 276,000, while the latter could show but 242,000. Between 1880 and 1890 Louisville advanced from 123.758 to 161,129; in the same decade Hanover had risen from 122,800 to 163,600, and Konigsberg from 122,600 to 161,500. It is fair to say that meanwhile Jersey City had slightly outstripped the two German towns, having increased from 120,722 to 163,003. In the decade mentioned, Frankfort-on the-Main and Newark were almost neck and neck, having started with 136,800 and 136,500 respectively, and having finished with 180,000 and 181,800. We are accustomed to regard Minneapolis and St. Paul as astonishing instances of growth, yet between 1885 and 1890 both were outdone by Magdeburg. Even Chemnitz beat St. Paul, having had 110,800 against 111,000 in 1885, and having attained in 1890 to 138,955 to St. Paul's 133,156. The area, however, of many German cities would be considered small according to the present American standard. Thus Berlin, Hamburg, Leipsic, and Munich, the four largest cities of Germauy, cover each a superficies of only about 15,000 acres. Viewed as a whole, the comparative statistics of the two countries sustain Mr. Shaw's conclusion that, since the war of 1870, the urban centers of Germany have been gaining population even more rapidly than those of the United States.—*Literary Digest.*

### Importance of Slow Burning Construction for Buildings.

The August number of the Engineering Magazine contains an excellent article by Mr. Edward Atkinson, on the enormous losses by fire, the results of ignorance, stupidity and neglect. He says:

There are no more perfect examples of the art of combustible architecture than are to be found in most of the hospitals, asylums, college buildings and school houses. He has never been called upon to inspect more dangerous and unsuitable buildings than some of the larger hospitals, especially one for the insane, which he was once asked to protect as far as he could. The power of invention had been exhausted in making that building unsafe and unfit for its use, and that has been the common rule rather than the exception down to a very recent period. He does not insist upon an absolute fireproof construction of all buildings, as that would be impracticable, owing to the heavy costs; but he strongly advocates a better use of ordinary building materials, whereby the fire cannot so rapidly spread, thus giving time for extinguishment.

For instance, wherever the mill floor, suitably constructed of three inch plank, grooved and splined, covered with one inch top boarding, laid on timbers eight or ten feet on centers, has been made continuous—that is to say, without any break for belt holes, open elevators, or open stairways—it has never been burned through by a fire upon the floor or by fire passing through the floor above, except in one instance, and that was in a warehouse where a pile of jute bales took fire in a place where it could not be reached. The firemen then put water through the hole from open butts and drowned it out. Fires on such mill floors have been held, not only in the building, but in the room where they originated.

Again, iron posts have been crippled or sprung by heat a great many times at an early period in a fire. A wooden post of suitable size has never burned off until other parts of the building were already destroyed. They have in one instance resisted for hours fire which destroyed granite posts near them by reducing them to sand—the granite measuring 12 by 12 inches. In this instance oak posts were put in between the original posts of granite to bear an added weight of machinery. When the fire came, the oak sustained the whole load.

To repeat, the mill floor properly constructed and rightly guarded has sufficed to hold fires not only in the building but in the room in which they have originated, until the mill fire department or the public fire department could extinguish the fire. The wooden mill post of suitable size will last longer than the floor. The mill floor possesses this very great advantage over the ordinary joisted floor; fires may be readily swept away between the timbers either by sprinklers or by water from hose pipes; while in the joisted floor or floor laid over plank on edge 18 inches to 24 inches apart on centers, the fire will burn on one side of the joist or plank while the water is playing on the other side.

WHAT MILL CONSTRUCTION IS.

I. Mill construction consists in so disposing the timber and plank in heavy solid masses as to expose the smallest number of corners or ignitable projections to fire, to the end also that when fire occurs it may be most readily reached by water from sprinklers or hose.

II. It consists in separating every floor from every other floor by incombustible stops—by automatic hatchways, by incasing stairways either in brick or other incombustible partitions—to the end that a fire shall be retarded in passing from floor to floor to the utmost that is consistent with the use of wood or any material in construction that is not absolutely fireproof.

III. It consists in guarding the ceilings over all specially hazardous stock or processes with plastering laid on wire lath or upon dovetailed lath or by plaster board of a suitable kind, following the lines of the ceiling and of the timbers without any interspaces between the plastering and the wood; or else in protecting ceilings over hazardous places with tin or other suitable metal, but not with zinc.

