SCIENTIFIC AMERICAN

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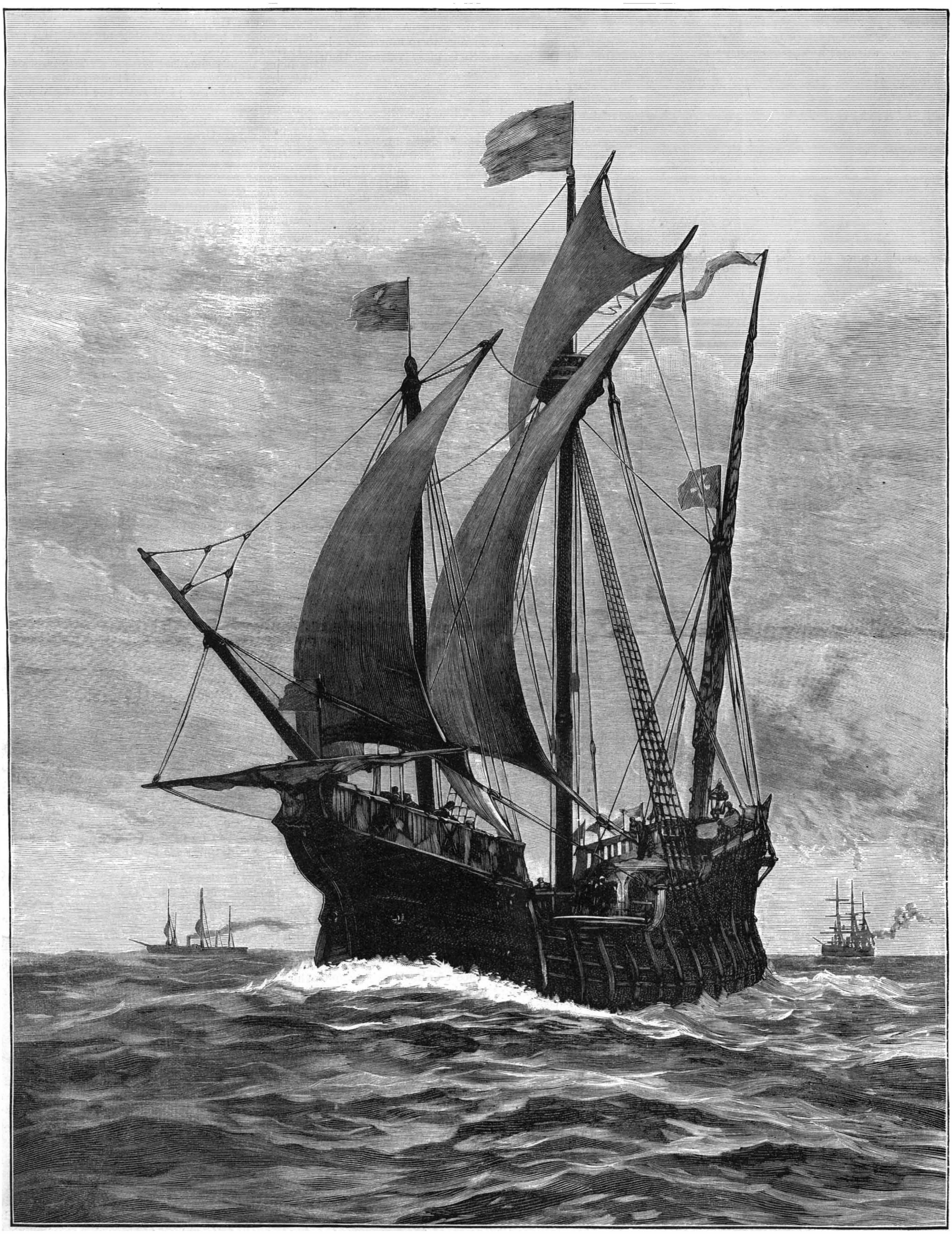

THE NEW SANTA MARIA, REPLICA OF COLUMBUS' VESSEL, WHICH IS TO BE SAILED ACROSS THE ATLANTIC.—[See page 245.]

Scientific American.

ESTABLISHED 1845.

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NEW YORK, SATURDAY, OCTOBER 15, 1892.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 876.

For the Week Ending October 15, 1892.

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THE COLUMBIAN CELEBRATION OF OCTOBER, 1892.

When this paper reaches our readers, New York will have been the scene of one of the most impressive spectacles it has ever been her fortune to witness. The four hundredth anniversary of the discovery of America by Columbus will have been signalized by parades on land and water, by exhibitions, by decorations of buildings, by meetings of societies and by all the means employed to commemorate great deeds. In a practical age and in the midst of a practical nation, one distinctively of modern times, it is a good sign to see the entire populace alive to the great deeds of preceding centuries. What America lacks is full association with the past. Compared with the European countries, she seems but a modern creation. But in this commemoration of Columbus' work, America asserts her rights in the past, lays claim to an inheritance in the story of the ages which is more valuable than much that Europe can claim.

The story is so picturesque; the departure of the three ships on the ocean, ships which to-day would be deemed unseaworthy, bound, like Hiawatha, "westward, westward;" the weary voyage, the dissensions of the mariners, the encouragement derived from the sea drift which was encountered, the landing at the end of the three months' voyage, is an epitome of all that is best and most courageous in man. In those three months the destiny of a great continent was disposed of, and the history of the world was modified.

America, in the last four centuries, has led the world in many things. In material progress, the increasing rapidity of her development has been without parallel. In old times the civilization of a country was a slow process. The requisite increase of population, the replacing of savage or semi-savage customs by more advanced ones, was a work of time. But here the work, slow at the beginning, has gone on with accelerated speed. Three centuries nearly lapsed before the scattered settlers of the colonies defied and conquered the most powerful nation of Europe. The country for half a century more was lighted at night with candles and whale oil; its mails were transported by stage and horse; its roads were almost impassable in winter; its methods were still of the past.

Within the lifetime of many the new era began. A few experimental railroads, to be operated by horse power, were built. An engine was tried on one of them. The seed germinated, and within a generation the great area is covered with a network of railroads.

Next some scientists begin experimenting with electricity. The entire subject excites but little interest. When Congress is asked for an appropriation, it is but grudgingly granted. The message, "What hath God wrought?" goes down the wire, and, after a few years, the railroads are paralleled with telegraph lines.

There was no question of replacing old established stage or diligence lines with railroads. The carrying of the mails over districts a few hundred miles in extent was not the issue. An area large enough to constitute a continent was to be the scene. The lines were to go through wildernesses and over deserts. The lives of the builders were to be sacrificed to the savage aborigines before the great work could be done. And with all the difficulties the older countries may be fairly allowed to be defeated in the race. Columbus' achievement in its enterprise and daring and in its success was a pledge of the work which has since been done in the land he sailed to.

Looking over the busy scene of enterprise, there are feelings of regret to be mingled with admiration. The civilization of America means the extermination of entire races of mankind. The Northern Indians, human beings, who might have been a most important factor in their own land, have succumbed, and have almost disappeared. Their condition was well within the limits of the savage, yet they were intellectual, and were susceptible of training. The Christian missionaries to Great Britain were moved to effort, it is said, by the sight of British slaves on sale in the markets of Rome. To-day the same race has left its imprint on the entire face of the world, and shows the greatest powers of persistence of almost any people. It would seem that something might have been done with the thousands of Indians whose doom was sealed when Columbus set sail from Spain.

In the south most interesting civilizations have disappeared. Yucatan yields to the explorer ruins that indicate civilization probably as advanced as that of Egypt. The Incas of Peru seem to have been on the same high level. Yet all has disappeared, and Columbus led the way for the Caucasian army, which now holds sway over the entire hemisphere.

The celebration in this city is but a part of a year of celebration, which began last August in Spain and will end at Chicago in the Columbian Exposition. Not the least of the good effects will be the study of the life and times of the great discoverer, and the placing of his character upon a firm and authentic historical basis.

Elsewhere we describe some of the features of the work of the ensuing year and of the reproduction of the ships and of their old-time voyage. The future may see more imposing celebrations, but another century must elapse to give an equally important era.

The Mineral Oil Industry of Scotland.

At a recent meeting of the Federated Institution of Mining Engineers, at Shelton, a paper by Mr. Robert Thomas Moore, on "The Mineral Oil Industry of Scotland," gave a brief notice of the progress and present position of the industry of shale distilling. It included descriptions of the geological and stratigraphical positions of the various seams of shale worked, including the now exhausted Boghead mineral, which yielded 2,337,932 tons in 1891, almost entirely from strata in the lower carboniferous or calciferous sandstone series; the methods of working, the machinery for breaking, and the distilling apparatus for crude oil; the subsequent refining operations being omitted, as being mainly chemical processes. The position of this branch of manufacture, in spite of the constant improvements in the yield from the material by the introduction of more exact methods of working, is, unfortunately, very unsatisfactory from the commercial point of view. Originally burning oil, which was the sole product, sold at 3s. per gallon, and the trade was a very profitable one; but, principally from the competition of natural American and Russian oils, the price has fallen to less than 6d. per gallon; and, although the yield has been supplemented by other products, such as paraffin wax and sulphate of ammonia, the business is not profitable, the price of the raw material and coal having so risen by the increase of 40 to 50 per cent in miners' wages that only a few of the companies have been able to avoid loss in working. The contrast between the original and the present condition of the trade will be seen in the following figures, giving the yield of products per ton of shale treated at the same works. In 1877 they were 30·499 gallons of crude oil and 17·37 pounds of sulphate of ammonia, together worth £1 3s. 2d.; while in 1891, 25·1 gallons of crude oil, 1·73 gallons of naphtha, and 27·23 pounds of sulphate of ammonia only realized 13s. 2d.; the price of the latter having declined from £17 5s. 6d. to £10 7s. 1d. per ton.

Oxyphenine.

This dyestuff makes its appearance in the form of a light yellowish brown powder, which is slightly soluble in cold, but more easily in hot water, to a dirty yellow solution. Alcohol produces a brownish yellow solution; sulphuric acid dissolves it, forming a brownish scarlet solution, which, on diluting with water, turns lemon yellow; hydrochloric acid and caustic soda throw down from aqueous solutions dirty reddish yellow precipitates. Oxyphenine is a direct color dyeing unmordanted cotton from a boiling bath containing soap and salt, going on evenly and easily, 3 per cent giving a deep golden yellow shade, while 1 per cent dyes a fine canary yellow. One merit of the dyestuff is that the dye bath is nearly exhausted, whereas with other yellows of this group much of the coloring matter remains in the bath.

On silk oxyphenine dyes from either a salt or acid bath, giving shades the same as those on cotton; half silk may be dyed in a simple salt bath. Wool may be dyed from either a salt or weak acid bath, but the shades have a more olive tone than those obtained on either cotton or silk. The color is turned a shade redder by strong acids; strong caustic soda has very little action, turning the tint a shade redder, but weak solutions have no action. Soaping has not the slightest action on the color, whether on cotton or wool, so that oxyphenine may be used on goods which have to be milled. Light appears to have little action. Swatches which have been exposed to the sun and air for three weeks show no sign of fading. Oxyphenine may, therefore, be classed among the fastest yellow dyestuffs at the disposal of the dyer. Oxyphenine may be used in calico printing, giving good yellows when printed on with the aid of soda crystals and a starch-gum thickening. A better plan still is to print on a color containing acetate of alumina, acetic acid, and a starch-gum thickening, the color being faster to soaping by this method than with the last. It may be also applied by padding.—*Dyer and Calico Printer.*

THE new twin-screw steamboat Richard Peck, built by the Harlan & Hollingsworth Company, at Wilmington, Del., for the New Haven steamboat line, made 20¼ miles an hour on her trial trip recently. The boat is 316 feet long over all, 48 feet beam over guards, and has a depth of hold of 18½ feet. Her horse power is 4,000 and her gross tonnage is 2,906. She was designed by A. Cary Smith.

UNINFLAMMABLE PETROLEUM.—Numerous processes have figured of late in the patent list whereby it is claimed that petroleum could be rendered inexplosive and also uninflammable. One of these consists in adding to about forty gallons of petroleum two pounds of copper sulphate and stirring the whole well. After about six hours standing the oil is ready for use.

Sixth Edition of Dana's "System of Mineralogy."

The appearance of the successive editions of Prof. Dana's "System of Mineralogy" has been coincident with phases of mineralogical progress, which has made each of them not only symptomatic of a scientific era, but its reflection as well. They have, therefore, illustrated the changing conceptions of the mineralogical mind as a whole, and this cosmopolitan and liberal and practical tone recommended them to the high position they have attained as the *ex cathedra* utterances of the mineralogical faculty. In their *technique*, so to speak, they have shown the most practical and skillful arrangement of details, and their erudition has been equally remarkable and helpful. But they have also assumed the more important function of contributing original views as to the fundamental construction of the science, and this has resulted in a certain grandeur in their breadth of composition and an unmistakable forcefulness and completeness in their assertions. In the words of an English critic, "It is not too much to say that the publication of each successive edition of this work has constituted an epoch in the history of mineralogical science." When we turn back to the edition of the "System" in 1837, and open in succession the subsequent issues, we encounter one of the interesting phases through which all branches of science have passed and which persists in a diminishing degree to-day, viz., the elaboration of its nomenclature. Too much weight cannot be given to a system of nomenclature by which the designations of the separate species are firmly determined, and the terms of their description defined; but the scope and significance of nomenclature is given a deeper importance if we extend its meaning to the classification of species, their grouping, ordinal and family arrangement. Such a problem confronted mineralogists in 1830, and, somewhat dazzled by the unexpected and euphonious results flowing from the binomial system and the groupings of genera, families, orders and classes in botany and zoology, and anxious to confer upon this science the benefits of a device which seemed the apposite reflection in language of the measures and delimitations of nature, they undertook, under the leadership of Mohs, to arrange the mineral species according to a mingled consideration of their physical and chemical composition, and with this system Dana, in 1838, combined a peculiar and original scheme of binomial titles.

Few perhaps of the younger mineralogists and none of its latest students may be familiar with this very bold and independent effort, and the occasion of the appearance of the sixth edition of this great work seems an appropriate time to recall some of its details. It has an indelible interest as associated with the history of the science, and a still greater intellectual interest from the fact that Prof. Dana has gradually eliminated it as a whole, while preserving not only traces but representative parts of its more lucid and scientific features, features always co-ordinated with the chemical properties of minerals.

Prof. Dana, in introducing this "New Mineralogical Nomenclature" before the scientific world, said in his paper before the Lyceum of New York, in March, 1836, alluding to the system of Mohs, which he accepted: "In this arrangement M. Mohs has not wholly relied upon chemical characters, the exclusive adoption of which would have degraded mineralogy from the rank of an independent science, and merged it in that of chemistry; nor has he depended on physical characters solely; for although the latter are more especially employed, the author has throughout been guided to a certain extent by that important source of physical characters, viz., chemical composition. A cabinet arranged according to the system of Mohs presents, with remarkable clearness, a chain of affinities running through the whole, and connecting all the several parts. The *gases* and *liquids*, with which the arrangement commences, are followed by the *salts*, so disposed as to present an increase in stability, hardness, and luster, as the eye proceeds onward. Among the *gems*, we arrive at the diamond, in which these characters reach their climax. Then, descending in the series, we gradually pass through the *metallic oxides* to the *native metals*. In these the light-colored species are followed by the *sulphurets* and *arsenides* of similar color and luster, which are succeeded by the dark-colored metallic sulphurets; and these pass insensibly to the sulphurets without a true metallic luster. From the latter there is a natural transition to *sulphur*, and its close allies the *resins* and *coals*, with which the series terminates."

The minerals or mineralogical elements were grouped under the *Epigæa*, which included the fluids and all soluble minerals whose formation is now going on, the *Entogæa*, embracing those which occur in rock strata, and the *Hypogæa*, or those so deeply embedded in the earth's crust as to justify the appellation of buried. It was in the *Entogæa* that the larger number of the mineral species were placed. The *Epigæa* embraced gases, water, and soluble salts, as borax, alum, common salt, the alkaline salts, and the soluble secondary metallic salts, as copperas, blue and white vitriol, while the *Hypogæa* received the coals, bitumens, oils, etc. These classes were again subdivided into orders, and these again into genera, and each mineral species received a binomial name under its appropriate genus.

A few examples of orders and genera from all these classes will illustrate the system without entering more minutely into details of the method.

In *Epigæa*, or the mineral substances found upon the earth, we find two orders, the *Rheutinea*, or fluids, including two genera, *Aer* and *Aqua*, and the *Sterinea*, or solids, containing the genera *Acidum*, *Borax*, *Alumen*, *Natron*, *Sal*, *Picralum*, *Nitrum*, *Vitriolum*, and *Gœlum*. These genera were separated by considerations based upon chemical composition and upon hardness, gravity, and especially taste, as *weak sweetish alkaline*, *styptic*, *alkaline*, *purely saline*, *saline and bitter*, *cooling and saline*, *astringent and metallic*. The binomial scheme was applied in the following manner:

GENUS PICRALUM.

H.—1·5—2·5. G. 1·4—2·8. *Taste saline and bitter.*

P. glauberi.....Glauber's salt.
P. thenardianum.....Thenardite.
P. rhombicum.....Epsom salt.
P. reussii.....Reussite.
P. volcanicum.....Mascagnine.
P. vesuvianum.....Aphthitalite.
P. octahedrum.....Sal ammoniac.
P. deliquescens.....Nitrate of magnesia.
P. tenellum..... " " lime.

