THE MACHINERY OF THE INMAN LINER CITY OF NEW YORK.

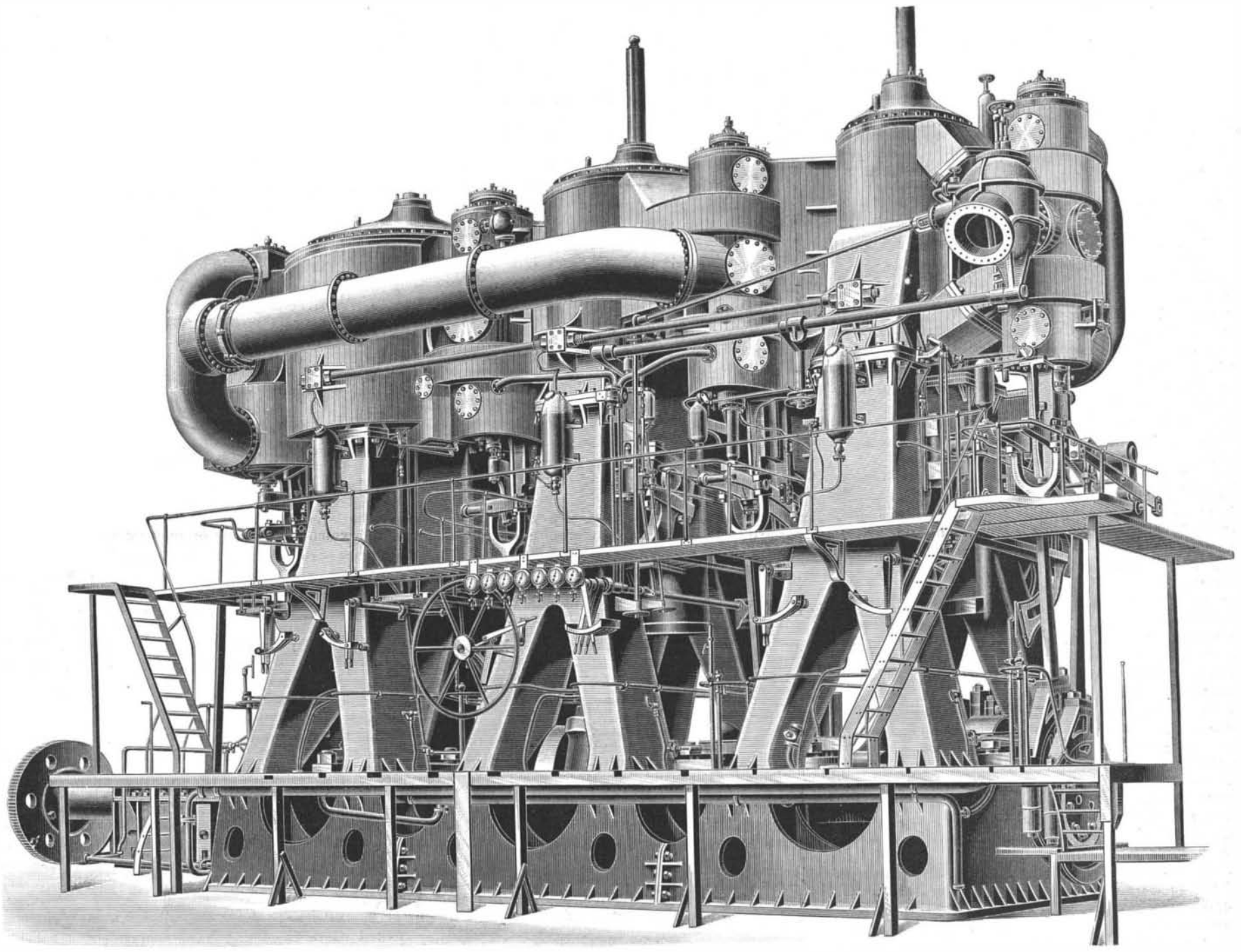
This new and magnificent steamship has lately completed her first round trip from Liverpool to New York and back, and a fair trial of her ponderous machinery has been had. The results show that the calculations of the builders were correct. The working of the mechanism proved highly satisfactory. We take the following from *Engineering*, together with our engraving:

The twin screw steamer City of New York was built and engined by Messrs. James & George Thomson, Clydebank, to the order of the Inman and International Steamship Company. The many novel features of the hull are accompanied by almost as many novelties in the machinery. The adoption of the principle of twin screws has been almost compulsory in this case, as it would be very difficult and probably very imprudent to construct single screw engines having the enormous power that these combined twin screw engines are intended to exert. The great advantage of built upon a very solid structure in the ship, but have, in addition, a cast steel bed plate. This bed plate is formed in three parts, each part weighing about sixteen tons. The columns are also of cast steel, and are of the "split type." The condensers, which usually form part of the main engine structure, are made, as in war ships, of brass, and are quite independent. The cylinders and their covers are cast iron, but the pistons are of cast steel of the dished type. The crankshafts are built of steel; the thrust, tunnel, and propeller shafts are also of steel. The crankshaft is 20¼ in. in diameter at the journal and 21 in. at the pin. The tunnel shafting is 19¼ in., and the propeller shafting 20¼ in. The piston rods and all the principal moving parts are of ingot steel. The piston rods have tail rods, and are attached to the pistons by flanged connections.

The high, intermediate, and low pressure cylinders are 45 in., 71 in., and 113 in. in diameter respectively, the stroke being 60 in. All the valves are piston valves, being one on the high, two on the intermediate, and four on the low pressure cylinders. The adoption of

The air pumps are the only auxiliaries driven from the main engine. There are two of them to each engine, of the ordinary vertical type, and they are worked by levers off the high pressure and low pressure crossheads. A small oil pump is also driven off the main engines. It is for keeping the crank pits clear of oil, which is forced into the stern tubes.

The boilers are fed by Worthington vertical pumps, four in number, associated with Gilmour's feed heater. These during the trial proved satisfactory, and in this connection it may not be uninteresting to indicate briefly their system. Each pump has two 12 in. steam cylinders and 28½ in. double-acting water plungers, with a 10 in. stroke. There are two pumps in each engine room. Of these one supplies the feed heater with water at the temperature of the hot well. This water has its temperature raised in the feed heater by live steam from the boiler to nearly the boiler temperature, and the second pump delivers this heated feed water at a slightly increased pressure to the boiler. There is no advantage on the score of economy; but in so far as



THE MACHINERY OF THE INMAN LINER CITY OF NEW YORK.

the duplication of all parts is too obvious to be dwelt upon here, excepting to state that with only one of the engines running, sufficient power would be developed to propel the vessel at about 15 knots per hour. To indicate how the dimensions and power of the engines of the City of New York compare with those of the principal merchant single screw steamers afloat we give a table compiled partly from a paper read by Mr. W. John, at the Liverpool meeting of the Institute of Naval Architects last year, and partly from the records of the trials of the steamers.

It will readily be seen that the power to be developed in the City of New York (20,000 indicated horse power) is considerably in excess of that in the other steamers, and to have fitted a single set of engines, even supposing it had been advisable from every other standpoint, would have been a very questionable step to take. The view we give is of the port engine. The two engines are separated by a longitudinal bulkhead reaching up to the main deck, communication being established by a sliding door, worked by a rack and pinion from above in case of need.

Many of the features which are common to war ship machinery have been introduced into the design of these engines, in order partly to save weight and in consideration of the high piston speed. The engines are the four sets of piston valves for the low pressure cylinder is unique, and is necessitated by the large port area in this cylinder, and to avoid the strains due to the great overhang which would be caused by the adoption of two sets only. The valve gear is of the ordinary eccentric type, the eccentric straps being of cast steel lined with white metal. The equilibrium valve, which controls the inlet of steam, is worked by an independent engine, which can be connected to the Dunlop governor. The adoption of this engine renders the handling of the main engine very much easier.

The turning engine is of a new type, being simply a hydraulic ram working by a pawl on a ratchet wheel. This ram is vertical, and takes up very little space, but is at the same time very powerful.