IV. It consists not only in so constructing the mill, workshop, or warehouse that fire shall pass as slowly as possible from one part of the building to another, but also in providing all suitable safeguards against fire.

V. It consists in laying the top floor and the outer boarding of the roof over mortar, plaster board, or some other fire retardent between it and the plank, where the maximum of safety is to be attained.

WHAT MILL CONSTRUCTION IS NOT.

I. Mill construction does not consist in disposing a given quantity of materials so that the whole interior of a building becomes a series of wooden cells; being filled with concealed spaces, either directly connected each with the other or by cracks through which fire may freely pass where it cannot be reached by water. That is the common practice now named "combustible architecture."

II. It does not consist in an open timber construction of floors and roof resembling mill construction, but of light and insufficient size in timbers and thin planks, without fire stops or fire guards from floor to floor.

III. It does not consist in connecting floor with floor by combustible wooden stairways incased in wood.

IV. It does not consist in putting in very numerous divisions or partitions of light wood.

V. It does not consist is sheathing brick walls with wood, especially when the wood is set off from the wall by furring, even if there are stops behind the furring.

VI. It does not consist in permitting the use of varnish upon wood work over which a fire will pass with the speed of a race horse.

VII. It does not consist in leaving windows exposed to adjacent buildings unguarded by fire shutters.

VIII. It does not consist in permitting the storage of very combustible goods without protecting the ceilings with solid plastering, plaster board, or metal.

IX. It does not consist in leaving even the best constructed building in which dangerous occupations are followed without automatic sprinklers and without a complete and adequate equipment of pumps, pipes, and hydrants.

X. It does not consist in using any more wood in finishing the building after the floors and roof are laid than is absolutely necessary, there being now many safe methods available at low cost for finishing walls and constructing partitions with slow burning or incombustible material.

The importance of these suggestions will be understood if we reflect for a moment upon the vast aggregate of property values annually destroyed by fire. Mr. Atkinson says:

The waste of property by fire is increasing year by year, in undue proportion to the increase of property at risk. Last year's ash heap in the United States has been computed in excess of $150,000,000. In order to ascertain the true measure of the fire tax we must add to this some $60,000,000 to $70,000,000 as the cost of sustaining insurance companies, by which a part of the loss is distributed throughout the community. To this again must be added the cost of sustaining fire departments, which came to $25,000,000 some years ago, when I first investigated this subject. Thus the measure of this fire tax in the past year cannot have been less than $250,000,000. That is the penalty which we pay for ignorance, stupidity, carelessness, and crime, for which the responsibility must be distributed mainly among owners of buildings, though shared in part by occupants, architects, and builders.

### The Padrone Robbers.

The merciless exactions of the Italian padrones in our large cities, and some of the efforts now being made in Boston to suppress them, are described by Dr. Edward Everett Hale in *Lend a Hand* for June:

"The word 'boss' is none too honorable in its broader sense, but the boss of a working party who are taking up the streets may be a Christian gentleman of the type of Sidney. These Italian bosses have none of his duties. They are not the foremen who preside over the workmen or give them their directions; they are simply an avowed class of middlemen, whose intention it is to make as much money, on the one hand, from the contractors for labor, and, on the other hand, from the laborers, as they can squeeze out of either party.

"They do this in this way: They say to the laboring man, 'You must give me a bonus for finding work for you.' This bonus ranges from two to six dollars. They say, in the second place, 'When I have found work for you, you must live in certain tenements which I shall provide for you.' These tenements are of the lowest grade, while the rent is such as belongs to much more comfortable apartments. They say, in just the same way, 'You must buy your food at my shops;' the food also is of the lowest grade, and the price is much more than it is worth. The laborer is thus bound to the boss by all the ties by which, in the lowest regions of the South now, the poorest negro is bound to the person from whom he hires his land.

"After this miserable arrangement has been made, the boss, at his convenience, agrees with some contractor that he will furnish ten, twenty or forty workmen, and he does so. Very probably the contractor pays him $1.75 a day for the workmen, of which he pays to the workmen $1.50. The workman cannot help himself, and has to take what he can get. More likely, at the end of ten or twenty days, the workman is turned off by the boss, who by this time wants to hire other laborers who will pay him a new bonus or entrance fee. The laborer has no remedy against him.