To the *Entogæa* were assigned, separated by hardness, gravity, luster, and streak, some eighty-two genera, and in looking for their determinative elements we find that they may comprehensively be grouped under chemical composition, chemical properties, as fusibility; physical features, as color, cleavage, luster; crystalline form or condition, as crystallized, massive, lamellar, etc.; geological accidents, as place of occurrence, volcanic, etc.; and associations, as granitic, etc. This system not only brought many mineral species into groups whose affinity is unquestioned to-day, and which are retained together, and must be upon any scientific basis of classification, but it also gathered into one genera very discordant neighbors and forced upon essentially distinct minerals a purely arbitrary and fictitious relationship.

Thus, under the order *Hyalinea*, so called from the high glassy luster possessed by its representatives, we find the genus *Hyalus* divided as follows:

H. bicolor.....Iolite.
H. acutus.....Axinite.
H. rhombohedrus.....Quartz.
H. opalinus.....Opal.
H. vulcani.....Obsidian.
H. sphærulus.....Sphærulite.
H. ferriferus.....Isopyre.

There was thus produced here a mixture of oxides, sub and uni silicates at the dictation of an extraneous fact, viz., luster; which, however correlated to density or molecular state, failed to express the esoteric principle which, in the philosophy of nature, establishes a truly natural classification in minerals. That esoteric principle was chemical *make-up*, which to-day rules the science and has shed such an abundant light over its dark places as to enlist it among the most finished and most rational sciences of our age. Chemical composition has been found to be the co-ordinating principle which enters most profoundly into all the varied aspects of minerals and binds into certain necessary sequences crystalline form, hardness, luster, and optical characters.

The third class of Dana under this system was the *Hypogæa*, or those so-called buried minerals. In this there were two orders, *Pittinea* and *Anthracinea*. Under the first were gums, bitumens, resins, and under the latter coal and graphite. The recent large extension of the hydrocarbons could not have enjoyed its present comparatively intelligent arrangement if a system of color, translucency, etc., as here adopted, had been retained. Among these organic products, as among the inorganic species, chemistry was alone able to disperse the confusion of discrepant groupings and give to the mineralogist the guidance of her dictum as to their genealogy and kinship.

The affinities of chemical composition was the Ariadne thread which led the mineralogist through the Dædalian labyrinth of mineral species, or perhaps, less strainedly, it was the standard of reference by which they were given their natural positions. To the chemical law Prof. Dana has more and more closely adhered, while he has in this last work advanced along the line of chemical chronology and inspected, in the difficult compounds formerly classed as margarophyllites and in the micas, under the suggestions of Tschermak and Clarke, the perplexing questions of their generation from some fundamental hypothetical molecule.

This chemical plan has separated the aggregate of mineral species into native elements, arsenides, sulphides, antimonides, sulph-arsenides, sulph-antimonides, and other alkaloidal unions, into the oxides, hydrous and anhydrous, the silicates, uni, bi and sub, with later modifications introduced in this sixth edition, the hydrous silicates and the oxygen salts, as carbonates, tantalates, columbates, sulphates, etc., a system practically maintained to-day, with changes more or less material in their succession and interpretation.

In the fifth edition, based upon this plan of chemical reference, Prof. Dana attacked the momentous question of synonymy, and forced upon the science a unifying device of substantive terminations, the classic if not somewhat monotonous *ite*. The review of this section of the subject by Prof. Dana in the fifth edition was very explicit and frank.

When we compare the last, sixth, edition with its immediate predecessor, we find that the science has greatly enlarged its material scope and has also changed some of its points of view. With the growth in the number of species there have been attendant consolidations of species and reference of former species to varieties. There is also shown the evidence of new light or at any rate new conceptions in the treatment of the silicates, and, to a large degree, the groupings have been rearranged, while the succession or sequence of groups and divisions has been extensively altered. The fundamental plan of the fifth edition has been adhered to, and it would be difficult to devise a method and typographical treatment more expressive and convenient.

In the place of the bi, mono and sub silicates with the hydrous silicates, more or less hypothetically separated under these three sections, we have the di, poly, meta, ortho and sub silicates. The disilicates are salts of disilicic acid, $H_2Si_2O_5$, and have an oxygen ratio of silicon to bases of 4:1, and are represented by *petalite*; the polysilicates are salts of polysilicic acid, $H_4Si_3O_8$, and have an oxygen ratio of 3:1, and are represented by the feldspars; the metasilicates are salts of metasilicic acid, H_2SiO_3, and have an oxygen ratio of 2:1, and are represented by *pyroxene* and *amphibole*; the orthosilicates are salts of orthosilicic acid, H_4SiO_4, having an oxygen ratio of 1:1, of which the garnets are representative; and, lastly, the sub-silicates, in which the oxygen of the bases exceeds that of the silicic acid. The system has many exceptions, and seems hardly to introduce any chemical conceptions or aid in the realization of the facts of nature more clearly than the old method, which regarded the excess of silica (as would be the case in the di and poly silicates of this system) as unsaturated acid of the ordinary type.

The species *titanite*, *keilhanite*, *guariuite*, *astrophyllite* and *perofskite* are considered titano-silicates, and are placed at the end of the silicates, between which and the niobates, tantalates, etc., they form an interconnecting link or at least are regarded as doing so. The carbonates precede the silicates, and quartz, which formerly ended the oxides, now, by a natural precedence, leads the list. A few substituted names or combined species for older ones strike the eye. Naselite replaces nasite, raimondite covers apatelite, lazurite replaces lapis lazuli, pinite is added to muscovite, tennantite is combined with tetrahedrite, salite takes the place of salilite, bastite or Schiller spar is put under hypersthene, iadeite receives a much fuller treatment, klipsteinite is put under rhodonite, kupfferite under anthaphyllite, gieseckite under nephelite, as a long-supposed alteration product of that species. The investigation of Klein into the double refraction of garnets is incorporated, and the optical anomalies of other species, as explained by this author, also noted. Humite is separated from chondrodite, with a new species, clinohumite (1876). These three species are discussed together. Phlogopite is appended to biotite and also lepidomelane. The treatment of columbite is much expanded. Gummite and uraninite are placed under the uranates. The so-called perofskite of Magnet Cone, Arkansas, is made a titano-niobate of calcium and iron and placed under the name dyslanotite.

The crystallographic part of the system has been extensively revised. Nearly all of the 1,400 figures are either newly drawn or are new drawings of old figures, the angles of fundamental forms have been traced to the original authorities, and from them the axes have been determined by calculation, and the angles recalculated of the more important and common forms. The numerous interpolations of new species has displaced the old species from their numeral position, as well as their rearrangement. The vast amount of mineralogical investigation which has accumulated in recent years has been examined, and its substantial and permanent results given.

The sixth edition of Dana's "System of Mineralogy" places the science of minerals in a unique position, for it furnishes the student with a text book which is practically a complete repository of all that the science contains.

L. P. G.

Horse Power of Locomotives.

According to the *Railroad Gazette*, there are many cases in which 1,000 horse power and more has been exerted by locomotives. Indicator cars of Strong locomotive 444, drawing a 370 ton train at a speed of nearly 60 miles an hour, show the horse power to have been from 1,369 horse power up to 1,810 horse power. Cylinders, 20 × 24 inches; 62 inch driving wheels. Weight, 138,000 pounds, of which 90,000 pounds on driving wheels. Piston speed, 1,304 feet per minute. It is believed this power has not been exceeded.

Printing of Woolen Tissues.

Of late years the printing of woolen tissues has developed to a very great extent and has become a by no means inconsiderable branch of the textile printer's art. Consequently printers are giving much attention to it, and the printed tissues have become favorites with the ladies, who, after all, exercise a considerable influence, by creating the demand for certain textile fabrics, in developing the production of those fabrics.

There is no doubt that the great development which has of recent years taken place in the production of coal-tar colors and the many brilliant and fast dyestuffs now at the disposal of dyers and printers have contributed much toward the increased attention which has been paid to woolen printing. The woolen printer is enabled by their means to produce his effect with great ease, and with successful results, and in these respects the coal-tar colors offer superior advantages to the older natural dyestuffs. The use of these in printing presented many difficulties, and only a limited number of colors and shades could be produced by their means.

It is now customary to prepare woolen cloths which are intended to be printed on by a passage through a bath made with bleaching powder and hydrochloric acid. Dyes printed on cloth thus prepared with chlorine give colors which are much more intense and are faster than if printed on unprepared cloth. Still, although the colors obtainable on chlorine-prepared woolen tissues possess a sufficient degree of brilliancy, deft, and fastness, there are other points in connection with the prepared cloth which are not so satisfactory; thus the cloth may take a yellow tone and a harsh, unpleasant feel, and often is rather brittle. All these things are undesirable, and are no doubt due to an over-oxidation of the woolen fiber, which is not always easy to prevent. In a paper lately communicated to the Society of Dyers and Colorists, Mr. E. Lodge has shown that, by a careful regulation of the strength of the chlorine baths, this over-oxidation of the woolen fiber may be avoided and the cloth left white and comparatively soft, although its attraction for coloring matters is not less than in over-oxidized woolen cloth.

Mullerus has lately suggested another principle. One defect of the chlorine method is the harshness which is imparted to the woolen cloth. Now printing can be considered simply as localized dyeing, and as the color is thus produced in places on the tissue, Mullerus considered that the oxidation of the fiber might also be produced locally and in the places where required by the design printed on the tissue. To carry out this idea he mixes the ordinary printing color with oxidizing agents like chlorate of soda, barium peroxide, etc., with excellent results so far as regards brilliance, intensity, and fastness of color, while the harshness of the fabric is prevented.—*Dyer and Calico Printer.*

Disinfection by Means of Sulphur.

We do not think that sufficient publicity has ever been given to the remarkable experiment made at Detroit, during a severe epidemic of diphtheria and scarlet fever, in checking the spread of the disease by disinfecting the sewers with sulphur, tons of which were burned in them. The experiment seems to have been signally successful. Of course, it would be rash to infer, from a single trial, the causal connection of things which may possibly have been simply coincident; but it is certain that as soon as the sewers had been saturated with the fumes of the burning sulphur, the epidemic declined rapidly, and both diphtheria and scarlet fever soon disappeared. The probability that cholera will make its appearance next summer in at least some of our large cities suggests the propriety of adopting this simple and inexpensive precaution, in case of the introduction of the epidemic into any sewered town. Every one knows that the fumes of burning sulphur form the most potent of disinfectants, and cholera would, in our cities, probably spread more rapidly through the sewers than in any other way. It will be remembered that at Croydon, after the introduction of sewers, typhoid fever, which had previously been endemic in the lower parts of the town, but was almost unknown in the upper regions, inhabited by the rich and well cared for people, suddenly appeared in an alarming form in the upper quarters, as if the new sewers had conducted the contagion from the abodes of filthy misery to those of wealth and cleanliness. The same thing may be expected to happen with cholera germs, which, if once introduced into the sewers, would, if they will float in the air when dried, which seems to be the case, have plenty of opportunities to escape through street ventilators, dry traps and leaky soil pipes, all over the city. The saturation of the sewers at short intervals with sulphur vapor would destroy the germs contained in them, and, it would seem, do much to localize any sporadic case, or group of cases, while no harm could be done by the operation. Indeed, the principal homeopathic prophylactic against Asiatic cholera is sulphur; so that the inhalation of a few stray fumes, although perhaps unpleasant, ought to make the person into whose nose they accidentally penetrated feel himself doubly protected.—*Amer. Architect.*

A FAN ATTACHMENT FOR ROCKING CHAIRS.

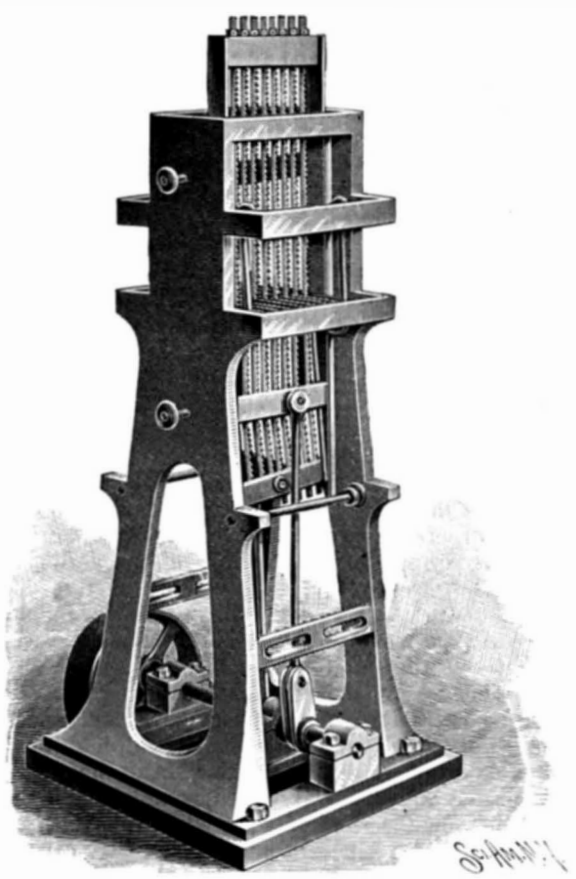
This is a device to be applied to a platform rocker, and, as one rocks backward and forward, a continuous rotary movement will be imparted to a fan held above the occupant of the chair, affording a constant and refreshing current of air. The improvement has been patented by Mr. Horace M. Baker, of No. 203 Macon Street, Carthage, Mo. The larger view shows the application of the attachment to a chair, parts of which are broken away, while the smaller view represents the details of the mechanism. At the back of the platform is

BAKER'S ROCKING CHAIR FAN.

the drive shaft, a crank arm on which is adjustably connected with a pitman whose upper end is pivoted on the back of the chair. On the drive shaft are also two other crank arms extending in opposite directions, each being connected by a rod with the crank arm of a different segmental gear on another shaft, so that, when one segmental gear is rotated downward, the other has an upward direction. By means of loose pinions, a ratchet wheel, and spring-pressed dogs, these opposite movements are made to impart a continuous revolution to a central shaft journaled in bearings transversely of the platform. On the outer end of this shaft is a crown wheel or gearing meshing with a pinion on the lower end of an upright fan shaft journaled at one side of the chair, the fan shaft carrying on its upper end a fan, the blades of which may be made, if desired, to open outward as a person is seated, and automatically fold down around the shaft when the chair is vacated. The fan shaft may be also entirely removed from the chair. With this attachment in position, the fan is kept constantly in motion while the occupant of the chair continues to rock.

AN IMPROVED GANG SAWMILL.

The gang sawmill shown in the illustration, although it may be adapted for sawing different kinds of material, is especially designed to saw shingles, operating two gangs of saws in such a way as to saw up an entire bolt at one operation, without waste of stuff, the saw gangs being independently adjustable in relation to each other to give the desired pitch or bevel to the shingles. The improvement is the invention of Mr. William T. MacRey, of Vancouver, British Columbia. Each frame, with its gang of saws, is reciprocated in the standard by a pitman, connected with a crank on the driving shaft, the frames being arranged in their guides so that the wear may be readily taken up. One saw frame slides vertically in the standard, and just behind it the other saw frame slides in inclined guides, so that its saws will be at a slight angle to those in the first frame, the guide frame being quickly and accurately adjusted by the set screws projecting through the sides of the standard. In operation, one frame goes up while the other goes down, the vertical saws cutting the bolt into straight strips and the oblique saws then cutting these straight pieces to the desired pitch or bevel. At a convenient height for the insertion of the bolts to be sawed the standard has projecting portions, one above the other, which form supports for upper and lower feed bars, adapted to move back and forth at right angles to the saw frames. These feed bars have teeth in their faces to engage the bolt, and move toward each other to clamp it in place, reciprocating to feed the bolt through the machine, the lower feed bars being lifted upward and thrown forward, while the upper ones are thrown downward and forward. The inclined guides may be arranged vertically if desired, so that the bolt may be sawed into staves of uniform thickness. It is said that this sawmill, cutting shingles, will cut from three hundred to four hundred thousand per day of ten hours.



MACREY'S GANG SAWMILL.

This improved mill is being placed on the market by the MacRey Patent Gang Mill Co., of Vancouver, Toronto, and Buffalo.

Rubbers.

I know it is the custom and the habit to sneer at rubbers. It is the custom and the habit to say: "Why don't you give us something that is good for something?" We give you, gentlemen, just what you called for. I will guarantee that in my mail (and we average perhaps a hundred letters a day) there is not one letter out of 5,000 which says: "What is the best thing you have got?" but it says: "What is the cheapest thing you have got?" Now, when you ask for the cheapest thing, we are going to give you lampblack and whiting and resin, and everything else that will make the goods cheap. When you turn around and say: "Give us good rubbers that will pull and stretch and hold," and pay for them, we will give them to you; and we won't give them to you until you do ask for them.

We are glad to see you gentlemen here as representatives of the trade. No gentlemen can get together in any one line of trade and rub their heads and ideas together without imparting knowledge to one another. We take more in by absorption than by reading and study.

I want to say to you, gentlemen of the national association, that if you never accomplish another thing, the fact of your establishing what is recognized throughout the United States, and almost throughout the world, the standard measurements, is a monument to your enterprise and your energy. There is not a manufacturer now that goes to work to make shoes but what consults that standard. It is the standard. There is no standard among us rubber fellows. I expect you will go for us next. But that is a very difficult thing to accomplish, more difficult than you have any idea of. You sell a woman a pair of shoes, 4 D, and you think a 4½ rubber ought to fit her. Perhaps it will and perhaps it won't. If it is a grain button boot, it won't fit. If it is a square edge, it won't fit; if it is a bevel edge, it will. Then you want to recollect that the lasts upon which the rubbers are made are put into a heater. They are all supposed to be made out of upland maple. Well, these dear countrymen get the maple out for us, and sometimes we find a good deal of swamp maple in it. That is put into a heater, 268° F. The heat will affect one piece of wood in one way and another piece in another.—*W. L. Sage.*

Storage Battery Monopoly.