In addition to the usual draining from the jackets and casings, which is collected in the hot well, there is a continuous flow through the casings from the high pressure to the intermediate pressure casings, and from the intermediate pressure to the low pressure casing. In the latter casing the drainage passes into the low pressure cylinder in the form of vapor, there doing work, and finally passing into the condenser. By this means any accumulation of water is prevented in the casings when the engines are running, and the glands are always dry.

the feed water is introduced at boiler temperature there is complete absence of any possibility of strain due to irregular cooling of the boiler plates. The heater can be thrown out at any time and only one pump used, and as the capacity of each pump is sufficient of itself for boiler feeding, the other may be looked upon as an alternative in case of breakdown. In the ordinary arrangement, the first pump, which delivers from the hot well into the feed heater, is controlled by a float in the tank, so that it will be impossible either to have overflow or an insufficient quantity in the hot well. As all the water passing through the feed heater is at a high pressure all impurities in the water are deposited in the latter, from which they are occasionally discharged by means of a blow-off; and since the heater itself is in no way cramped or confined by large tubes, its cleaning becomes a very easy matter. Indeed, it is completely done by blowing off at regular intervals.

There are two fire and bilge pumps in each engine room for general ship purposes. These are also so arranged that they can be used as feed pumps in the event of the main getting out of order, and they are connected to the double-bottom system of piping, and are available for pumping the compartments between the bottoms should the circulating pumps bein use for other purposes. The water is circulated through each

HULLS AND ENGINES OF ATLANTIC STEAMERS.

NAME.	Vessel's Dimension.			Engines.	Engine Cylinders.		Boilers.		
	Length.	Breadth.	Moulded Draught.	Indicated Horse Power.	Diameters.	Stroke.	Heating Surface.	Area Fire grate	Working Pressure.
	ft. in.	ft. in.	ft. in.			ft. in.	in sq. ft.	in sq. ft.	lb.
SS. City of Rome	542 6	52 0	21 5½	11,890	3 in. 46 — 3 in. 86	6 0	29,286	1,398	90
" Normandie	459 4	49 11	19 9¾	6,959	3 in. 35 7/16 — 3 in. 74⅝	5 7	21,404	756	85
" Arizona	450 0	45 1½	18 9	6,300	1 in. 62 — 2 in. 90	5 6	..	..	90
" Orient	445 0	46 0	21 4½	5,433	1 in. 60 — 2 in. 85	5 0	..	..	75
" Stirling Castle	420 0	50 0	22 3	8,396	1 in. 62 — 2 in. 90	5 6	21,161	787	100
" Elbe	420 0	44 9	20 0	5,665	1 in. 60 — 2 in. 85	5 0			
" Umbria and Etruria	500 0	57 0	22 6	14,321	1 in. 71 — 2 in. 105	6 0	38,817	1,606	110
" Aurania	470 0	57 0	20 0	8,500	1 in. 68 — 2 in. 91	6 0	23,284	1,001	90
" America	432 0	51 0	26 0	7,354	1 in. 63 — 2 in. 91	5 6	22,750	882	95
" Servia	515 0	52 0	23 3½	10,300	1 in. 72 — 2 in. 100	6 6	27,483	1,014	90
" Alaska	500 0	50 0	21 0	10,500	1 in. 68 — 2 in. 100	6 0	..	..	100
" Ems	430 0	46 10	20 7½	7,251	1 in. 62 — 2 in. 86	5 0	19,700	780	100
" Aller	438 0	48 0	21 0	7,974	1 in. 44 — 1 in. 70 — 1 in. 100	6 0	22,630	799	150
" Ormuż	465 6	52 1½	..	9,000	1 in. 46 — 1 in. 73 — 1 in. 112	6 0	26,000	850	150
" Lahn	448 5	49 0	..	9,500	2 in. 32½ — 1 in. 68 — 2 in. 85	6 0	.	..	150
" City of New York	560 0	63 3	25 0	20,000	2 in. 45 — 2 in. 71 — 2 in. 113	5 0	50,265	1,293	150

of the main condensers by two sets of 15 in. centrifugal pumps, either of which is more than capable of doing all the work required. There are fresh water condensers in each engine room, which have their own feeding and circulating pumps automatically worked. All these pumps are of the Worthington type.