"The so-called boss, having thus got the laborer pretty much in his power, establishes a bank, as he calls it. This is a place where he takes the money which these poor Italians wish to remit to Italy, and provides for them bills of exchange. Nobody knows how much he makes them pay for the exchange; and that is comparatively unimportant when one considers the other result, which is that three of these bankers have, this winter, abandoned the business of banking, and retired to parts unknown, with $90,000 which belonged to these poor people. Thus far legal remedies have been vain; so useless, indeed, that it is said that one of these persons, having apparently spent his share of this plunder, has come back to Boston and is about to attempt a similar enterprise again.

"It is almost inconceivable that such a tissue of fraud should have been woven under our own eyes here, among people who have, at least, the rights of dogs or monkeys if they have not the rights of men."

### Strawberries vs. Gout.

Strawberries have for a long time had a well-established reputation as a remedy for the gout. Dr. A. George, in the *Annales de la Société Horticole de l'Aube*, tells us that in the last century the great botanist Linnæus, who was gouty, had much cause to extol the action of the fruit in this disease. At this epoch, when uric acid was unknown, he had the prescience that the chemical cause of gout was identical with that of gravel, and he expressed himself in a picturesque manner to one of his friends when he wrote to him: "I have the gout and you have the gravel; we have married two sisters." The only method that Linnæus found of easing his gout was by an abundant use of this fruit, to which he has made a graceful acknowledgment in his writings.

### The Rifle Balls of the Future.

The reduction of the caliber of guns is necessarily accompanied with a diminution in the weight of the projectile. The length of the latter, in fact, cannot exceed a certain limit, beyond which it would no longer have sufficient stability in its trajectory. It would, therefore, be of considerable interest to have at our disposal, for the manufacture of rifle balls, a metal of reasonable price and heavier than lead. One of the metals upon which hopes may be founded, remarks the *Revue d'Armes Portatives et de Tir*, is tungsten. This metal, which is almost as hard as steel, has a density varying from 17 to 19·3, say one and a half times that of lead. By reason of such qualities, balls of tungsten, of equal dimensions, possess a power of penetration much greater than that of lead. Thus, a tungsten ball penetrates a steel plate 3 inches in thickness at a distance of 650 yards, while a similar one of lead penetrates a 2¾ inch plate at 325 yards only. The present obstacle to the use of tungsten is its relatively high price, but there are indications that this will soon be lowered to reasonable figures.

### NEW TOOL SHARPENER.

There is perhaps no better gauge of the ability of an artisan than the appearance of his tools after he has sharpened them.

Mechanics are not common who can sharpen a tool so as to give its smooth plane surfaces a correct angle and a clean edge. Recognizing this fact, Messrs. Ezra F. Bowman & Co., of Lancaster, Pa., have brought out a simple but effective device for holding tools of various kinds while being sharpened. This device, which is shown in the annexed engraving, consists of a yoke in which is journaled a roller designed to roll upon the surface of the stone on which the tool is to be sharpened, a post inserted in the yoke and capable of being adjusted to any desired angle, and a tool-holding clamp inserted in the end of the post and adjustable in a plane at right angles to the plane of rotation of the post. It will thus be seen that the tool may be readily adjusted to form any angle with the abrading surface. The milled nuts serve to clamp the parts in any desired position.

GRAVER, DRILL AND TOOL SHARPENER.

The collar on the tool clamp and the base of the post are graduated to permit of reproducing any particular adjustment

While this tool is more especially designed for sharpening jewelers' and engravers' tools, it is applicable to other uses.

It is particularly useful in sharpening gravers of various kinds, flat and twist drills, and many other small tools which, without the aid of this instrument, can be sharpened only with considerable difficulty.

### The Phonograph in the Class Room.

Professor McKendrick, of Glasgow University, carried out an interesting experiment in his physiology class one day recently. The occasion was the formal closing of the summer session, and the professor gave a practical demonstration of the ability of the phonograph to deliver the lecture which he had previously spoken into the instrument. The words were distinctly heard in every corner of the class room. Of late, suggests the *Christian Commonwealth*, such "demonstrations" on the part of noisy students have occurred and recurred in certain of the medical classes in the university that the suggestion to substitute the phonograph for the *personnel* of the lecturer may not seem altogether far fetched.