After a struggle lasting for about ten years, beginning in the Patent Office and carried successively through the United States Circuit Courts in several States, the United States Circuit Court of Appeals on the 4th inst. handed down a decision sustaining the decree of Judge Coxe rendered in July, 1891, in the suit of the Brush Company against the Electrical Accumulator Company. The sole right to use storage batteries with the active matter mechanically applied is now owned by the Consolidated Electric Storage Company, the licensees of the Brush Electric Company. Consequently, this decision gives to the Consolidated Electric Storage Company a monopoly of the storage battery business throughout the United States for a period of over ten years next ensuing.

The Electrical Salesman.

Perhaps no other industry has developed so many peculiar conditions surrounding the disposal of its product as has the electrical field. A unique genius is the fruit of this set of conditions. The genius is known as "the electrical salesman." The causes for his being have been natural only to a certain extent. There were things, peculiar things, to be disposed of by barter and trade to the people, and some one had to be found to do it. The electrical salesman was not born—he has evoluted.

In ancient days, ten years ago, the difference between the office boy and the electrical salesman was merely one of age; each knew about as much regarding electrical apparatus and its sale as did the other. But as the business grew, conditions arose which acted as the pyro solution on a photographic negative—they developed. Existing manufacturing companies attained greater proportions, alliances with other companies were made, contracts were drawn up, subcontracts were let and relet, territories were defined, cut, recut and defined all over again, price lists changed nearly every hour, and at last combinations, consolidations, and complications (for the salesman) were effected, bringing us down to the present day, and all the time competition kept getting keener. During this tremendous advance the factories were belching forth thousands of tons of all kinds of electrical apparatus, which must be disposed of. It was then that the electrical salesman began to evolute. He was the all-important medium between producer and consumer, employed to tell the merits of apparatus to the buyer and to report defects, as they came under his notice, to the manufacturers, that they might apply the remedy.

The electrical salesman, in all truth, has been *the* factor on the commercial side of electrical development: he is the king pin of the electrical car of progress. He has been maligned, insulted, given the lie, and generally maltreated by the public at times, but only at times, because he has many friends, and deserves more. It is only the absurd few who do not understand his genius that have abused him, and even these few, we dare say, will change their opinions of him ere long.

There are many electrical salesmen who hold responsible and valuable positions to-day, all owing to the experience acquired during their evolution. These will move up higher and others will follow along after them. It is probably true that nine-tenths of our electrical brethren have been or will be salesmen before they die.

To be the *beau ideal* of electrical salesmen, a man should begin with perfect confidence in himself, supreme assurance as to his certainty of victory, and a *quantum sufficit* of technical knowledge. In addition, he must possess the detective's instinct in ferreting out "jobs," the reporter's "nose for news," so that he will know a customer when he sees one, an ability for making and keeping friends, good conversational powers, the wiles of a diplomat, the silver tongue of an orator, and the sincere and convincing arguments of a practiced debater. And he must be always resourceful and ready at any and all times to have recourse to expedients to overcome his competitors. As we said before, an electrical salesman is not born with all these attributes of genius, but he assimilates them as he evolutes and ends by surprising himself at his own abilities.—*Electrical Review.*

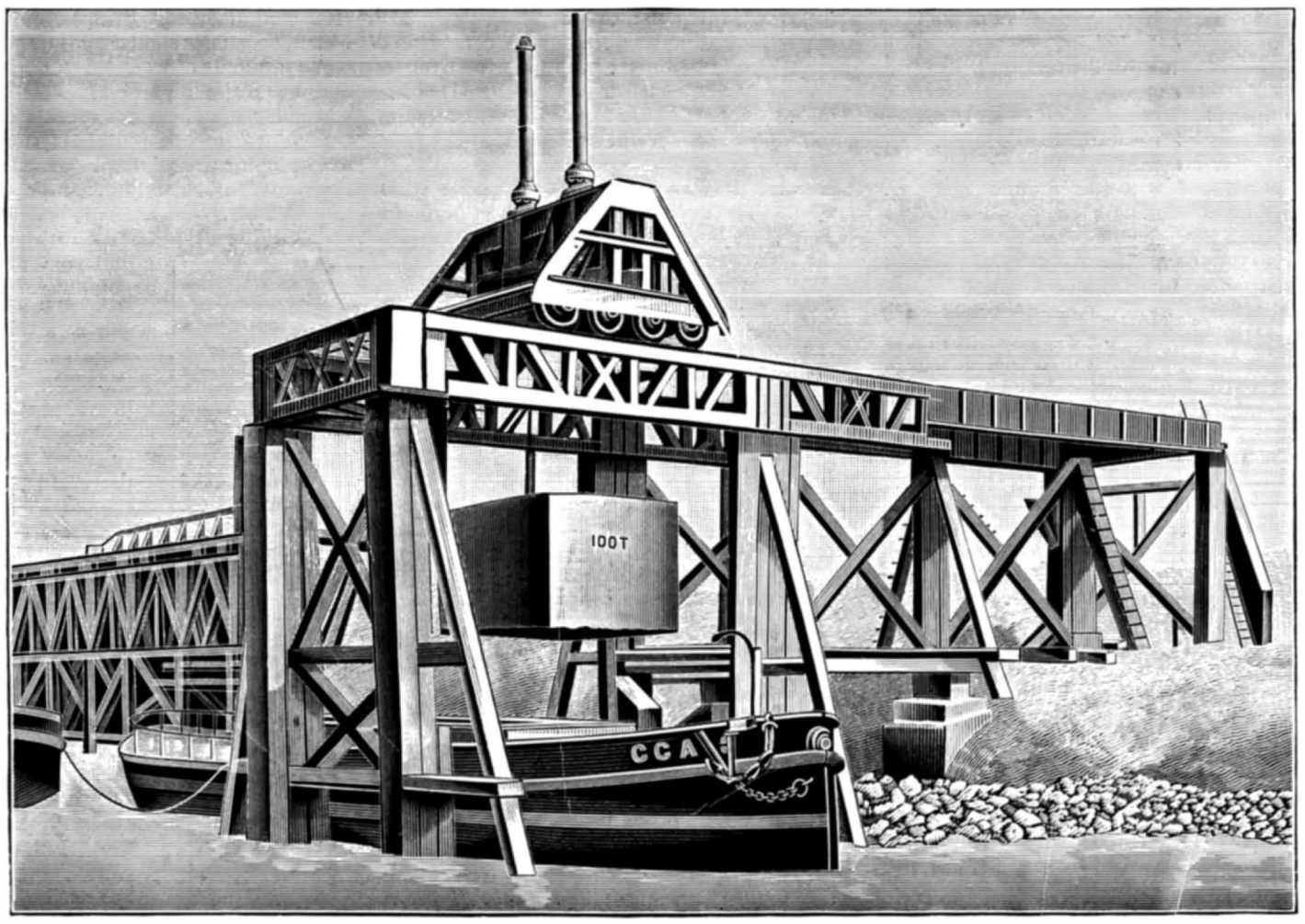


Fig. 1.—WORK AT THE PORT OF BILBAO—FRAMEWORK AND APPARATUS FOR LIFTING BLOCKS OF BETON AND LOADING THEM ON A BARGE.

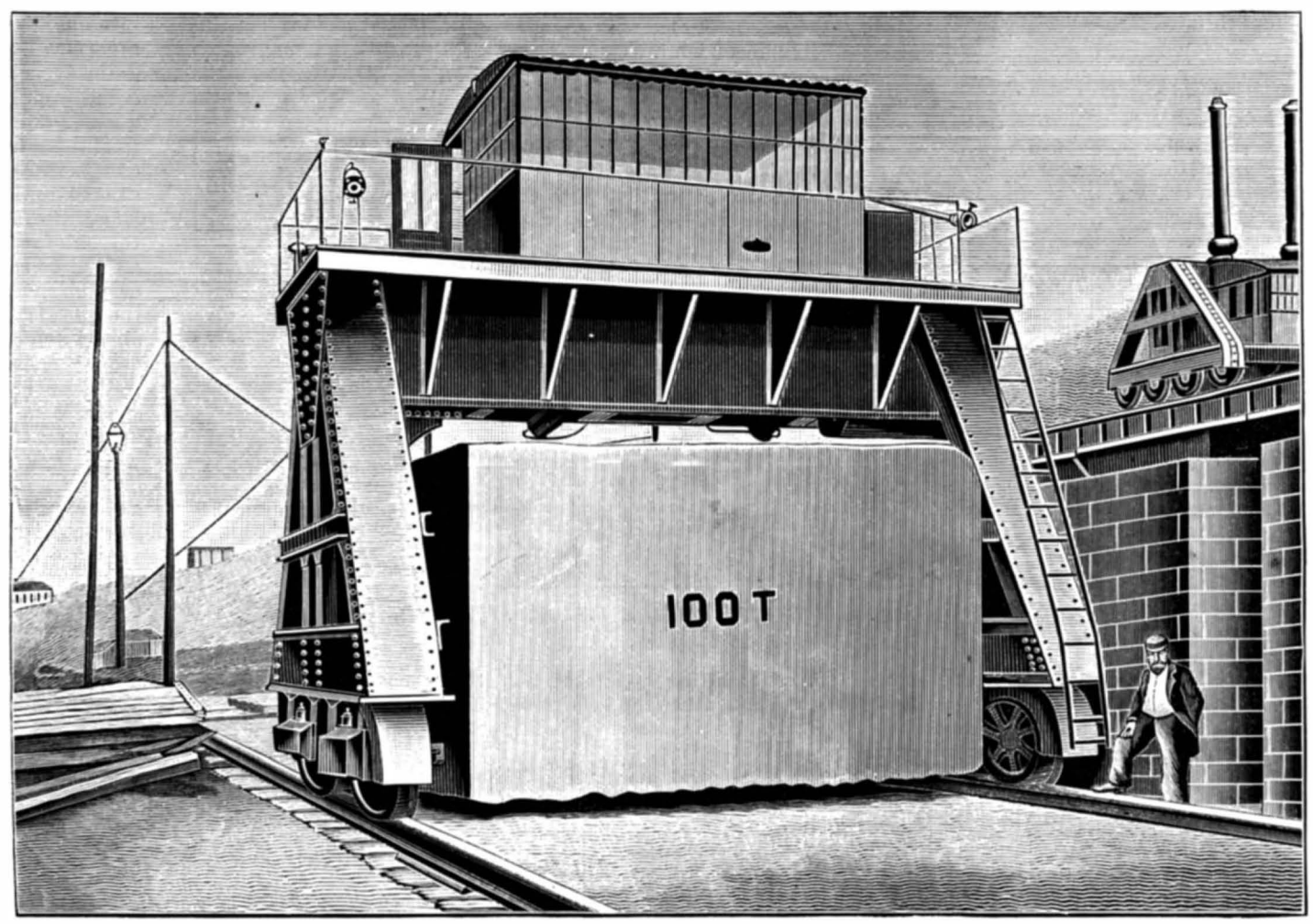


Fig. 2.—FRONT VIEW OF THE APPARATUS FOR LIFTING BLOCKS OF BETON AND CARRYING THEM TO THE CAR.

APPARATUS FOR MANUFACTURING AND LIFTING BLOCKS OF BETON AT THE PORT OF BILBAO.

As the method of manufacture of the blocks of beton used in the construction of an external port at Bilbao, and the apparatus employed for lifting and carrying them, present some novelty, we propose to enter into some detail upon the subject.

The beton apparatus, constructed by Carey & Lathan, an English firm, consists of a cylinder 3 meters in length and 0·91 meter in internal diameter, movable around its axis, which makes an angle of about 3° with the horizontal. In the interior of this cylinder there operate sixteen helicoidal paddles fixed upon a tubular axis, which makes fifteen revolutions per minute, while the external cylinder makes twenty. Into the interior of the latter, two chains of buckets, though lateral hoppers, empty the stone and sand in the proper proportions. The cement is put into a hopper placed upon a covered platform, whence it is taken up by a screw and carried to the interior of the cylinder in which the beton is under preparation. The velocity of this screw is independent of the general motion of the apparatus. It is so regulated that the quantity of cement that it introduces into the cylinder may be varied at will.

The materials, that is to say, the stone, sand, and cement, enter simultaneously at the top of the cylinder, and, during the first third of their travel, are mixed, while dry, through the motion of the paddles and that of the external cylinder. The water, the quantity of which can be regulated at will, enters continuously through a tube that debouches in the second third of the length of the cylinder, so that the elements that form the beton are intimately incorporated before leaving the apparatus. When finished, the beton falls into Decauville cars, which carry it to the spot where the blocks are to be manufactured. The

apparatus is capable of furnishing from 15 to 18 cubic meters per hour, and this permits of manufacturing four blocks of 50 cubic meters or seven of 30. The power of the motor is 18 horses.

The contractors arrange upon the platform for preparing the blocks 517 moulds, 120 of which are of 50 cubic meters and 397 of 30, representing a total volume of 17,910 cubic meters. With the method of carrying that they employ, they are capable of submerging, in a period of three months, all the blocks that the platform can hold.

Let us now pass to the apparatus employed for lifting, carrying, and shipping the blocks.

The frame of the rolling crane for lifting the blocks consists of two strong trestles of plate and angle iron connected at the upper part by two cross pieces that support a flooring 2·6 meters in width, upon which is installed the entire motive mechanism. This crane is provided with four pairs of wheels and runs upon tracks of 5·7 meters gauge formed of Vignole rails supported by strong wooden ties. It differs but little, as a whole, from the cranes that have hitherto been constructed for the same purpose; but up to the present only manual or steam power has been used, while in this case it is electricity that actuates the lifting and shifting mechanisms and that gives motion to the various apparatus serving to carry the blocks to the place of shipment. To this effect there is installed at a certain point of the field of operations a dynamo actuated by a 60 horse power compound engine making 300 revolutions per minute. This dynamo develops an e. m. f. of 220 volts and produces a current of 200 amperes. The e. m. f. is transmitted by a non-insulated copper wire strung upon wooden poles. This conductor is established all along the beton yard, and the current may be received by the dynamo carried by the rolling crane, whatever be the spot occupied by the latter upon the tracks. To this effect, upon the sides of the platform there are two bamboo canes 3·6 meters in length movable around a joint situated at 1·1 meters from the lower extremity.

At the upper part of each bamboo there is fixed a small iron pulley which bears constantly against the wires of the circuit, owing to a counterpoise at the base of the bamboo canes. Communication between these pulleys and the receiving dynamo is established by means of copper conductors covered with gutta percha. The circuit is closed through this dynamo. The current traverses a resistance apparatus which allows of the passage of the whole or a part of the e. m. f., according to the work to be effected.

The receiving dynamo makes 600 revolutions per minute, and effects the rotation of a horizontal shaft that transmits power either to the pistons of the hydraulic presses that serve to lift the blocks and that have a maximum stroke of 0·4 meter, or to another horizontal shaft situated at right angles with the other, and upon which are mounted pinions that gear with two endless chains. The latter transmit the power to drums fixed to the front wheels of the crane. These wheels produce the motion of the entire apparatus upon the tracks at the velocity of 10 meters per minute.

The pistons of the hydraulic presses are connected by joints with the hooks that serve to suspend the blocks. The length of the hooks varies with the size of the blocks to be lifted. Each block carries two lewisons, that are set into the block at the time of its manufacture, and with which the suspension hooks engage.

When the apparatus is placed over the block to be lifted and carried, the hooks are introduced into the lewisons, then the machine is set in motion, and the suction pipe of the pump is opened in order to allow water to enter the cylinders of the hydraulic presses. As soon as the pistons of the latter have lifted the block about 30 centimeters, the pipe is closed, and the wheels that control the motion of the crane upon the rails are thrown into gear. The crane, once in motion, is led over a truck or car that runs upon a transverse track. At this moment, the cylinders of the presses are emptied and the block slowly descends upon the platform of the truck. This operation finished, the hooks are disengaged and the crane moves backward over another block, which it carries to the truck as before.

The truck or car that carries the block is likewise moved by electricity. To this effect, it is provided with a receiving dynamo analogous to that of the lifting apparatus. This dynamo receives the current through copper wires. The latter are not insulated, so that at every point of their length communication may be established with the receiving apparatus and the circuit be closed through the generating dynamo.

This car is hauled under a framework consisting of two strong horizontal iron trusses supported by cross-braced wooden posts, each surmounted by a cast iron cap. The bases of these posts are set into masonry. At the upper part of the framework is situated the apparatus designed to lift the block and bring it directly over the lighter that is to carry it to the point where it is to be submerged. This apparatus is set in motion by electricity. It is constructed upon the same principles as the other lifting apparatus, but its frame is not of so large dimensions, and the stroke of the pistons of its hydraulic presses is different, being seven meters.