The hydraulic installation of the ship, which is the most extensive fitted on shipboard, has its pumping engines—two in number—in the engine room. These engines are of the compound surface condensing type of Messrs. Brown, now so well known in connection with hydraulic ship plant. These engines work seven hoists, nine derricks, two warping ends, a windlass, and two warping capstans aft on the promenade deck.

The steel boilers which supply the steam are nine in number, and are equally divided in three water-tight compartments. They are built of steel, the shell plates being $1\frac{9}{32}$ in. in thickness. The diameter of each boiler is 15 ft. 6 in., the length 19 ft., and the working pressure is 150 lb. to the square inch. The boilers are double-ended, and have each six furnaces, the mean diameter being 3 ft. 11 in. The tubes are 7 ft. 6 in. long, $2\frac{3}{8}$ in. in diameter, and in each boiler there are 1,056 tubes, or 9,504 in the nine boilers. The total heating surface is 50,040 square feet. The furnaces on each end have a common combustion chamber. Each boiler weighs seventy-four tons.

The boilers are worked on what is known as the closed stokehold system. This is the first ship for the Atlantic passenger trade that has been worked on this system, and it necessarily introduces many novelties. There are no air hatches excepting those through which the fans draw down the air supply. The fans for supplying air to the furnaces are twelve in number, and are each 66 inches in diameter. They are the result of very exhaustive experiments. The application of forced draught has become so general that the design of the engines has become equal in importance with the engine for propelling the ship. The experience which the Messrs. Thomson have gained during the past few years in constructinghigh speed war ships fitted with forced draught has enabled them to design a fan and engine that will work with great efficiency and comparatively no attention.

Wooden Toothpicks.

A toothpick factory, so says the *Timberman*, is one of the flourishing woodworking establishments at Harbor Springs, Mich., and it is one of the largest factories of the kind in the country. White birch is exclusively used in the manufacture of the toothpicks, and about 7,500,000 of the handy little splinters are turned out daily. The logs are sawed up into bolts each twenty-eight inches in length, then thoroughly steamed and cut up into veneer. The veneer is cut into long ribbons three inches in width, and these ribbons, eight or ten of them at a time, are run through the toothpick machinery, coming out at the other end, the perfect pieces falling into one basket, the broken pieces and the refuse falling into another. The picks are packed into boxes, 1,500 in a box, by girls, mostly comely-looking young squaws, and are then packed into cases and finally into big boxes, ready for shipment to all parts of the world. The white birch toothpicks are very neat and clean in appearance, sweet to the taste, and there is a wide market for them. The goods sell at the factory at $1.90 a case of 150,000 picks, or 100 small boxes each containing 1,500, and the small boxes retail at five cents each, or 300 picks for one cent, at which rate almost everybody can afford to take a fresh toothpick after each meal.

Hydrochinon.

Probably the most interesting of all photographic chemicals at this moment is the much debated hydrochinon, recently brought forward as the perfect developer and substitute for pyrogallic acid. In fact, Balagny, one of the most expert French photographic investigators, pronounces it absolutely satisfactory, giving strength and vigor, and defying fogging in overexposed plates, rendering detail in shadows, and susceptible of use for continuous operations of development. It does not become discolored, and certainly does not stain gelatine emulsions.

The formula of hydrochinon is given below, with the formulas of the three other chemicals that closely resemble it in chemical composition:

Pyrogallic acid has the formula	$C_6H_3(OH)_3$
Brenzcatechin is	$C_6H_4(OH)_2$
Chinon is	$C_6H_4O_2$
Hydrochinon is	$C_6H_4(OH)_2$

Looking at the chemical components of the above named bodies, a very slight difference of composition is plainly seen, and yet the four substances are distinctly different both chemically and physically, and three of them are of photographic importance. Another form of hydrochinon described by Wohler, called green hydrochinon, contains $C_6H_5O_4$, but this form has not yet been tried in photography.

Why these substances of apparently the same composition should have such varying properties is the subject of years of hard study and theory among the hard working chemical investigators, who are continually finding new compounds and methods of utilizing them in practical pursuits.