"HELLO! What do you want!" exclaimed a parrot the other day, when a robber entered an apartment house up town. The thief had adroitly seized some clothing and was making off with it when the voice of the bird called the occupant's attention to the intruder, who was quickly arrested and taken to the police station.

### Punches.

A large number of tests of punches of different forms were recently made by Mr. George S. Allen. The object of the experiments was to determine: (1) Which of the various shaped punches now in common use for punching iron and steel did its work with the least maximum pressure and the relation of unit stress to distortion as the punch passed through the plate; (2) the effect of clearance upon the power required by the punch; and (3) the effect of the form of punch and the amount of clearance upon the tensile strength of the punched plate. The results of the test may be summarized as follows:

1. A punch to work easily and not injure the metal should not be cupped out.

2. A double punch, that is, one which first punches a small hole and then reams it out by means of a shearing counter-punch, leaves the plate stronger, but requires at least twice the power necessary to run a flat punch.

3. The ordinary flat punch leaves the plate about 90 per cent as strong as a drilled and reamed plate.

4. A milled spiral punch is preferable to one which has the spiral cut in a lathe.

5. A single spiral requires less pressure than a double one, and leaves the metal about as strong.

6. A single sloping or whistle-shaped punch does its work with the least consumption of energy.

7. Between the limits of 0·01 inch and 0·05 inch clearance has no effect on the power consumed by a punch or upon the strength of the punched plate.—*Engineering.*

### Tests of Bullet-Proof Clothing.

An example of bullet-proof clothing, claimed to be equal to that of the famous German inventor, Herr Lowe, has been produced in this country. John F. Lennard is the inventor. An exhibition was recently given at the Imperial Music Hall, this city. Marksman Johnstone took his place on a platform in the center of the auditorium and fired at a corrugated steel plate with a Winchester rifle. Sixteen boards seven-eighths of an inch in thickness nailed together, with a seven-eighths of an inch space between each, were then placed before the steel plate. Two shots fired traversed the fourteen inches of pine wood and struck the plate.

Lennard, the inventor, then donned his bullet-proof shield, concave in shape. It covered less than a foot and a half square of his chest. With chalk a small bull's eye was made in the center. Johnstone aimed, and at the command of fire, given by Lennard, he discharged his rifle. Lennard trembled visibly as the bullet struck, but he was unhurt. As represented the act is certainly a remarkable one. Lennard declines to divulge the secret of his fabric. He asserts that, unlike Maxim's, there are no steel plates concealed in the shields, proof of which he will furnish by permitting their being tested by means of a brace and bit.

### How to Make Milk Sugar.

Prof. C. L. Penny, of the Delaware Experiment Station, gives the following:

The skim milk is heated in a suitable wooden or tin tank to about 120 deg. F. To this, for each 100 pounds of milk, one and one-half pounds of sulphate of alumina is added in the form of a hot solution. The curd precipitates at once or in a very few minutes. The clear whey is then separated from the curd by filtering through wire gauze. It is next heated to not less than 180 deg. and about one-fourth pound of powdered chalk to each 100 pounds of milk is added. The excess of sulphate of alumina is precipitated, together with some nitrogenous matter in the whey not precipitated by the first treatment. From this precipitate a perfectly clear filtrate may be obtained, the large part by simply drawing off, the last portion by filtering through duck filters. This clear juice contains sugar, some sulphate of lime, and still a small residue of nitrogenous matter. . . . To prevent foaming, which would greatly retard the work or cause a loss of much of the sugar, a treatment with ground oak bark, or its extract, has been found thoroughly effective.