The pumps that send the water into the cylinders and the shifting mechanism receive their motion from the dynamo that the apparatus carries with it.—*Le Genie Civil.*

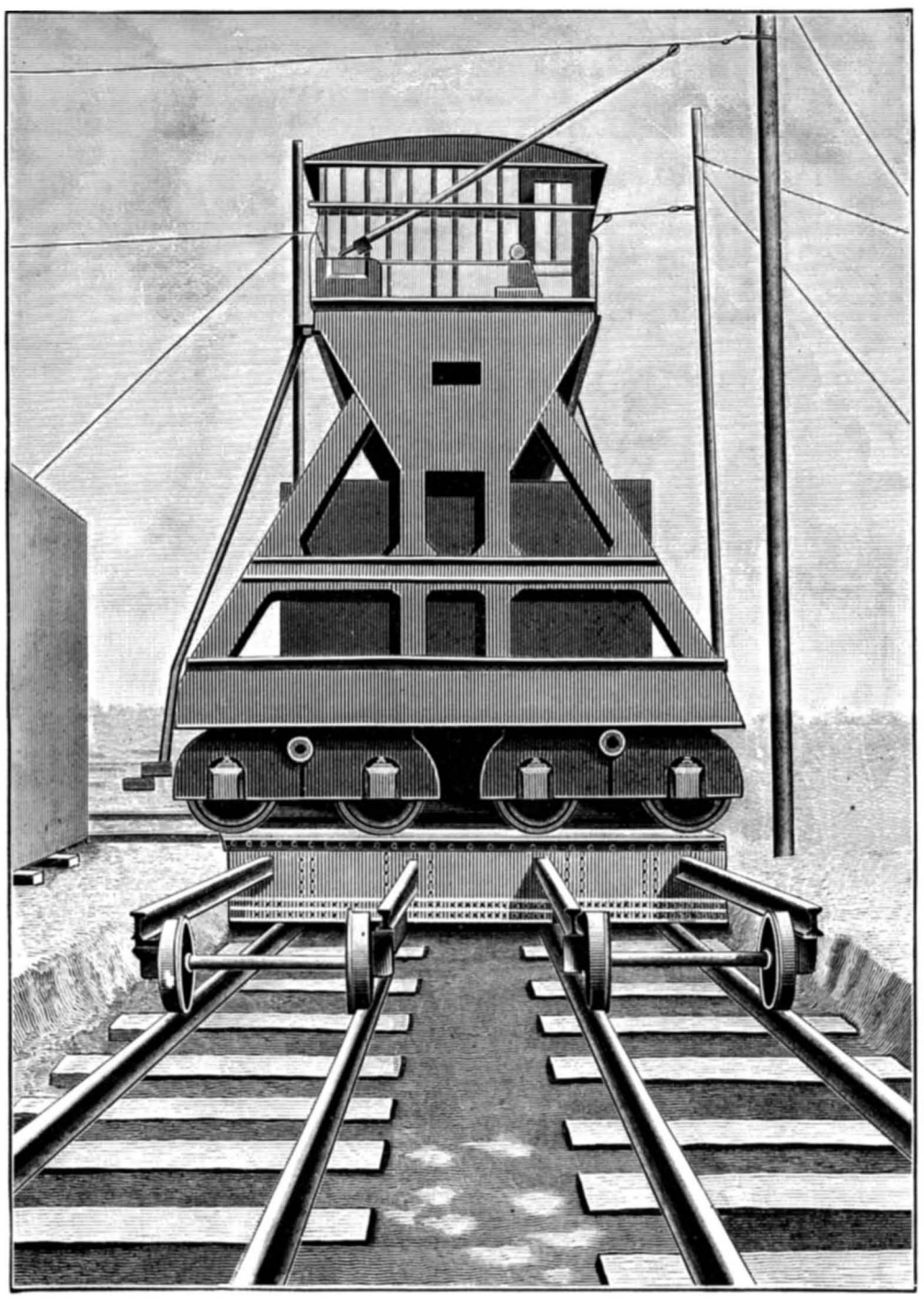


Fig. 3.—SIDE VIEW OF THE LIFTING APPARATUS.

The Logan Storage Battery.

The Grand Trunk Railway Company gave the Standard Electric Company permission to run an electric car over its tracks on August 23, from Milwaukee Junction, near Detroit, to Mt. Clemens, and return. The car was of the regular open-face type of tram car, with seats placed back to back. The car was propelled by a Shawan motor, the electricity being furnished by the Logan storage battery, 108 cells of nine plates each. This battery, by its construction, is peculiarly adapted for use where it will be subjected to jarring. The electricity with which the batteries were charged was nearly all generated on July 5. The car and its load weighed eleven tons, and the Detroit *Tribune* says that an examination made after the trip showed that the battery would carry the load about 100 miles without recharging. In spite of some delays at the various switches, the average running speed was about 12 miles an hour, and the best mile was done in 3:35. The trial seems to have been very satisfactory.

Fibrous Clay.

Clay, in every respect, resembles very closely the fundamental and natural principles of oxides and ores of metals, and maintains the same characteristics with remarkable relations all the way through its formation after manufacture. But the closest of all metals of which it assumes similarity is iron.

For example: Iron ore ground and smelted and cast into pig metal is short or brittle, not having any particular grain, except slightly lengthwise, the way the metal flows in casting. If this same pig metal is reheated into a workable or pliable condition, and put under rollers and for a number of times rolled in the same direction, then by compression the crystals, which in dimensions are almost equal in every direction, and join only at geometrical points, are being first flattened, then drawn or pressed oblong. The process of cooling again acts upon them to slightly separate the crystals, but leaving them in groups closely adhered to each other, and wherever these breaks or contraction cavities occur there will take place a sliding of the particles upon each other in the process of rolling.

The effect of this is that the construction of the original pig metal, which appears much like compressed salt, becomes a series of fibrous-formed material, overlapping each other like brick masonry, excepting that the longitudinal sections are probably hundreds of thousands of times smaller in diameter.

In many instances the formation of rolled iron may be compared with oak timber in its formation of grains or fibers, which has at the same time throughout its longitudinal structure a large amount of cross fibers.

Comparing the same with the continuous working of the clay into one direction produces the same effect of forming a fibrous grain as can be seen in a bar of rolled iron. For instance, take a sewer pipe when it first comes from the press; it would be difficult to tear it sideways, while it can be torn into small shreds lengthwise, the course it passed through the die. The same with a brick being made on a spiral or plunger brick machine. If the brick is an end cut, it will be almost impossible to break it evenly crossways, while there would be but little trouble to split it lengthwise into any number of parts. Therefore, in bricks which are expected to carry much transverse strain, the lengthwise grain is much preferable over all others.

In the forming of grain in clay, water plays a very important part. As the wedging of the clay goes forward, the molecules of clay become closer attached to the moving particles, and the water and air find their way into the horizontal layers, forming the lubricator between the strata.

This is easily witnessed by a simple practical experiment. If a block of plastic clay of about twenty-five pounds be taken and rolled for several times in one direction, forming the grain in length, then the block set on end, and slabs cut from it about one inch thick, will make tiles about 9 in. ×9 in. ×1 in. in size. If these are put to dry, the probability is that 90 out of 100 will crack through the middle; the same as if a slab be cut off the end of a log crosswise, which would be sure to go to pieces before it became dry.

On the other hand, if the clay slabs or tiles were cut from the side of the former mentioned blocks, the effect of rapid drying would simply be warping, the same as a green board would turn up if placed in the sun.—*Clay Journal.*

A NEW aluminum alloy, with titanium, is made in Pittsburg. It sells at from 25 cents to $1 per pound more than pure aluminum. It is an excellent material for making tools. About 10 per cent of titanium is used.

THE SANTA MARIA.

A great series of celebrations and festivities, upon two continents, in commemoration of the first voyage and the discovery of America by Columbus, was commenced at Palos, Spain, on August 3, the four hundredth anniversary of the day on which the little fleet of the great navigator set sail on its memorable quest. The little town is on the Rio Tinto, near its mouth, in the Gulf of Cadiz, and between it and the sea is the old convent of La Rabida, intimately associated with the memory of Columbus. Near by is the much larger modern town of Huelva, which has considerable export trade, and at this port assembled the Spanish vessels and those representing foreign nations also participating in the inaugural ceremonies, as the harbor at Palos did not allow the entry of large craft.

The principal feature of the celebration at this time was found in the Santa Maria, a vessel built in every respect after the original of the largest of the three vessels of Columbus. The Nina and the Pinta, the two other vessels, completing the squadron, it is expected will be constructed in time to bear a part, in connection with the Santa Maria, in the naval celebration to take place in New York Harbor next spring, preliminary to the opening of the great exhibition at Chicago. Our picture of the Santa Maria is from a drawing made for the *Graphic* by Lieutenant E. C. Villiers, of the British Navy.

It was the design that the little vessel should sail out of the harbor of Palos in the early morning of August 3, after the same manner as the first or discovery voyage was commenced; but when the sailors spread their canvas it was found that there was no breeze, and one of the gunboats was then employed to tow her toward the ocean. The Spanish vessels followed, and every foreign ship saluted with cannon as the Santa Maria passed. The war ships of foreign nations sent to represent their governments in the celebration followed the Spanish vessels. The multitudes on shore cheered in unison with the roar of the artillery. For three hours the Santa Maria followed the route along which Columbus had been wafted by a favoring breeze, and was then towed back to Palos. Huelva, which is undertaking the larger part of the celebration, was bright with flags and thronged with visitors from all parts of the world. Palos is hardly more than a memory of what it was in the days of Columbus. It was then the chief city of the region. It has since decayed, and is overshadowed by Huelva, the capital of the province. The convent of Santa Maria de la Rabida was also thronged with visitors. The convent buildings have been put in nearly the exact condition they were 400 years ago, when Columbus was a guest there. The tower of the convent, which occupies a prominent site, was probably the last object on the mainland which Columbus saw as he sailed away.

These jubilations formed the starting point for a series of *fetes*, designed to occupy Huelva, Palos, and La Rabida during the whole of the months of August, September, and October, concluding with an International Congress and the official celebrations, in which the Queen Regent, the Court, the Ministers, the Corps Diplomatique, and the provincial and foreign deputations were to take part. At Madrid, Granada, and Seville there were to be congresses, horse races, and bull fights, gala theatrical performances, historical cavalcades, and popular fairs, balls, receptions, and *soirees*. Nothing has been spared to mark with becoming pomp the *role* played by Spain in the discovery of the New World.

The Santa Maria of 1892 is in every respect, and in the minutest detail, a reproduction of its analogue of 1492, as it is pictured to us in the diary of the illustrious navigator. It has the same old-fashioned shape, the same primitive masts, rigging, and sails, even the same armament of falconets and mortars, halberds and arquebuses. The cabin of the commander is furnished in the style of the fifteenth century and its table is littered with maps, documents, and nautical instruments of the period. Finally, its mastheads are decorated with the royal standards of Castile and Leon, in exact imitation of the flags which Columbus planted in the New World on October 12, 1492. The vessel is manned by an excellent crew, obtained from among the fishermen and sailors of Cadiz and San Fernando, and placed under the orders of a detachment of officers of the Royal Navy. They are all in the highest spirits and confident that they will be able to conduct this vessel of 240 tons safely to New York next year, when the great celebrations are to take place here. Preliminary to that occasion it is designed that the Santa Maria will be accompanied across the ocean by a Pinta and Nina, also constructed in imitation of the two smaller caravels which formed Columbus' escort four hundred years ago. And these in their turn will be watched over by a modern Spanish squadron, which will act as a guard of honor and render them any assistance they may need, a provision whose necessity will readily be understood when we remember that the largest of the vessels had only about the dimensions of a good sized canal boat of the present day.

World's Fair Items.

Two immense search lights, which will be used to illumine the grounds next summer, have arrived at Chicago, and will probably be used for the dedicatory exercises. These great lamps weigh respectively 2,200 and 1,300 pounds, with diameters of 4 and 3 feet. The larger one will be placed on the roof of the Manufactures Building, and will, it is said, light up the Van Buren Street station, seven miles away, with the intervening space. The other will be mounted on the cupola of the Transportation Building, and will shed light on the Illinois Central tracks, to the south and west. A six foot lamp is to be put up next summer. These search lights are the largest in the world.

The fourteen principal buildings and their cost are:

Transportation Building, 5 3-5 acres	$370,000
Horticultural Building, 5 7-10 acres	325,000
Mining Building, 5 3-5 acres	265,000
Electricity Building, 5 1-2 acres	401,000
Machinery Hall, 9 3-5 acres	1,285,000
Administration Building, 1 3-5 acres	435,000
Agricultural Building, 9 1-5 acres	618,000
Manufactures Building, 30 1-2 acres	1,500,000
Government Building, 3 3-10 acres	400,000
Fisheries Building, 1 2-5 acres	224,000
Battleship, 1-3 acre	100,000
Art Building, 4 4-5 acres	670,000
Forestry Building, 2 1-2 acres	100,000
Women's Building, 1 4-5 acres	138,000
Total	$6,831,000

The Finance Committee have decided to recommend that $150,000 be appropriated to construct a special building for educational exhibits. It will afford 160,000 square feet of space and be located east of the Fine Arts Building. This will relieve the tremendous pressure for space in the Manufactures Building, to which the liberal arts display was previously assigned.

Canada will exhibit a mammoth cheese made at the Dominion experimental station at Perth. It weighs over 22,000 pounds, and contains the curd of a day's milk from 10,000 cows. A gigantic oaken press was erected for the purpose of constructing the cheese, and 200 tons of pressure was applied. The cheese has already been pronounced perfect in texture, flavor, and color. It will be placed in the pyramid of Canadian dairy products at the World's Fair, and will afterward be cut up and sold in pound blocks, either in Chicago or in Great Britain.

Edison's Patents Sustained by the United States Circuit Court of Appeals.

The United States Circuit Court of Appeals for the District of New York, Judge Wallace presiding and Judges Lacombe and Shipman sitting as associates, on October 4 handed down a decision affirming that of the Circuit Court in the action of the Edison Electric Light Company against the United States Electric Lighting Company.

The decision of the Circuit Court in favor of the Edison held, in effect, that the incandescent lamps manufactured and put upon the market by the United States and cognate companies were infringements of the Edison patents. The practical effect of the affirmation by the Appellate Court of Judge Wallace's decision is to give a monopoly of the manufacture of the incandescent bulbs to the Edison Company, and also confer upon it the right to claim an accounting and damages for infringements from the defendant companies. The court finds that not only any known form of incandescent lamp, but probably also any possible form of incandescent lamp that can be manufactured, is an infringement of the Edison patents, and that therefore no other competing company can make such lamps without license from the Edison company.

The present production of incandescent lamps by the Edison Company is 80,000 a day. These lamps have been put forth in like volume by rival companies for several years past. When the action was begun the United States Company was allowed to go on manufacturing the lamps pending a decision of the questions involved, by executing a bond to pay damages and account for their profits to the Edison Company in case the court should decide against them. In the interval between the inception of the action and the decision of the United States Circuit Court of Appeals, the work of assessing the damages has been going on before a master appointed by the court, and is not yet completed.

Mr. Edison applied for a patent for his lamp in 1879.

The Edison patent has about three and a half years yet to run.

The *N. Y. Herald*, in commenting on this decision says:

"The decision of the United States Circuit Court, of Appeals in favor of the priority of the Edison incandescent lamp will be hailed with the greatest satisfaction by the numerous friends of the 'Wizard of Menlo Park,' apart from all consideration of the technical and legal questions involved. The decision means many millions of dollars to the Edison General Company, in which, we understand, the inventor still maintains a solid interest.

"Hitherto Mr. Edison has not been so fortunate as he deserved to be in his business ventures. His invention of a transmitter for the telephone was sold for an annuity of $6,000, to be paid for a period of seventeen years. The day after he had concluded this bargain he was offered $500,000 in cash for the invention. The quadruplex system, which revolutionized telegraphy, was bought from Mr. Edison by the Western Union Company for $30,000. By it the Western Union Company has been enabled to save a million dollars a year in wire.

"The people of all lands owe this man a vast debt of gratitude, and will not, we believe, be slow to hail the decision of the court, which gives him back his own, with loud acclaim."

Steam on the Highway.

Peter Chalmers, a farmer of Farmington, is a genius in his line. When anything new comes out he studies to see whether it cannot be adapted to use on his farm.

For one thing, he has applied helmet oil cups to greasing wagon wheels. He has a score of grain wagons, all of them supplied with these cups, and all of the wheels can be greased by means of them in ten or fifteen minutes—a job which would require an hour or more without them.

All the plowing done on Chalmers' big ranch is done with a traction engine, and during the last plowing season he ran the engine day and night, having three shifts of men. A locomotive headlight was employed to illuminate the path ahead and another was used to throw light on the plows.

Now the farmer is hauling wheat to town with his engine. He brought a load in recently and stored it at the Stockton Warehouse. There were nine wagons in the train, and each carried sixty-eight sacks of grain. Each sack weighs, on an average, 137 pounds, so each wagon load was 9,316 pounds, and the aggregate of all the wagon loads 83,844, or nearly forty-two tons.

The farmer has 30,000 sacks of wheat to haul, some of it belonging to neighbors.

"Is it much cheaper to bring the wheat in this way than it would be to ship by rail?" asked a *Mail* reporter of Mr. Chalmers.

"Well," was the reply, "I can't say positively that it is any cheaper at all, but I think it is. You see, this is only my third trip, and I haven't been able to cast up accounts yet. The wheat I'm bringing now comes from near Farmington, which is seventeen miles from Stockton, and it would cost $1.10 a ton to get it here by rail. Some of the wheat I'm going to haul is farther away, and to transport it on the railroad would cost $1.50 a ton. I don't think it will cost me a dollar a ton on the longest haul."

"Where does the saving come in?"