Hydrochinon, at first simply the interesting "find" of a scientific investigation, with its properties closely studied has been utilized simply by scientific deduction as to its reducing properties, and after being known for years comes to the front, ready for the photographer and promising to be a substitute for pyrogallic acid.

Corlorless hydrochinon is the principal product in the dry distillation of kinic acid, a substance found in cinchona bark, also from the addition of hydrogen to chinon, a substance produced artificially from aniline, which was first produced by the distillation of indigo.

To prepare hydrochinon from chinon, Wohler took a hot saturated solution of chinon (with a good quantity of chinon in suspension), passed sulphurous acid gas through it until the solution was colorless or all the chinon dissolved.

From one atom chinon, two atoms of sulphurous acid, and two atoms of water, are obtained one atom of hydrochinon and two atoms of sulphuric acid ($C_6H_4O_4 + 2SO_2 + 2H_2O = C_6H_6O_4 + 2SO_3$). Evaporating this solution at a moderate temperature, hydrochinon crystallizes out, without being decomposed by the sulphuric acid which has been formed. The crystals, being collected, are washed with a small quantity of ice cold water, and by recrystallization are produced in a pure state.

These crystals occur in colorless, six-sided prisms, easily soluble in water and alcohol, and more readily when warmed. They are odorless, taste sweetish, and are neutral to litmus paper. Heated in a glass tube they melt at low temperature, and then sublime on the sides of the glass, and on cooling appear in crystalline form. Between two watch glasses, on heating, they are sublimed and settle on the upper glass in shining plate-like crystals; but by higher heat they are decomposed into chinon and green hydrochinon. In solution hydrochinon is colored by ammonia, from the surface downward to a brown red color, and on evaporating this solution a brown amorphous substance results.

From an aqueous solution of hydrochinon, chloride of iron, chlorine, nitric acid, nitrate of silver, and chromate of potash precipitate a substance call chinhydron.

An alkaline solution of hydrochinon is decomposed by exposure to air. According to this reaction, it will not probably be advisable to attempt to make a "one solution" developer.

The various photographic stock solutions of hydrochinon suggested by writers invariably contain sulphite of soda in their admixture, and this doubtless is added to preserve the solution as well as for the chemical action of the sulphite of soda. Just what the decomposition is that occurs in the application of hydrochinon developer to gelatine-bromide surfaces is out of the province of this article, but it would be an interesting investigation to follow up, and its pursuit might lead to unexpected results. To those photographers who have not tried hydrochinon a new source of surprise and pleasure is at hand, and once having tried it doubtless they will discard pyrogallic acid and neutral oxalate on gelatine work. In wet plate work nothing can exceed the old methods in skillful hands, but the preparation of collodion emulsion and the use of nitrate of silver baths are tedious and treacherous undertakings, and in the extreme majority of cases of modern workers are practically abandoned for obvious reasons.

In purchasing hydrochinon, great differences will be noticed in the preparations of different manufacturers, and, so far as known, preference should begiven to the soft crystalline kind, it being more readily soluble and probably purer than that in hard rhombic crystals of yellowish color. Hydrochinon is now produced in the American factories, and should the duty be maintained will be made in quantities, pyrogallic acid being imported from Europe, the absence of protection in the way of duty rendering it a losing business in competition with cheaper solvents and labor in Continental laboratories.—*Science of Photography.*

Gleanings from Various Sources.

The American Graphophone Company has decided to locate permanently in Bridgeport, Conn., and is making the necessary alterations and additions to the fine buildings formerly occupied by the Howe Machine Company. They have one of the finest properties in Connecticut for manufacturing purposes, and are putting in the special machinery and apparatus required to produce the graphophone.

A man consulted two doctors. One told him to drink nothing between meals. The other forbade him to drink anything at meal times. He paid both for advice, but it rather weakened his confidence in doctors.

Butter contracts during cold weather, forcing the brine to the surface, and the water, evaporating, leaves the salt that was in the brine in flakes on the outside of the butter.

Some men are naturally good milkers. They have a firm yet gentle hand and a way of winning the cow's confidence.