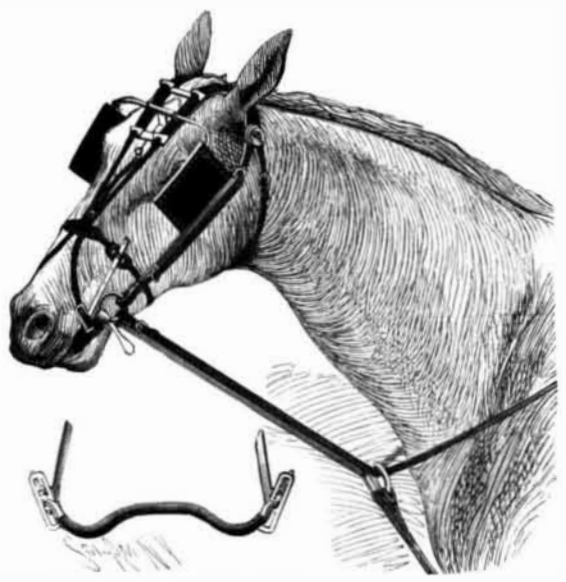
It is indeed believed to be, if not a necessary part of the process, at least one that will greatly facilitate it and diminish the loss. From three to four pounds of ground bark for every 100 pounds of milk is found to be enough. Instead of the ground bark, from two-fifths to one-half pound of commercial tanner's extract of oak bark is more convenient and equally sufficient. Bone-black also attains the same end, but it is not recommended on account of the time, trouble and expense of the treatment. The whey thus purified is boiled in a vacuum pan just as are sugar juices. The crude, almost black product is first boiled to prevent moulding and afterward purified by being redissolved, passed hot over bone-black till it is colorless, and again evaporated to the point of crystallization. The purified sugar must be dry to prevent moulding.

It is estimated that with this method about 65 per cent of the refined milk sugar in skim milk, or about 3¼ pounds of commercial milk sugar per 100 pounds of skim milk, can be recovered at a cost of about 13 cents per pound, which might be reduced with experience. The price of milk sugar during the year (1891) is quoted at 24 cents. The profit from working 5,000 pounds of skim milk per day, with milk sugar at 20 cents per pound, is calculated at $21.09; and with sugar at 15 cents, $12.96.

It is also believed that with actual experience the yield could be increased and the cost diminished from the figures given above, which are intended for the simplest form of plant, just such as is actually necessary to the profitable conduct of the business on a fairly large scale. The estimates are intended to be entirely safe and to overrate the expense and underrate the profit, rather than the reverse.—*Rural Pacific.*

### AN IMPROVED CHECK REIN SUPPORT.

The combined check rein support and winker stay shown in the illustration has been patented by Mr. Joseph Carter, of Blyth, Ontario, Canada, the overcheck bit being also shown by itself under the horse's head. This support for an overdraw check is designed to prevent the check rein from wearing or rubbing against the head of the horse, and the winker stay is so attached that the blinds or winkers may be readily adjusted at any desired angle to the animal's head. The support consists of a face cross bar of leather, or metal and leather, having felt on its inner side, and resting on the animal's face, where it is held by means of two side bars, preferably of spring steel, leather covered. The bars are curved so as not to touch the animal's face, and their upper ends are attached to the crown strap of the bridle, which may also be of felt or similar material on its under side. There are loops or sockets, each with friction rollers, on the side bars, through which pass the rearwardly extending members of the overdraw check, rendering it very sensitive to every movement of the horse's head. The winker stay consists of a rod with a shank adjustable by a set screw in a slideway in the central portion of the face bar, the rod having in its ends sockets in which the wires constituting the frames of the winkers are conveniently adjustable.



CARTER'S CHECK REIN SUPPORT.

### Explosion of a Silvering Mixture.

Sanderson Drury, a youth of 18, was nearly blinded recently by the explosion of a mixture of nitric acid and mercury. Drury had a brass watch chain, and he was anxious to turn it into silver. He learnt the secret how to do this from one of the itinerant lecturers who attend Shipley Market, and he paid a visit to a chemist and purchased a mixture of nitric acid and mercury, which was supplied to him in a bottle. He had not gone far from the shop when the bottle was blown to pieces, the glass and the acid striking Drury in the face. At first it was thought by bystanders that the youth was killed. They conveyed him to the hospital, where Dr. Foster found that there were serious injuries to the eyes and face. The usual remedies were applied and the patient is going on as well as can be expected, although he has not yet regained his eyesight.—*Yorkshire Evening Post.*

### Artificial Silk.

The process of producing "artificial silk," invented by Dr. Lehner, was shown to a party of scientists, etc., at Bradford recently. Waste cotton, wool, jute, or other suitable material is reduced to an emulsion by means of a mixture of nitric and sulphuric acids, when it is formed into threads by forcing it through glass tubes of small bore, and is passed over a series of rollers and wound in the ordinary way on bobbins. Before the artificial silk is used in manufactures, or is sold, it is denitrated to destroy the explosive properties, and is also rendered uninflammable, which will render it suitable for many purposes, especially as it is said to resemble real silk very closely.