"Well, one has to load his wheat anyhow, and if he ships it by cars, he's got to unload and then load it on the cars. That requires men and time. This way all we've got to do is to load it in the field—the warehouse men do the rest. It requires only three men to take care of our train—an engineer, a fireman, and a man to look out for the wagons and see that they don't get 'hot boxes.' The only expense of hauling, therefore, is the wages of the three men and the cost of the coal used."

"But," said the reporter, "there's the interest on the money in the engine, which cost—"

"Four thousand five hundred."

"And then there's repairs and the steady wear of the machine; and you've got to have a lot of money invested in wagons. You would only need a couple of wagons to haul to the railroad, but this way you need a dozen."

"Oh, I need the wagons and the engine on the farm, anyhow," was the reply.

In further conversation, Mr. Chalmers said it would not be feasible to haul grain as he is doing except on level and good roads. The only trouble he experienced was in crossing small bridges, which he had to brace up on the first trip. The tender carries water sufficient for only twelve hours' consumption, but water is pumped into it from watering troughs along the road.

It might seem foolish to say that the wagons follow one another around corners in the same path, since as a matter of course they would do so, but people often ask the farmer what sort of gearing he puts on his wagons to make them follow the lead.

The engine can haul the train at the rate of four miles and a half an hour, but to prevent jolting the speed is regulated to about three miles an hour.—*Stockton Mail.*

Profits of German Sugar Factories.

Last year was, generally speaking, very favorable to the German sugar factories, as is shown by the following details: The Cares sugar factory, in Dirschau, with a joint stock capital of 600,000 marks, obtained a profit of 201,788 marks, out of which a dividend of 10 per cent was declared. The sugar factory at Radegast declared a dividend of 17 per cent, that at Wendersen 20 per cent, that at Zuckendorf 22½ per cent, the sugar factories at Glazig and Korbisdorf each 12 per cent, that at Camburg 31 per cent, and that at Gross-Gerau 50 per cent (in the preceding year 42 per cent).

THE PROBABLY BEST AUTHENTICATED PICTURE OF COLUMBUS.

So many widely differing pictures of Columbus are now being published and painted upon banners for display that we republish a portrait of the great navigator which appeared in the SCIENTIFIC AMERICAN of May 9, 1891, in regard to which Mr. Clement R. Markham, the English geographer, submits some important particulars. In a most interesting and carefully prepared paper upon Columbus, which is reproduced in the September number of the *Proceedings of the Royal Geographical Society*, Mr. Markham amplifies the story of Columbus' life through the exhaustive local researches he has made in Italy and Spain. He found the portrait of which this is a copy in a private house at Como, where it has been carefully treasured ever since it was placed there by Paulus Jovius [Giovio], a contemporary of the great Genoese admiral. Mr. Markham says:

"We gather some idea of the admiral's personal appearance from the descriptions of Las Casas and Oviedo. He was a man of middle height, with courteous manners and noble bearing. His face was oval, with a pleasing expression, the nose aquiline, the eyes blue, and the complexion fair and inclined to ruddiness. The hair was red, though it became gray soon after he was thirty. Only one authentic portrait of Columbus is known to have been painted. The Italian historian, Paulus Jovius, who was his contemporary, collected a gallery of portraits of worthies of his time at his villa on the Lake of Como. Among them was a portrait of the admiral. There is an early engraving from it and very indifferent copies in the Uffizi at Florence and at Madrid. But until quite recently I do not think that the original was known to exist.

"It, however, never left the family, and when the last Giovio died it was inherited by her grandson, who is the present possessor. I was so fortunate as to see it when I was at Como, and also to obtain a photograph of it. Here we have the head of a venerable man, with thin gray hair, the forehead high, the eyes pensive and rather melancholy. It was thus that he doubtless appeared during the period that he was in Spain after his return in chains or during the last years of his life."

PORTRAIT OF COLUMBUS, BY SEBASTIAN DEL PIOMBO, RECENTLY DISCOVERED AT COMO.

A FOUR-FOOT WATER VALVE.

On January 1, 1893, the system of water supply and distribution within the limits of the city of New York will comprise over 710 miles of water mains. These are of cast iron with calked lead joints. They vary in internal diameter from 6 inches up to 48 inches, the latter being the largest size of distribution main. In the year 1893 it is proposed to greatly extend this service and to lay twenty-five additional miles of pipe. Part of this amount represents the substitution of new for old pipe; a part represents entirely new lines.

In the present system there are over 9,000 fire hydrants and 7,300 stop cocks or valves. We illustrate one of the latter, taking as typical a valve inserted in a 48 inch main in the upper part of the city. This valve was built in Coxsackie, N. Y., by the Kennedy Valve Mfg. Co.

The valve comprises a cast iron shell, within which the gate moves up and down or horizontally, according to the way the valve is set. In the case illustrated, the movement is horizontal. The shell is in sections, with faced joints, and the parts are fastened with bolts. Lead gaskets are introduced between the faces of the joint to supply packing.

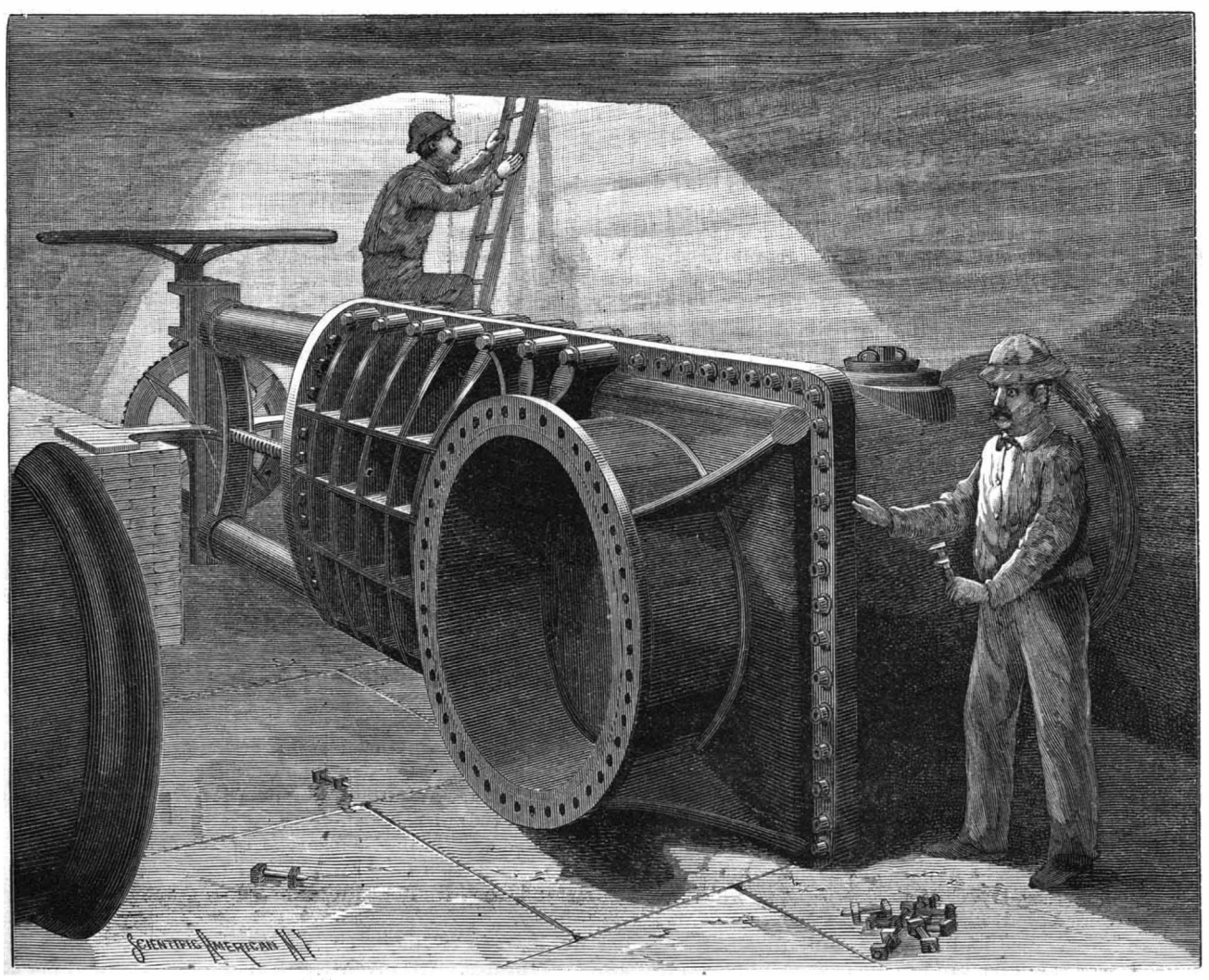
Within the shell are the valve seats. These are made of the best quality of composition metal, and slope toward each other like a reversed wedge.

The gate which closes the valve opening is in general terms a disk, somewhat wedge-shaped, so as to fit between the valve faces. At its upper end, assuming the valve to be set upright, the gate is eight inches thick. At its lower end it is four and one-half inches thick. These dimensions refer to its outer ring or zone. The inner portions are hollowed or cored out, so that the center portion is only two and one-half inches thick. The ring or face of the gate, which abuts against the composition seat within the valve, is also made of composition.

The gate is moved by a stem, 3½ inches in diameter, passing through a stuffing box and provided with an external screw. This is attached by a transverse steel pin, 2½ inches in diameter, to a pair of lugs on the gate. This allows a considerable amount of play to the gate, and avoids straining the stem. The nut which operates the screw is of composition. For the packing box, hemp packing is used. The cut shows the arrangement of gearing used to turn the nut.

The valve was tested as to its tightness by a hydraulic pressure or head of two hundred pounds to the square inch.

It weighs between eleven and twelve tons, and required a truck with three teams of horses to mov it across the city from the river front, where it had been delivered by lighter.



MAMMOTH VALVE FOR WATER MAIN, NEW YORK CITY.

Fair Logs.

Recently, says the *Pacific Lumberman*, the tug Rip Van Winkle towed down from Port Blakely to Tacoma the ten largest logs ever cut on Puget Sound for shipment in one consignment. The logs are to form part of the foundation of the State of Washington's World's Fair Building. All the logs are 122 feet long. The largest one is 42 inches square at the large end, the others being slightly smaller. This largest log contains about 1,500 cubic feet of timber, and weighs, computing at 48 pounds per cubic foot, something over thirty tons. The aggregate weight of the ten timbers is nearly three hundred tons.

One of the most interesting things about the timbers is the manner in which they will be shipped to Chicago. It will require a train of thirty-five cars to ship them across the continent, and only air brake cars will be used. The thirty-five are at the Edison shops, where ten of them are being fitted with "bunks," or cross pieces, on which the ends of the timbers will rest. It will take seven cars to carry each two logs, whose weight will be borne entirely by the first and last of the seven.

This arrangement is necessary to allow the middle five cars to swing out from under the timbers when rounding curves, their only use being to connect the end cars.

To load the timber on the cars a strong chute has been constructed at the end of the ocean dock. They will be hauled up out of the water by a Northern Pacific locomotive, and kept straight in the chute during the operation by means of a pile driver, to which their water ends will be attached with chains.

In all 174 logs will be shipped for the foundation, and the other construction material will include between 500,000 and 600,000 feet of lumber.

THE CANADIAN PLAN FOR UTILIZING THE POWER OF NIAGARA FALLS.

In the SCIENTIFIC AMERICAN for March 5 last we gave an illustrated article descriptive of the great tunnel works on the American side of the Niagara River at the falls, by which the gigantic water power is to be utilized. This remarkable work is now nearly completed and several new manufacturing establishments have located near the tunnel, from which power will be taken.

While so much has been done on the American side, active steps have also been taken toward the utilization of the power of the great falls on the Canadian side. The Canadian Power Company was recently organized under charter granted by the Parliament of Ontario at its last session, with the following officers: President, Albert D. Shaw; vice-president, Francis O. Stetson; secretary and treasurer, William B. Rankine.

The valuable concession of the water power privileges on the Canidian side of Niagara passed into the control of this new company, 60 per cent of whose stock is owned by the Cataract Construction Company, the company which is now developing the tunnel scheme on the American side. It will be seen that one corporation really controls all the water power privileges on both sides of the great cataract, and has at its command a water power estimated at more than 3,000,000 horse power.

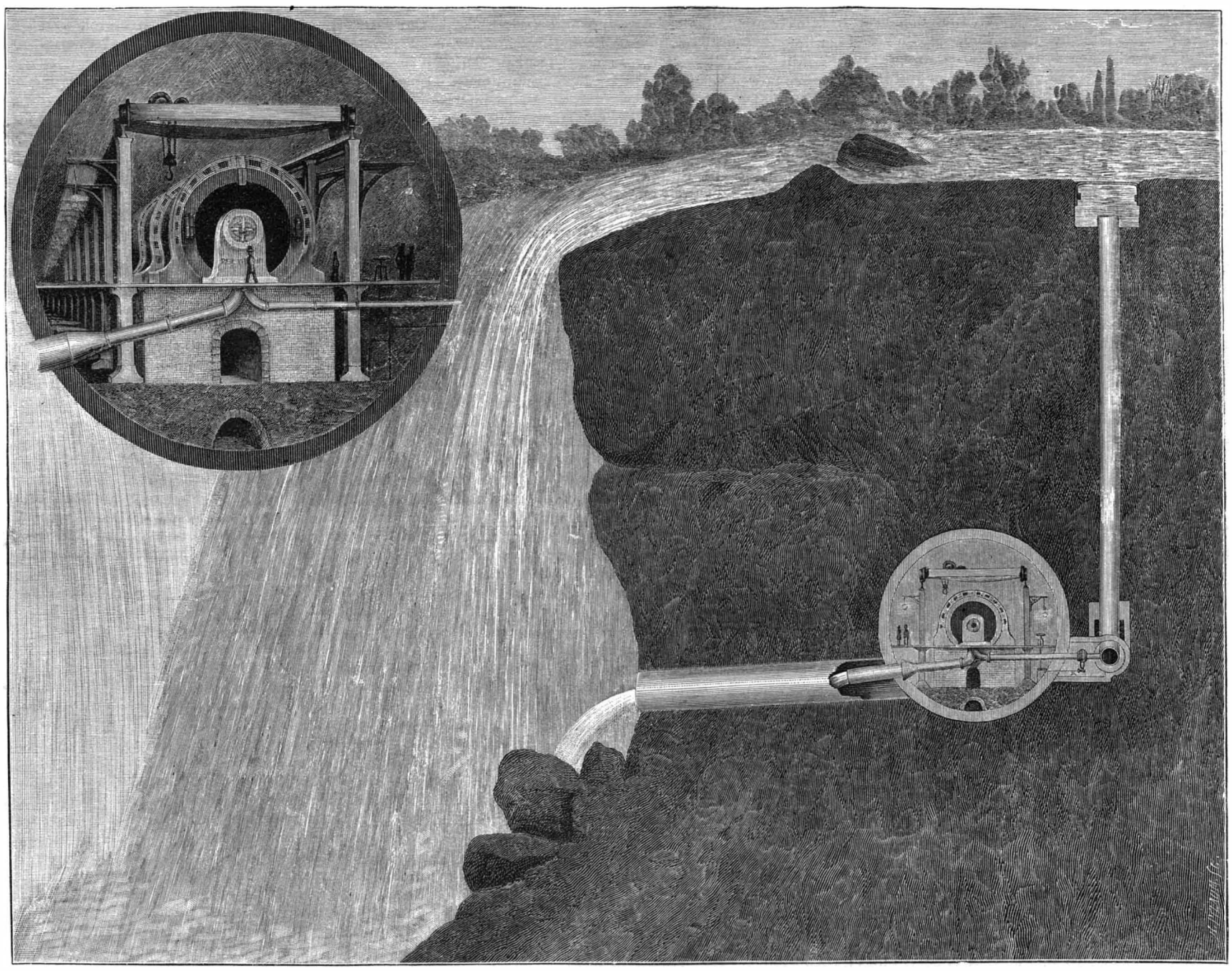
It is the intention of the Canadian Power Company to await further practical developments on the American side before determining what the character of the works shall be. It is proposed to make the Canadian side furnish the means for the transmission of power to Buffalo and other distant points. As is well known, the possibilities on the Canadian side within the limits of Queen Victoria and Niagara Falls parks, where the company has exclusive rights, are very great for the development of cheap electric power. A tunnel of less than 800 feet in length would furnish ample outlet for an intake that would develop hundreds of thousands of horse power, and all the necessary works could be constructed at a very low cost compared with the extensive operations on the American side.

Several plans for utilizing the water power on the Canadian side have been suggested by different eminent engineers, and the accompanying illustrations represent one of the most original and interesting yet proposed. This scheme involves a tunnel, but is very much simpler and radically different in many respects from that which is now being developed on the American side of the river.

Our engraving gives a very excellent idea of the whole scheme. A tunnel is constructed directly under the river near the falls, and water is taken in from the river above by large vertical pipes, and after passing through the turbines is discharged through a short canal out under the falls and thence into the river below. At the left hand corner of the same illustration is seen a more detailed view of this tunnel. Some idea of its size can be gained by comparing its diameter with the height of the men seen in the foreground. Large Ferranti dynamos, similar in construction to those now in use in the Ferranti station at London, are to be directly driven by powerful Pelton water wheels. The size of these units has not been definitely decided upon, but they will doubtless be very large. The immense traveling cranes which are seen will be used in moving machinery to the different parts of the tunnel.

Professor Forbes, of London, and the eminent engineer Ferranti have both given a great deal of study to the proposed works on the Canadian side of the falls. Those in the best position to judge expect to see work commenced some time in the spring under the management of the ablest engineers in this country and abroad.