Shade sheds should be provided in treeless pastures for the cattle.

The surplus and inferior grapes make capital vinegar.

What goes to waste in many kinds of business is far more than what goes to profit.

Frogs' legs have become a staple delicacy on the bill of fare of all our first-class hotels and restaurants.

The best recipe for going through life in a commendable way is to feel that everybody, no matter how rich or how poor, needs all the kindness they can get from others in the world.

Mignonette and other plants will live for many years if the flowers are plucked as fast as they fade, but if the seed is allowed to perfect, they are but annuals—the plant dies.

The annual value of the dairy product of Illinois equals the gold production of the United States. Who says the cow is not the best friend of the farmer?

A dozen trees planted each year may change the appearance of a farm greatly in a generation and lead along to income, very satisfactory, as well.

The Brush Electric Company, Cleveland, O., reports that its carbon business is larger than ever before. It has shipped, within the last month or two, eight or ten solid car loads of carbons to different portions of the country.

Hemlock Lumber and Bark.

Of the sole leather made in the United States, a very large proportion is tanned in the State of Pennsylvania. Jackson S. Schultz, of New York, has been for many years largely interested in this and in the lumber business, and in the manufacture of bark extract for tanning, and he writes to the *Shoe and Leather Reporter* as follows touching the uses of hemlock lumber and how long the supply is likely to last:

Hemlock lumber is worth at the mills, when in a seasoned condition, from $6.50 to $7.50 per thousand feet. This lumber is used very extensively in all parts of Pennsylvania. In the city of Philadelphia, especially, the best frames are made from this timber, and have been so made from our earliest history. This circumstance is mentioned only to show that hemlock lumber is unexceptionally good. If used for docks under water, this timber will last an indefinite time; and if used for docks and cribbing, partly under and partly out of water, it will last as long as pine or spruce. Like all other timber, if exposed to wet and dry atmosphere alternately, where so exposed it will decay. The life of hemlock, under these conditions, is not beyond eight or ten years. But the Sunbury and Erie Railroad, which was constructed about eighteen years ago, used "sapling" hemlock very largely for its ties, and many of them still remain in the roadbed. Because this wood does not hold the spikes as well as oak and chestnut in part accounts for its non-use in modern railroads. For this reason, too, are pine and spruce rejected. It is claimed that, when this wood is kyanized with tannin, it will last as long as oak or chestnut for bridges or ties.

As a finishing wood for ceilings and flooring, hemlock is subject to this objection: It will splinter when roughly used, as in kitchen floors, but when covered with carpeting on bed rooms or parlors, it will give perfect satisfaction. Many of the best hotels and dwellings of Philadelphia and Baltimore, as well as other cities of our Central States, are floored with white hemlock flooring, and it gives general satisfaction. For "siding," when covered with paint, it answers a good purpose. When not so covered, it is unsuited, as, indeed, few woods are capable of standing our climate unprotected with paint.

Wherever hemlock is used in contrast with spruce or pine in dry structures, such as dwellings, barns, sheds, etc., it will be found in all respects as lasting as these woods, and by reason of the exemption of this wood from *black knots*, it "cuts up" to a much better advantage—that is, less waste—than either of these more pretentious and expensive woods. It is to-day the wood, in most cases, men use in all the Northern States, including Canada. Until within a short period, hemlock has not been considered suitable for "pulping," but recent experiments have demonstrated that hemlock will make good pulp for the paper makers. While it is claimed that the percentage of product is not as large as from some other woods, the quality is equally as good. Recently a sample of hemlock was taken to France, and the chemist and pulp maker has sent back, as the result of his experiment, a sample of pulp quite equal to the best that is made.

Hemlock bark is conceded the leading tanning bark of the country. It is usually worth from $5 to $6 per cord, or ton of 2,200 lb., at the nearest place of delivery, when taken from the tree. When shipped to great distances by rail it is worth the freight additional, as, for instance, at Boston and Chicago it sells from $8 to $9 per ton, or cord.

The hemlock tree does not reproduce itself. When the land is once cleared of these trees, beech, birch, maple, and chestnut come in their place. This fact has given rise to the frequently expressed opinion that very soon we must look to other sources for our tanning material. Of course, under these circumstances, it is safe to predict at *some future period* there will be no supply of hemlock bark for tanners. But when asked to say how long the supply will last at the rate we are now consuming it, it is safe to say that the child is not born that will see the end of the supply.

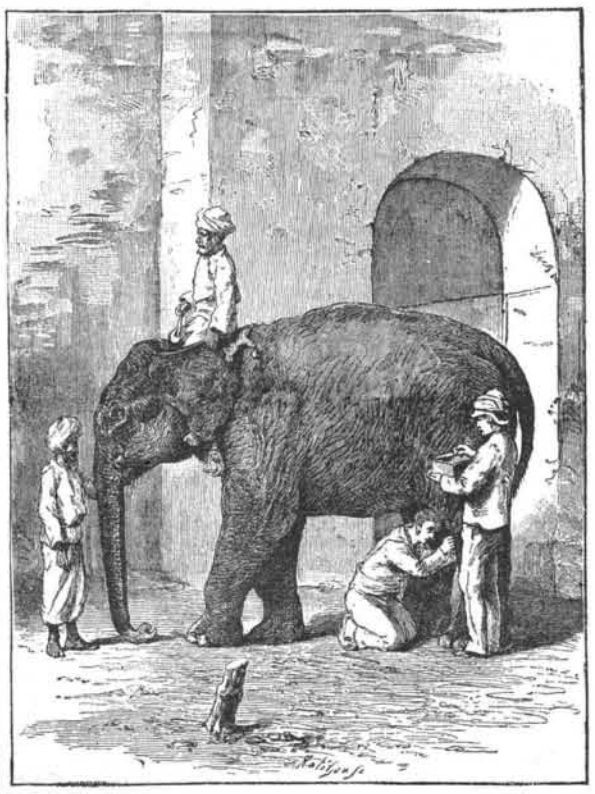
The counties of Elk, McKean, Sullivan, Warren, and Forest are substantially intact, although some forty large tanneries have been making drafts on their bark supply for sixteen years at the rate of 200,000 cords or tons per year. Except along the lines of railroads which have penetrated these counties, the hemlock forests stand to-day as they did at the beginning—covered with a dense growth of hemlock trees that will yield from 10 to 12 cords or tons per acre. When these counties were first opened up by railroads, the projectors of these roads went there for coal, but at that early day a tanner predicted that the roads built and to be built would carry out more tonnage of lumber, bark, and leather than coal. In other words, the surface would yield more tonnage than the mines. This would have been true but for the subsequent discovery of petroleum. Although that whole section is underlaid by a deposit of bituminous coal which is practically inexhaustible, the tonnage of crude petroleum, if all carried by rail, would probably far exceed all other commodities.

The final extinction of the hemlock forests will, of course, present a fruitful theme of speculation, for, as stated, it does not reproduce itself; but when we consider that other States besides Pennsylvania can be relied upon for a considerable amount of this lumber and bark, it seems quite unnecessary for us to make ourselves unhappy over the problem of final extinction.

Besides, within a few years it has been discovered that each oak and chestnut tree will yield as much tannin in its wood as its bark. This is a French discovery, and is now making practical headway in this country. If this discovery proves reliable, as there seems no doubt it will, then we may fall back on the old ground which the tanners have gone over fifty years ago, and rebuild our tanneries in the old States of New England and New York, and make leather quite independent of hemlock. But what shall we do for the serviceable and cheap hemlock lumber? Iron will take its place, as indeed it is already doing in some measure.

INOCULATING AN ELEPHANT.