Of the complete ultimate success of both undertakings there can be no question, and electricity will here play an important part in the solution of the great problem of securing the economical transmission of large powers. We are indebted to the *Electrical World* for our illustration and the above particulars.



THE CANADIAN PLAN FOR THE UTILIZATION OF NIAGARA FALLS.

Ornamenting Piled Fabrics.

This relates to ornamenting cut pile fabrics, as velvets, velveteens, corduroys and such fabrics as cannot conveniently be ornamented by the ordinary process of printing. In preparing the fabrics for treatment, they are dyed with colors that are susceptible of being discharged or modified by the action of certain discharging or modifying agents which are afterward applied. To produce the required pattern upon the dyed fabric, a solution of chloride of lime or ordinary bleaching liquor is applied at the required places to the surface of the dyed fabric. The result is that, where the fabric is touched by the solution, the dye is discharged, or it might be modified, and a pattern or effect is produced on the piece. Where an irregular effect is required, the discharging agent is applied to the surface in the form of a spray or in splashes, and where a design or pattern capable of reproduction or repetition is desired, the use of one or more revolving rollers, carrying design surfaces in relief, is preferable, which surfaces apply the solution to the fabric as it is moved past the roller, and practically print the design. These surfaces are made and the roller adjusted so as not to press too heavily upon the pile. For example, they might be made of felt or other comparatively soft material, compound, or fabric, and be of a porous nature, so that they could be kept saturated with the solution from the interior of the cylinder or from any other suitable source. In some cases, when producing an irregular or splashed pattern, a roller might be employed, which would throw the solution upon the fabric in splashes of regular or irregular size, and adjusting means for increasing or diminishing the number and size of the splashes at pleasure might be provided. The strength of the discharging agent is varied to suit the nature of the dye in the fabric. In some cases, coloring matter may be added to the discharging solution, so as to color the portions of the fabric affected by the solution; and to prevent blurring or spreading of the discharging or modifying agent, heat is employed in some suitable manner, so as to rapidly dry off the solution or fix the colors.

Curious Foundations.

The *Railway Review* tells of a novel method of laying foundations in swampy soil recently employed by an American engineer. The building to be supported was a low wooden one which it was proposed to use for the storage of machinery. Casks were set in holes in the ground along the line of posts and were filled to the depth of about one foot with iron turnings. The posts were placed in the casks, which were then filled with iron turnings compactly rammed in place. A solution of salt and water was slowly poured over the turnings, under the action of which they solidified into a hard mass. The heat of the oxidation of the iron was so great that the posts were charred. This also served to act as a preservative, and to that extent the iron turnings are probably superior to concrete under similar conditions.

Correspondence.

Molecular Motion.

To the Editor of the Scientific American:

In an article copied into the SCIENTIFIC AMERICAN SUPPLEMENT of September 3, on "A Theory of Illumination," the writer says that "scientists are somewhat off the track as regards certain minor points, such as the illumination of opaque bodies." In explaining his theory of illumination he remarks:

"Go to your room at night, when all is dark, and you see nothing whatever, for the composing atoms of each object in that room are in comparative rest. But now light the gas. Immediately vibration is set agoing by the combustion, and, passing on, it agitates the atoms of every object present.

"You now look at matter made visible, not by reflected rays, as commonly supposed, but by light waves of their own creation, caused by the imparted energy. A luminous body is the source of etheric light waves, while an opaque substance is made visible by the presence of a luminous one.

"The rays of the sun reach the side of the moon visible to us, creating among the atoms of that body a violent agitation. When they strike, their office is fulfilled; their motion has been checked, and they cease to be. But now the commotion of the moon's particles imparts its energy to the surrounding ether and thence to us, giving us the delightful evenings of full moon."

I cannot agree with the writer of the above, that matter is not made visible by reflected waves of the ether, but by light waves of its own creation, caused by imparted energy from some luminous body. If our moon were a perfect sphere and absolutely smooth, we could see it only as a point of light, in the angle equal to the angle of incidence. A perfectly smooth moon, however, would be impossible, even if composed of glass, because all matter consists of atoms and molecules, and the ultimate particles have certain dimensions.

Foliage on the banks of placid water appears to be inverted in the depths below when seen from the opposite side. As the light which impinges upon the trees is scattered in all directions, we receive those rays which bound to us from the surface of the water, and get the picture in the direction of the reflected rays. What is sometimes erroneously called the shadow of ships and foliage in marine pictures is not caused by what is supposed to be the partial absence of light, but by its reflection.

St. Helena is one of the numerous islands of the St. Lawrence River. It is here where I have been very much interested the present season in watching the play of light upon the water. I have noticed the broad band of reflected light of the moon when it appeared to dance upon the ripples in the warm summer breeze, and I have seen the narrow line of reflected light from the planet Mars. In the direction of the setting sun, when the clouds have a red and golden tint, these colors are reflected upon the water. At night the river course can be discerned by the light from the sky.

Sound is reflected as well as light. While light waves are somewhat similar to the waves of water, sound waves are produced by a to-and-fro movement of the air in concentric layers from the source of disturbance. The echo, or reflection of sound, is beautifully illustrated on the Canadian side of the river, near the "Lost Channel." As the steamer passes along the perpendicular rocks of the Laurentian range, the "toots," as they strike the shore, bound back to the boat, and we get a distinct repetition of the original sound.

Molecular motion is inherent in all matter. No atom is at rest. As the undulations of the ether from the sun strike upon the surface of the earth they shake its atoms and molecules, and this motion is what gives it warmth. A portion of the waves are quenched in doing work, while the remainder are reflected. In this mode of absorption and reflection we have all the beautiful colors in nature. I cannot undestand that light of its own creation can come from any other source than intensely heated bodies. The sympathetic agitation of the molecules of opaque bodies is not competent to produce this phenomenon. H. C. STILLMAN.

Island St. Helena, St. Lawrence Park, N. Y.,
September 13, 1892.

The Mount Washington Search Light.

The top of a mountain 6,300 feet above sea level seems at first sight a curious location at which to install an electric search light, and it will be admitted that few men would ever have conceived the idea of making the experiment. To Mr. L. H. Rogers must be attributed the honor of first suggesting that a search light would be an attraction on the top of Mount Washington, and that it could be operated successfully. Mount Washington, as is well known, is the highest mountain in the States east of the Rockies and north of the Carolinas, and belongs to the White Mountain range in New Hampshire. Large numbers of people visit these mountains every summer, and beautiful little towns and large hotels nestle in the surrounding valleys, most of them being situated where a good view of the king of the mountains may be had. Access to the mountains is extremely easy, the Concord and Montreal Railroad from Boston being the most popular route, as the line runs through country abounding in fine scenery, and takes the traveler to the very base of the mountain where the Mount Washington Railroad begins. Besides affording a vast amount of interest and amusement to the mountain summer visitor, the search light, poised at this extreme elevation, is of scientific interest.

A tower has been erected on the very highest point of the mountain, 27 feet square at the base, 50 feet high, and tapers to 14 feet square at the top. It is built of eight 9 inch spruce timbers reaching from the foundation to the top, each of the floors being supported on similar timbers, and the whole tied together by iron straps and bolted, and the framework chained down to the rocks on the mountain top. The whole building was then covered by heavy planking and clapboarded on the outside; but, even with this protection, so severe are the wind and rain storms, the moisture penetrates the building and makes the condition of operating a dynamo extremely severe, the armature after a great storm being frequently saturated with moisture. The first floor of the tower contains engine, boiler, dynamo and switchboard, the whole steam plant having been furnished by J. A. Grant & Co., of Boston. It consists at present of a 30 horse power vertical tubular boiler manufactured by the Erie City Iron Works, of Erie, Pa., which works at a pressure of 80 pounds. The engine will eventually be a 25 horse power McIntosh & Seymour high pressure engine, as it is expected that current will be furnished for lighting the Summit Hotel, but at present a 15 horse power Armington & Sims engine is used. Rain-water is used for the boiler, and it is fed through a National heater by means of a small Worthington pump, which lifts the water from a tank 10 feet below. In dry weather the water is brought up in tanks by one of the Mount Washington railroad locomotives, filled from the watering tanks on the side of the mountain. The dynamo is of the Thomson-Houston spherical armature type, compounded and capable of giving 75 volts and 110 amperes. In spite of the severe conditions owing to the extreme dampness, it has given every satisfaction, and has run without a hitch from the first. The switchboard is of the skeleton type, made of wood, and contains ammeter, voltmeter, a double pole single throw 120 ampere switch for the main search light circuit and two 10 ampere switches for the 18 incandescent lights distributed on the different floors of the tower. These lamps are on two circuits, one for the upper floors and one for the engine room. Fuse blocks and lightning arresters are also mounted on the switchboard, so as to prevent any chance of accident. In the engine room and protruding through the floor may be seen the top of the highest point of the mountain. In the center of the room a red incandescent lamp burning in a vase filled with water serves to mark the position of the copper bolt inserted in the rock, which formed one of the station marks set by the Geodetic and Coast Survey during their operations now completed. The second and third floors of the tower are used as storerooms, the fourth as the lower observation room, and the fifth as the general observation and controlling room. In this room is the controlling stand, on which is mounted a standard Weston voltmeter and ammeter, resistance coils and various switches for operating the light and the motor in the base of the search light by which the projector can be turned round in any direction, and the elevation altered at will. On the roof of the tower, open to the atmosphere, is situated the search light, which was manufactured by the General Electric Company. The light is inclosed in a projector of 30 inches diameter, the largest ever made in America, and is of 100,000 candle power nom., the actual candle power of the lamp without the reflector being 20,000. Hardtmuth carbons, made specially for this work in Vienna, Austria, are used in the lamp, measuring 1¼ inches diameter for the positive and 1 inch for the negative, the positive carbon being cored. The reflector consists of a Mangin lens with 14 15/16 inch focal point, made in Paris by a secret process, by which the quicksilver on the back of the reflector can withstand the extreme heat of the arc. The lamp when operating requires 45 volts and about 90 amperes, the voltage of the dynamo being reduced by resistances on the floor below.

Viewed from any of the well known summer resorts in the vicinity the effect is very fine, and it is astonishing to note the interest shown in the light by the visitors to these hotels, who gather in knots on the verandas and discuss the all-absorbing topic of "search lights" and endeavor to read the messages signaled to them, by means of a code which has been distributed in thousands all over that section of the country. At Maplewood, for instance, where the writer recently stood on one beautiful clear night 20 miles from the top of the mountain by air line, the light was "turned on" the hotel for about 20 minutes, and signals were read with the greatest ease and precision. At that distance the light is almost too bright to be looked at comfortably, and the effect of the illumination on the hotel is quite marked. The time on a watch is easily told and type as large as the heading of this article read with ease. On white surfaces such as the front of the hotel a curious shimmering effect is produced, and small dark patches seem to float constantly over the surface, produced perhaps by the magnified effect of minute particles of vapor in the atmosphere, or by some other phenomenon not yet accounted for. The signaling is accomplished by a metal damper in the inside of the projector which can be lowered between the arc and the lens by a lever extending to the outside, and by means of which flashes of short or long duration can be effected. At Maplewood, on the night when the writer was present, several signals were given and readily interpreted. Before spelling out the words, ten short flashes were given to attract attention, and then came a series of long and short flashes, spelling out the words of the famous message which will go down to all posterity as being the first telegraphic message ever sent by the Morse telegraph: "What hath God wrought!" After each word, the beam of light is moved up and down, and at the conclusion of the sentence a circular sweep of the beam shows that the message is concluded. A few minutes later the words: "Maplewood Hotel, good night," came flashing through the air, and one felt as if on personal terms of friendship with the friendly beam shedding its pure light over the intervening miles of rocky glen and wooded hillside. At Fabyan's, eight miles from the top of the mountain, ordinary type can easily be read, and at Mr. Milliken's Glen House, which is only five miles away by air line, the light makes the grounds as light as day. Standing alongside of the projector on the top of the tower at night, the sight is also a very grand one, and a beautiful view of the beam of light can be had.

When the projector is turned in the direction of any of the portions of the mountain from one-half to one mile away, the effect is very pretty, as it makes a round circle of light, and shows up any particular object even more distinctly than by daylight. It is a great source of pleasure to the visitors and they never seem to tire of watching the different effects produced. That it is a great attraction in the mountains is amply proved by the fact that in small places where the lights of the village cannot be seen by the naked eye from the mountain top, large bonfires are nightly kindled in the hopes that the ray of light will be turned in their direction. Many letters and telegrams are also received daily with "special requests for the search light," and letters from many eminent men within a radius of 100 miles have been received stating that the light had been seen and asking for further experiments in their particular directions.

As to the distance from which the light has been seen, it is a little difficult to get accurate figures. At Portland, which is 85 miles away, the beam of light has been distinctly seen, and actual telegraphic conversation held with the operator on the mountain, the search light flashing out a message, and the telegraphic operator at Portland repeating it by ordinary telegraph back to the mountain. Many towns 100 miles away have reported seeing it, and one report states that it was seen on one occasion at Pigeon Cove, Cape Ann, on the coast of Massachusetts, a distance of 116 miles. Recently the New England district of the Weather Bureau has instructed Mr. Rogers to make experiments on weather signaling, and for the past three weeks weather signals have been shown at eight o'clock every evening to the surrounding districts, a combination of long and short flashes signifying fine or rainy weather, according to the reports from the bureau. These signals have been seen and read at Exeter, N. H., a town about 100 miles from Mount Washington, and are giving general satisfaction to the surrounding countryside.—*A. C. Shaw, in the Electrical Engineer.*

Only Man Ever Killed by a Meteor.

To the writer's certain knowledge there is but one case on record where a human being has been killed by an aerolite or fall of meteoric stone. The fatality mentioned occurred in Whetstone Township, Crawford County, O., in 1875, and is recorded in the Bucyrus *Journal* as follows:

"As David Misenthaler, the famous stockman of Whetstone Township, was driving his cows to the barn about daylight this morning he was struck by an aerolite and instantly killed. . . . It appears as if the stone had come down from a direction a little west of south, striking the man just under or on the right shoulder, passing obliquely through him from the right shoulder to just above the left hip, burying the greater portion of his body under itself in the soft earth. The stone is about the size of a wooden water bucket, and appears to be composed of pyrites of iron."—*Philadelphia Press.*

[The item quoted by our contemporary the *Press* was a canard. It was published at the time stated in the Bucyrus *Journal*, and was manufactured by one of the reporters of that paper. No such occurrence took place.—ED. S. A.]

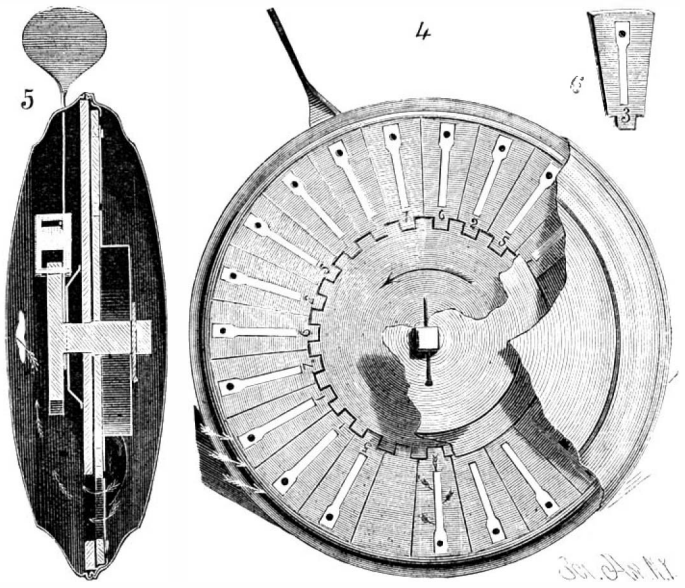
The Chicago New Drainage Canal.

August saw the actual beginning of one of the largest engineering schemes in the country. For many years Chicago has had spasmodic attacks of realizing that her sewerage system was inadequate to her needs. After each fresh attack improvements have been planned and executed, which, however, were only of a temporary nature, owing to the ever-increasing size of the city. At present, with every severe storm the sewers are flushed out into the river, and with any heavy fall of rain a few miles back in the country the low river valleys are flooded and the waters come rushing down into the South Branch of the river, driving all its dangerous pollution into Lake Michigan. Pumping works have from time to time been established to induce the beautiful Chicago River to change its nature, and, unlike most rivers, be able to flow two ways. These pumps are no longer powerful enough, and for the last five years there has existed a drainage commission whose history is more stormy than that of the Guelphs and Ghibellines, but which has now either killed off its most belligerent members, has lost its fighting blood, or at least appears to be devoting itself in a somewhat more energetic manner to drainage and less to lively discussions of a somewhat political character. The present scheme is to create a channel from Lake Michigan, at Chicago, for a distance of forty miles to Joliet. The route of this channel will lie chiefly through the valley of the Des Plaines. Starting from one of the southwest "tributaries" of the Chicago River, it will, in its westward course, utilize the Illinois and Michigan canal, create new cuts, and finally settle itself into the bed of the Des Plaines, widened and deepened to suit its needs. In time the current will reach the Illinois River, and by this waterway will eventually gain and mingle with the floods of the Mississippi. The one saving feature of the scheme for the counties adjacent to Cook County, and in fact for part of that same county itself, lies in the fact that the land surrounding the lake is considerably higher than that several miles back in the country, and consequently sufficient fall can be secured in the channel to obtain for it a large volume of water from Lake Michigan. That the towns along the route of this channel, into which Chicago intends to pour all of her liquid and semi-liquid filth, should have for an hour entertained the idea of permitting such an enterprise seems incomprehensible. Such, however, in the main is the idea of the present great drainage undertaking of Chicago. There is talk of eventually constructing the channel so as to make it navigable for large vessels, thus making Chicago, as well as the smaller towns along its course, in a degree, seaports, giving them direct connection with the Atlantic.

The law requires that the channel must be two hundred feet wide at the surface, one hundred and eighty feet wide at the bottom, with a depth of water of eighteen feet. The flow of water must be at the minimum rate of three miles an hour. These conditions are required, not because of any question of navigation, but that the sewerage may be sufficiently diluted to render it harmless and inoffensive. Experience and experiments in various countries have shown that twenty thousand cubic feet of water a minute is the least amount that, by diluting, can render harmless the sewage from a city of one hundred thousand population. The plans will contemplate the possibility of the growth of the city during the next thirty years up to the number of three millions in population; and, consequently, the channel will provide for a possible flow of six hundred thousand feet, or three times the original estimate. Not all the water sufficient to dilute the sewage can be carried through the South Branch, and another channel from the lake will have to be created, to enter the main channel at a point farther west. As consent to carry the drainage canal through the west-lying towns has been obtained from the inhabitants, conditional upon the amount of pure water brought into the channel, and this permission would be canceled if any lack of the fresh water supply arises, it appears probable that the requirements will be fulfilled. Though this sketch of the plan contains the chief elements embodied in the scheme, there are many minor details yet to be arranged. The ceremony of breaking ground for the main channel has already taken place, accompanied by the usual amount of flourish. When this great undertaking is finally completed, Chicago will have a system of drainage to be proud of, with a lake unpolluted by the drainage of a great city. The result will be most important, not only to the sanitary condition of the city, but will be the means of adding not a little to its beauty, so far as its water surroundings are concerned.—*Amer. Architect.*

AN INTERESTING TOY.

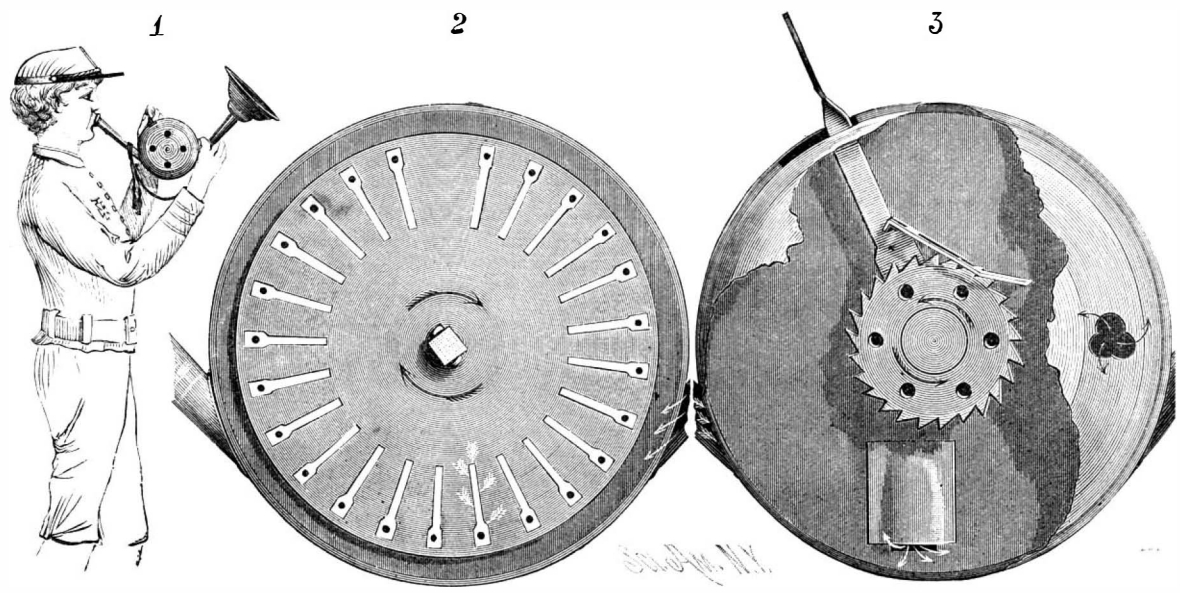
We give engravings of a toy bugle provided with an air chamber divided into two compartments, in one of which is placed a disk having a series of radial slots covered by reeds. In the partition is an aperture through which air passing through the reeds can find its way into the rear chamber. In this chamber, on the prolongation of the axis of the reed disk, is placed



HORN WITH REMOVABLE REEDS.

a ratchet wheel, and on the same axis is pivoted a lever which extends through a slot in the casing. The lever carries a spring pawl, which acts upon the ratchet wheel. An induction pipe communicates with the chamber in which the reeds are located, and an eduction pipe with a flaring end is connected with the chamber containing the ratchet. The disk is revolved by vibrating the lever, causing the pawl to engage the teeth of the ratchet wheel in succession. By means of this movement, a step-by-step motion is given to the disk which brings the reeds in regular succession opposite the opening in the partition, so that one after another of the notes of the music represented by the different reeds are produced and the tune is played. At the end of the tune there is a blank space, which prevents any sound being made, and this notifies the player to stop, unless he wishes to repeat the tune.

In Figs. 4 and 5 is shown a disk carrying removable reeds, which admit of changing the tune by simply drawing out one set of reeds and inserting another set. The construction of the reeds is shown in Fig. 6, while the arrangement of the lever, ratchet wheel, disk and apertures in the central partition is clearly shown in



DETAILS OF THE MUSICAL HORN.

Fig. 4. A person who is not a musician may play upon this instrument as well as the best player.

Cotton Manufacture.

Arsenic in Prints.—A large proportion of prints contains small quantities of arsenic—so small, in fact, that there is not the slightest cause for alarm. Many of the anilines, such as ceruleine blue, aniline greens, etc., and many of the vegetable colors, are fixed on calico by printing the color with a salt of alumina and a solution of white arsenic in glycerine, or in a borax solution. The reaction that takes place on steaming the goods is a double compound of arsenic, alumina, and coloring matter or, briefly, double arseniate of alumina and dye. This compound constitutes the insoluble *lake* which colors the fibers of the cloth with a more or less *insoluble* and fast color. This at once removes any danger in the wearing of the material. As a matter of fact, arsenic colors contain a considerable excess of alumina, and this is a *preventive* against the possible presence of uncombined arsenic. In extract alizarine colors, the soluble arseniate of alumina is sometimes added to brighten the colors, but, on steaming, the insoluble compound is obtained. When used properly, there is no harm in the use of this drug, and the cry which, no doubt, has been the cause of a decline in some classes of prints has originated from experiments on a small scale and conducted on false premises.

Colors.—Auramine is a coloring matter which gives a very pure shade of yellow, whether dyed on yarn or printed on calico; for yarn, chrome yellow is, however, cheaper and more readily produced. Auramine has all the advantages of aniline yellows without their deficiencies, as it is moderately fast to soap and light. If dyed by means of alumina, a good green shade is obtained, but it is loose; when fixed with sumac and tin, or tannic acid and tartar fustic, a most beautiful shade of pure maize yellow is obtained. The more tannic acid employed—up to the limit of 12 ounces good tannic acid to 3 ounces auramine—the faster will be the yellow obtained, but it must be observed that the color is not so bright as when less tannic is used, because the brown dulls the yellow. The same must be understood with equal force as to the use of auramine in printing, where a fine color can be obtained by fixing the auramine with 12 ounces per gallon of pure tannic acid and from 3 to 4 ounces auramine; this will stand strong soaping, but not so well as *berry yellow*. Auramine is, at present, largely adopted in many styles, as it is much less difficult and a more regular color to work than the berry yellow, and it will work well with many aniline colors. A yellow shade of green is got from it, and aniline crystal green. To detect it on the fiber, the following tests are reliable: Caustic soda turns the color white very rapidly; dilute hydrochloric, same result. It can be readily ascertained whether the color is fixed with tannic acid or alumina by boiling a piece of the cloth in a dilute solution of chloride of iron. Blackness will show tannic acid. A very fine shade of yellow, possessed of extraordinary *fastness*, in fact, the fastest artificial color as yet discovered, is chrysamine, used very much in dyeing, rarely in printing. It is not materially affected by acids, soap, or alkalies, and even caustic soda, light, air, rubbing, or chemic have little effect, except that alkalies turn it to an orange shade, while acids will restore it to a pure yellow, with a slight tendency toward light green. The present prevailing features in some print dress goods of pale yellows and buffs, as well as in cotton hosiery and laces, are produced by chrysamine, or mixtures of it, with benzopurpurine and other *azo* colors. In dyeing, the shade is obtained at one bath and without a mordant operation, etc., necessary in other dyes, and which are so injurious to the fiber of fine cotton lace goods. The reason the use of this dye is so much restricted is that a deep shade of yellow cannot be obtained so far. It is, however, found useful for buffs, and every delicate shade of pale yellow, salmon, etc.; it is not readily soluble in cold water, but dissolves freely in hot, and is still more soluble when in boiling water with a small atom of caustic soda. There is little doubt that this is the yellow of the future, when science unfolds nature's mystery.

Metallic Tungsten.

Dr. Martin Krieg, of Magdeburg, prepares pure metallic tungsten in the following manner: The finely ground tungsten mineral is made into a porous mass with fine carbon and tar or pitch. This mass is placed in the voltaic arc of the Jablochkoff system and chlorine introduced through the hollow candles. The candles can be made to furnish the chlorine by adding chloride of lime and silica to the material from which they are made. In either case chloride of tungsten is produced together with chloride of other metals.

If these chlorides be boiled in concentrated hydrochloric acid, oxide of tungsten is thrown down; the other chlorides are dissolved. The oxide is separated by decantation and washed. This oxide, mixed with carbon, can be easily reduced in the voltaic arc in an atmosphere of neutral gas.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Eugene Geant, Fort Logan, Col. On the laterally-swinging longitudinally-yielding drawhead provided by this invention is pivoted a clasp having an eye and depending flaring sides, the prongs of the clasp when it swings downward locking the coupled drawbars, the outer end of each of which has a rounded-off end and an inclined shoulder adapted to engage a similar shoulder on the opposite drawbar. The device permits an easy coupling and uncoupling without the operator passing between the cars, and each head is adapted to receive an ordinary coupling link to be coupled with a car having the ordinary link and pin coupling.

SIGNAL AND STAND.—George T. Brown, Sedalia, Mo. This is an improved device for carrying signal flags on the front part of a locomotive. It consists of a cylindrical column containing several tubular chambers, and with an outside socket at its base, the flags of different colors, rolled on their staffs, being kept in the chambers, for which there is a removable cap piece, having also an outside socket. The latter socket and the one in the base form supports for the staff of the flag being displayed.

Mechanical Appliances.

ELECTRIC MOTOR.—William M. Dresskell, Brainerd, Minn. This motor may be operated by an alternating or direct current, the sections of the commutator being readily removed and replaced without disarranging the adjustments of the machine. A multipolar field magnet is formed of laminated circular segments held in position by clamping rings and bolts, the multipolar armature having a less number of poles than the field magnet, while the commutator is formed of a series of disks with their contact surfaces arranged with reference to the poles of the armature, to reverse the polarity of the armature as many times during its revolution as there are field magnet poles. A simple and efficient switch is provided for reversing the current in the field magnet.

WATER MOTOR.—William E. Seelye, Brainerd, Minn. This wheel has an outer rim divided into a number of curved buckets, having their larger openings inward, from which direction the water enters, the discharge being through the outer or smaller ends, the force of the water being applied near the circumference of the wheel. Means are provided for delivering the water in solid columns to the wheel buckets, and the invention includes a peculiar form of gate which enables the motor to be easily and nicely controlled.

FLUME GATE.—Stephen M. Irvin, San Bernardino, Cal. This is a gate of simple and durable construction, arranged to prevent leakage and to permit of conveniently cleaning the flume in case the latter is clogged with sand. The improvement consists of a cap adapted to close an opening in the bottom or side of the flume, a spring lever connected with the cap being pivoted on the flume and at all times pressing the cap securely in position to prevent leakage. The cap is moved to the side of the opening to clean the flume.

CHAIN WRENCH.—William H. Brock, Brooklyn, N. Y. This wrench has a convexed shoe and a concave pipe-receiving depression in the rear of and adjacent to the shoe, there being a chain pivotally connected with the wrench body at the rear end of the depression, which extends transversely of the wrench completely from side to side and of a length to accommodate the pipe and cause the latter to tighten the chain when the pipe is brought from the concaved depression to the forward position on the convexed shoe. The wrench is strong and light, may be cheaply produced, and possesses practical advantages in being narrower than such wrenches usually are, while having the strength of a broader tool.

COUNTERBALANCING COLLAR.—Watson T. Webb, Salt Lake City, Utah Ter. This is an improvement on a former patented invention of the same inventor, relating to combined eccentric counterbalancing collars and shaper guards, and is especially adapted to counterbalance the cutters on the spindles of wood-working and other machines. The collar is secured on the cutter spindle, and a series of weights is held adjustably on the collar, lighter or heavier weights being used to compensate for the increased or decreased weight of the cutters on the head.

ROTARY MACHINE REVERSING MECHANISM.—John G. Johnson, Chester, Pa. This invention is distinctive in the fact that the driving motion is always taken from one or the other of two loose pulleys on opposite sides of an idle pulley fixed on its shaft. Only a single belt is required, and in driving either one of the loose pulleys it is made to lap partly over on the middle or idle pulley, so that only a small range of movement is required for shifting. The improvement is designed more particularly for imparting an alternately reversed rotation to the revolving shaft of steam washing machines.

PULP GRINDING MACHINE FEED.—Albert H. Lefebvre, Watertown, N. Y. This is a hydraulic feed for wood-pulp grinding machines for making paper pulp from wood blocks, and is arranged to quickly return the follower after the wood block is ground up, the machine being very simple and durable in construction and designed to be very effective in operation. A cylinder is adapted to be connected at one end alternately with a water supply and an overflow, a piston carrying the follower sliding in the cylinder, while a spring presses on the piston opposite the inlet to the cylinder. All packing and stuffing boxes, etc., are dispensed with, and a quick discharge of the water in the cylinder takes places by the action of the spring on the piston.

COUNTER SKIVING MACHINE.—Michael C. Bowman, Albert F. Rose, and Cyrus B. Morse, New York City. This is a machine for shaving or beveling or feather-edging the edges of counters for boots and shoes. It has a rotary work holder, by which the operator may replace finished counters, while others are being operated on by the cutters, the work holder being automatically raised at the proper moment to move the work out of contact with the cutters, while there is also a novel arrangement of rotary cutters which are automatically caused to traverse the counters presented by the work holder and returned for the next cutting movement.

A MACHINE TO TREAT LEAF TOBACCO.—Charles A. Snyder, Danville, Va. This is a machine for treating the tobacco preparatory to its manufacture into plug, fine-cut, smoking tobacco, wrappers, etc. The tobacco is first subjected to and thoroughly dusted in an air bath, then treated with the desired preparations and solutions, admitted by valves in nicely regulated quantities, and afterward dried, the tobacco passing by gravity through the machine. Near the discharge end of the machine is a pipe adapted to discharge dry or powdered flavoring onto the tobacco.

Agricultural.

HAND BINDER.—Arthur Morris, Rockefeller, Ill. The guide plate, held in the left hand, has a recess at its forward end and a clamping device, while a gripping implement of pincher-like pattern is carried in the right hand, having spring-pressed handles pivotally connected and concentrically curved beaks at one end of the handles. The implement is provided with a cutting blade which does not interfere with the movement of the handles or beaks. The device affords a ready means for quickly tying sheaves of grain and securely knotting the cord.

BROODER.—Charles E. Watkins, Harvard, Mass. The brooding chamber is circular, and has a surrounding casing forming an intermediate water space, there being a lamp chamber below the casing, with an off-take pipe leading from the lamp chamber, and pipes for supplying air to and discharging it from the brooding chamber. The brooding chamber is thus well ventilated and equally heated on all sides.

Miscellaneous.

MEASURING FAUCET.—Cyrus W. Steinmetz, Harrisburg, Pa. This faucet has a valve casing having a longitudinal slot on one side and a series of short slots on the other, measuring pockets being connected with the casing by short slots, while an outlet pipe opens from the valve casing, a revoluble hollow valve having aligning slots registering with the slots and the outlet pipe. The device may be arranged within any liquid-containing tank, and is adapted to draw off any desired quantity of liquor, having also a dial and indicator to tell how much liquor is to be drawn.

WAGON BRAKE.—Enoch G. and William A. Haney, Media, Kansas. The free and unobstructed movement of the brake levers, to move the brake shoes far enough from the wheels to prevent their blocking with mud, is provided for by this improvement. Longitudinal bars secured to the sills of the wagon body have downwardly extending keepers carrying pivots for the brake levers. The brake may be put on and taken off without in any way disturbing the box, straps, or sides of the box or wagon body, and relieves them of undue strain.

PREPARATION FOR BEVERAGES.—Adele S. Krueger, of Hannahfield, Lenzie, near Glasgow, Scotland. This preparation is formed of celery, dried, roasted and ground, and, when prepared as directed, is designed to be a valuable medicinal beverage in the treatment of rheumatism and nervous disorders, and as an anti-scorbutic.

CAN WASHER.—Charles H. Southard, Preston, N. Y. Extending from one side into a water trough adapted to receive the can lying on its side is a shaft on which is an expansion brush, arranged to be expanded within the can by the pressure of the can on the brush. The improvement affords a simple and efficient machine especially designed for cleaning small-topped milk cans used for shipping milk by railroad.

INSECT CATCHER.—William A. McAdams, Brooklyn, N. Y. Attached to a hoop having a handle is a conical net having at its apex an elastic bulb or pouch having a neck and an aperture for the escape of air. The net is carried rapidly through the air to follow the insect in its flight, thus forcing the insect into and through the neck of the bulb, the latter being removable for the purpose of disposing of the insects caught.

COOLING AND FILTERING WATER.—Albert Smith, Colorado Springs, Col. This invention relates to cooling and filtering water from which ice is to be made, before the water goes to the freezing cans. Solid or foreign matters are precipitated in a storage tank by suitable chemicals, a pipe leading thence through a filter to a cooling tank. The latter has a coil supplied with brine from a freezing tank, and in the cooling tank is revolved a shaft carrying agitating blades, gently agitating the water to more thoroughly subject it to the action of the cooling coil and facilitate its giving off the contained air, the air being exhausted by a vacuum pump at the top.

RING HOLDER.—Julius Smith, Tom's River, N. J. This device has a raised or hollow base having a recess in the upper side at one end, the recess having a bottom wall and a back wall with a slot, while there is a spring within the base and projecting at one end through the slot and across the bottom wall of the recess. The holder is adjustable, and designed to be arranged in a tray, case, or other convenient way to hold any kind of ring, or any kind of jewelry having a ring or loop attached thereto, holding the ring or other article in a way to exhibit it to advantage.

COAL CHUTE.—Gustavus L. Stuebner, Long Island City, N. Y. This chute consists of a tubular column with openings at intervals in its length and a hopper at its upper end, doors being hinged to swing over and from the openings, so that coal delivered to the chute may be drawn out at any desired height from the ground in sufficient quantities to provide space above at the top for one load of coal, preventing coal from becoming broken when dumped into the chute by providing that it may fall only a short distance. Any of the doors in the chute may be readily opened from the dumping platform.

DAVIT HOOK.—Samuel B. Butler, New York City. The body of this hook slides in an enveloping sleeve, a spiral spring on the hook body engaging a projection on the sleeve and a washer plate, while a tripping nose piece is pivoted below on a lateral limb of the hook body, there being a locking device for the hook nose piece which prevents it from vibrating when it is loaded. The hook is designed to engage the block and suspending ring of the boat fall ropes, so as to automatically release the ring as soon as the weight of the suspended boat and its load is upborne by the water of floatage, a single block tackle being used as well as a single davit hook.

SACK.—Harry V. W. Stivers and James Hoagland, Camden, N. J. Sacks for holding grain are by this improvement provided with a tie which can be quickly and conveniently manipulated, and which will securely close the mouth of the sack, the latter having handles at opposite sides to facilitate moving it. The band forming the tie is attached to the sack, and has on one end a hook adapted to engage apertures, preferably eyeleted in the other end of the band as the sack is closed.

ATOMIZER.—Harley M. Dunlap, Battle Creek, Mich. This device consists of a two-part spraying tube, having a side opening in the lower member and a hollow coupling connecting the two members, the coupling having a side opening to register with the side opening in the tube. This atomizer is easily taken apart and put together, especially adapting it for use in producing balsamic sprays, the solutions of which are apt to clog spraying tubes.

FIRE ESCAPE.—Patrick Lynch, Jr., Superior, Wis. This escape has upper and lower strong hangers attached to and projecting out from the building, and in these hangers are journaled shafts carrying sprocket wheels and chains connected by rungs to form an endless flexible ladder, with steps hinged to the rungs. In addition to the steps are bail-shaped guards in which a person may rest when standing on the steps. The escape is intended to work automatically, but where the weight is insufficient to work it a crank shaft may be employed, people stepping from the window upon the escape, and the rapidity of their descent being controlled by a simple brake mechanism.

BRIDLE ATTACHMENT.—Joseph W. Peace, Rhea Springs, Tenn. The cheek pieces of the bridle, according to this improvement, have snap hooks at their ends, while a brace band is secured to the cheek pieces below the brow band, and the nose band has rings at opposite sides with which the snap hooks engage. A simple, convenient, and handsome bridle is thus produced, which may be quickly and easily changed from a blind driving bridle into an open riding bridle, or *vice versa* while it may also be easily converted into a good halter, and is adapted for use as a hopple.

SLEIGH BRAKE.—David Collard, Hope, Idaho. A transverse brake shaft is journaled in bearings in the upper horizontal portion of the usual truss braces of the runners, this shaft being conveniently operated by a lever within easy reach of one in the sleigh, and the shaft carrying a gear wheel meshing with teeth on a nearly vertical bar, sliding in sockets, and the lower end of which forms the brake shoe. The construction is simple and the brake may be readily manipulated, while it may be attached to a sleigh in such a manner as not to weaken the runners.

CIGAR LIGHTER.—Franz Michl, New York City. This device consists of two tubes open at their ends and connected by an intervening plate, a cord or wick with attached chain being movable through one of the tubes, while in the other tube is a bottle having a stopper with a downwardly projecting needle. In the bottle is an alloy of sodium, potassium and zinc, and on touching a drawn-out end of the cord with the needle containing a small portion of the alloy the cord takes fire. The needle is replaced in the bottle and the cord drawn back into its tube to extinguish the flame, when the lighter may be returned to the pocket.

BUTTON EXHIBITOR.—Samuel T. Mosser, Abingdon, Ill. This device consists of a screen-covered cylinder, mounted to revolve in a case, a series of button-carrying brackets with hooks engaging the meshes of the cylinder to hold the brackets in place. The improvement is designed to afford a simple means to show to advantage a large quantity of goods, keeping them out of the dust and dirt, and holding them in such a way that any of the goods may be reached and removed when desired.

WASHING MACHINE.—John P. Hallsten and Charles J. Anderson, Rock Island, Ill. This is a double-acting machine in which rubbing boards are made to rub on both sides of the clothing at the same time, in the same manner as clothing is rubbed upon a washboard by hand, the work being more easily and rapidly done. The tube is formed with toothed cleats and reciprocating rubber boards, the upper board having on its upper side rollers upon which bears a spring-pressed bar. The rubbing boards are simultaneously moved in opposite directions by the operation of a lever, the clothes being rubbed between them.

WASH BOARD.—John C. Gearhart, Williamsport, Pa. This board has a removable and reversible rubbing plate, grooved or corrugated on its opposite faces, the main frame receiving laterally through or within it the marginal portions of the plate. An adjustable slide closes the slot in the side upright for the entry and removal of the plate.

CLOTHES LINE.—Jonathan W. Cadwell, Meriden, Conn. This is an improvement in clothes lines designed to extend from a window to an outer support, providing a device which will permit the washed clothes to be secured on an auxiliary line within the house, and affording convenient means for the attachment of this auxiliary line to the main endless clothes line stretched upon supports from the window outwardly. The clothes may thus be transferred to the outer air for drying in a convenient and entirely safe manner.

VEST AND DRAWERS HOLDER.—Albert Lustig, Corsicana, Texas. This holder is made of a main strip of metal, having at one end a downwardly projecting portion with a clasp for connecting with the drawers, the strip also having fastening devices for connection with the vest, the strip having sufficient elasticity to hold the vest down to prevent wrinkling, and without forming a rigid, unyielding connection.

Designs.

DESIGN FOR A PAPER WEIGHT.—Laurence J. Heffernan, New York City. The base of this device is shaped as the frustum of a prismatic pyramid, on which is an overhanging triangular tablet bearing a representation of a human head purporting to be that of Columbus, a ruching intervening the head and tablet.

BRIDLE BIT FRAME.—Wright W. Hall, New Windsor, Col. This frame has opposite slightly curved side plates, with a cross bar about the middle of their length, there being holes in the plates around the ends of the bar, while between the lower portions of the plates is a projecting curved round bar, and the lower ends of the plates have curved slots.

SPOON.—Edmund I. Richards, Brooklyn, N. Y. The end of the handle of this spoon is in the shape of a shield, within which is a large letter C, surrounding the letter E.

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INDEX TO NOTES AND QUERIES. NO.

(4559) T. R. asks: How can I make a machine to demagnetize watches? A. Make a sling like a small scale that will hold the watch in a horizontal position; to this attach a string, twist the string and allow it to untwist. While the watch is whirling rapidly, gradually lower it toward the poles of a strong permanent magnet; then while it is still whirling, gradually remove it from the sling. If the first treatment does not thoroughly demagnetize the watch, you will be obliged to try it the second or third time.

(4560) C. T. McM.—The plant popularly known as ragweed is *Ambrosia trifida L.* It is a plant with a rough hairy stout stem from 3 to 12 feet in height. The leaves are large and deeply three-lobed. The plant is common on moist river banks and has no medicinal properties.

(4561) F. P.—What you send is the seed of some species of milkweed (*Asclepias*) with their tufts of long silk hairs (*coma*). The material has been used for stuffing pillows, but is worthless for any other purpose.

(4562) P. J. H. asks: How do you find the theoretical value of a pound of coal in pounds water evaporated? A. The value of the combustion of coal is found from the known value of its chemical elements in their combination with the oxygen of the atmosphere in terms of the value of the amount of heat required to raise 1 pound of pure water at the temperature of greatest density one degree on the thermometric scale. This value is called a heat unit or thermal unit. The heat units of the various substances found in coal have been the subject of experiment by various chemists who do not exactly agree. The process is by burning a given amount of any element of combustion and ascertaining the number of pounds of water it will heat to some observed degree, and from these observations assign the heat units for each element. In this way coal is assigned an average of about 14,200 heat units per pound. In an experimental way it was also found that to evaporate 1 pound of water at atmospheric pressure at its boiling point (212°) required as much heat as would raise 966 pounds of water 1 degree on the thermometer, which is called the latent heat of steam at atmospheric pressure. Then the total heats units in 1 pound of coal divided by the heat units of evaporation gives the number of pounds of water evaporated by one pound of coal, viz., $\frac{14200}{966} = 14{\cdot}7$ lb.

In the practical operations of steam testing, the figures must be varied to suit the real combustion value of the coal and the amount of heat imparted to the water to raise its temperature from the normal temperature to the atmospheric boiling point, or to the temperature of evaporation. These points are illustrated in works on combustion and the generation of steam.

(4563) D. L., Jr., writes: In answer to query No. 4519 you state that the longest working electric railway is some five or six miles. Three have been running constantly here for a year past that exceed that length. The San Francisco and San Mateo Electric Railway has been running between San Francisco and Baden, a distance of 12 miles, from one central station, and over exceedingly heavy grades. The road is rapidly being pushed, 8 miles further, but whether or not it will be run from the same supply station I do not know. Another road runs between Oakland and Haywards, a distance of 10 miles; and another between Oakland and Berkeley, a distance of 8 miles. The extraordinary grades on the San Francisco and San Mateo road make it of peculiar interest. I think the Thomson-Houston system is used.

(4564) W. M. K. asks how to make modeling wax.

A. Best yellow wax ..... 50 parts.
Venice turpentine ..... 7 "
Lard ..... 3¼ "
Bole, elutriated ..... 36 "
Mix and knead thoroughly.

(4565) C. H. asks: 1. What would be the result if a 50 volt lamp was placed on a 75 volt circuit? A. The 50 volt lamp would absorb 1½ times the current and would not last long. 2 What is the amperage of each, a 50 volt, and a 110 volt, 16 candle power lamp? A. The 50 volt lamp requires 1 ampere and the 110 volt lamp ½ an ampere. 3. What is the amperage of the Edison dynamo, described in SUPPLEMENT of March 5? A. When running 9 lamps, 4½ amperes.

(4566) Engineer says: I am a locomotive engineer, 38 years of age, no family. I am out of work at present, with ample means to support me five years if necessary. Now I want to change my business. Do you think, by taking a couple of years course in mechanical engineering and draughting, that I could improve my prospects much? What pay does a draughtsman get? Is the business crowded? Am I too old to begin? A. If you have a mind that you can control for study and business, you can do much to forward your position in life. You must be your own judge as to the drift of your mind toward mechanical work and construction. With this propensity you can get along quite fast, but remember there should be no idle hours at your time of life, although it is never too late to learn. We advise you to take a position in some machine shop near home at any kind of work or price, and go to work with your eyes open to all that is going on around you. Use all your evenings for study and draughting. Select from our catalogue such books on mechanics as you may need from time to time, and start in draughting with the SCIENTIFIC AMERICAN series, then take up a more advanced work. With perseverance and a love for your work you cannot fail. Salaries for draughtsmen, like engineers, depend upon talent and experience, say $1,000 to $2,000 per year.

(4567) G. F. H. writes: 1. Will the pieces of carbons that have been used in electric lights (coppered) do for making small bichromate tumbler battery without removing copper plating? A. The carbons will do, provided you remove the copper. This may be done by placing them in nitric acid for a few minutes. 2. Will you give numbers of any back issues of SUPPLEMENT giving instructions how to make a small motor sufficient for propelling small hunting and fishing boat? A. We think SUPPLEMENT No. 641 contains the information desired. 3. Would plunge battery, Fig. 394, p. 401, in "Experimental Science," answer the purpose for the running of same? A. Yes. 4. Is liquid ammonia ever used as a fertilizer for fruits or flowers? A. Yes; when diluted with ten volumes of water.

(4568) J. C. writes: By placing a disk of wire netting in the bottom of a dinner plate sprinkled with sugar, and covering the plate with another disk of wire netting and running a wire from each disk to an induction coil or shocking machine, flies and other insects and small animals can be effectually shocked. The holes in the netting should be only large enough to allow the insects to reach the sugar through its meshes. By lighting upon the upper disk and reaching to the sugar or lower disk, the electric circuit is completed through the body of the insect.

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Roof, L. H. Montross 483,966
Root cutter, D. Maxwell 483,743
Rotary steam engine, F. A. Small 483,726
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Routing machine, W. Greaves 483,671
Roving frame, Morgan & McMullan 483,513
Sad iron, J. Sabold 483,769
Sad iron heater, F. R. Sutton 483,878
Saddle pad, harness, R. Whitman 483,754
Safety pin, hook and eye, E. M. Wright 483,886
Sanitary seal for covers of toilet vessels, C. Smart 483,948
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Sash, reversible window, G. Hoersch 483,763
Saw attachment, H. C. Webb 483,971
Saw set, H. B. Smith 483,793
Sawing machine, drag, Kirkscey & Bowden 483,630
Scale, coin-operated weighing, G. G. Merry 483,787
Scale, weighing and recording, R. McFarlane 483,675
Scarf clasp, J. J. Hallahan 483,783
Screen. See Window screen.
Seal lock, J. B. Price 483,867
Seat. See Spring seat.
Sewing machine feeding mechanism, B. F. Bellows 483,800
Shade roller, spring, E. F. Hartshorn 483,553
Shade supporter, window, S. T. Stuver 483,796
Shaft attachment, vehicle, F. M. Merrick 483,568
Shaving case, H. T. Peters 483,579
Shears. See Animal shears.
Shelf bracket, T. Corscaden 483,834
Shoe holder, E. Leger 483,808, 483,963
Silver ores, smelting complex, C. James 483,962
Sliding gate, double suspended, P. E. Jensen 483,614
Sole, Pfouts & Ball 483,580
Sole staining machine, F. L. Richardson 483,944
Sowing machine, E. G. Thoren 483,623
Speed measure, O. Knapp 483,846
Spinning mule, P. N. Dexter, Jr 483,906
Spittoon for railway cars, E. L. Harris 483,918
Spool boring machine, J. M. Parker 483,576
Spring. See Checkrein spring.
Spring seat, S. G. Scarritt 483,699
Square, tailor's measuring, P. N. Arvidson 483,521
Stand. See Barrel stand. Medicine stand.
Steam boiler, J. D. Hulings 483,805
Stereotype plate and base, J. R. Cummings 483,544
Stereotype plates, composition for, W. A. Force 483,716
Storage battery, E. R. Knowles 483,562, 483,563
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Tanning vat, leather, B. P. Bradford 483,734
Telegraph system, police, C. A. Rolfe 483,768
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Trap for sinks, etc., D. A. Horgan 483,961
Trolley catcher, J. J. Hoppes 483,689
Trough. See Feed trough.
Tug hook, harness, J. Green 483,959
Turning machine, wood, Bennett & Haidacher 483,760
Valve, automatic regulating, J. M. Foster 483,979
Valve check, E. W. Craine 483,603
Valve check, S. F. Prince, Jr 483,635
Valve controller, hygrometric, C. W. Rogers 483,725
Vapor burner, J. S. Wood 483,885
Vat. See Tanning vat.
Vehicle running gear, H. T. Goodrich 483,717
Veil pin, G. H. Fien 483,605
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Velocipede saddle, F. M. Slocum 483,875
Ventilator. See Air ventilator.
Ventilator, Gross & Beck 483,650
Vessel closure, J. B. McNabb 483,575
Vessels, apparatus for ejecting ashes from, H. See 483,770
Vine cutter, S. H. Francis 483,627
Vine holder, J. L. McGarrell 483,858
Violin, D. F. Burgner 483,897
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Well drilling machine, G. Zink 483,756, 483,888
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Whiffletree, J. Edgar 483,604
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Wrench. See Pipe wrench.
Wrench, L. I. Fak *et al* 483,803
Zinc furnace, O. Sumaghi 483,934
Zinc, reducing, C. James 483,652

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Corset, D. H. Warner 21,883, 21,884
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