Among the recent valuable discoveries of the famous French physician, M. Pasteur, is that of the vaccination of domestic animals for the prevention of the dire disease known as anthrax, or splenic fever. The marked success attending his system, in combating the rinderpest in Europe, encouraged Mr. J. H. Lamprey



INOCULATING AN ELEPHANT.

to bring the subject under the notice of the government of India, where no efficient remedy was known for this rapidly fatal illness, which annually carries off a large percentage of cattle of every kind. An order in council has been issued, after the most careful investigation of the merits of the system and of the probability of securing its favorable reception by native proprietors. In order to carry out this object, some native Indian students, who have received their education at the Cirencester Agricultural College, are now undergoing a course of instruction at the Paris laboratory of M. Pasteur, and will shortly proceed to stations in India, to dispense the vaccine, which is applied to elephants as well as to oxen and other beasts. It is confidently expected that their labors will be attended with the same success that followed the introduction of the system into those countries where it is now in full operation, with an ultimate prospect of the total extermination of the most serious maladies, working great havoc among flocks and herds throughout the world. The elephant, in a domesticated state, is liable, as well as other animals in the service of man, to certain epidemic diseases.—*Illustrated London News.*

Creosoting of Wharf Piles.

Engineer Manson's report to the harbor commissioners on the creosoting plant in San Diego and Ballona, Cal., states that the San Diego works, which were first inspected, have been in constant operation for the past six years, with the exception of a time when fire partially destroyed them in 1887. The works are located on the east shore of San Diego bay, near National City, and are accessible by rail. They cover an area of 1,000×250 feet. The plant consists of one pressure cylinder, 75×44, of 7-16 iron; two Blake air pumps, steam cylinder, 10×18; air cylinder, 12×18; three pressure pump cylinders, 8×14; one press, 5×14 feet; 75 tubular boiler and hoisting engines, pipe connections, iron trunks, etc.; storage tank, 75×4×3, 6,800 gallons.

The capacity of the plant is sixteen seventy-five foot piles each twenty-four hours. The working force is two foremen, two engineers, two firemen, and twelve laborers. The consumption of the creosote is for 3,318 feet of piling 3,169 gallons of creosote, or about nine-tenths of a gallon to each linear foot.

The cost of creosote delivered at 14c. a gallon, including labor, is 18⅛ c. a linear foot.

This does not include the cost of loading or shipping, but includes handling in the yard. A second batch cost as follows: Landing 100 piles from deep water to the beach, four men half a day, $4; fourteen men full day, $28; labor to engineer and fireman, $5; seven days' creosoting, fourteen charges night and day, $168; rafting to deep water, $8; 4,000 gallons creosote, at 14 cents, $560; total, $773, or $7.73 a pile, or 19½ cents per linear foot. The piling costs, delivered at San Diego, 26 cents per linear foot. These figures do not include interest or cost of fuel, which would amount to about one-half a cent more per linear foot.

The National City wharf was rebuilt in 1883 of creosoted piles. It consists of round piles, 12×12 feet piles, and 3×4 feet braces. The penetration of the creosote at this plant is from ¼ to 1¾. The square piling is generally in bad condition, but the round piles are in good form. The shrinkage in these piles was generally due to a split in driving the pile, injury of the piles after being driven, and imperfect and slight impregnation. In many instances the inside of a pile had been hollowed out by rot, while a shell of creosoted material was left untouched.

San Diego bay is not infested by the teredo as much as is the bay of San Francisco, but the limnoria is here, and much more destructive.

There was no indication that any of the piles at San Diego had been attacked by the teredo in National City wharf.

The oil used for creosote can be obtained at St. Louis at 7 cents a gallon, the freight to this city being 7 cents. It is a mixture of tar. Mr. Manson recommends that a sample of this oil be analyzed to fully determine its quality.

The amount of creosote oil used in the two cases cited is less than long practice has determined to be best. The results are, however, reported very satisfactory. The works are being operated night and day. These works are small and the machinery used is not of the best. Cheaper work and a more thorough penetration of creosote can be obtained. The oil can be laid down in bulk in this city at 10 cents a gallon. The cost of the San Diego works has been $12,000. The works could be duplicated in San Francisco for $5,000 or $6,000.

The Ballona plant cost $16,000, and is located near Santa Monica, Los Angeles County. The works have not yet been in operation very long, so that no data as to cost, etc., can be procured, but the better machinery at this plant lessens the consumption of creosote surprisingly.—*Pacific Lumberman.*

Coppered Carbons.

Probably nearly every electric arc lighting company owning a system (?) now electroplates its carbons. There was, in the dark ages of 1879, an interference in our much abused patent office between the two well-known inventors, Charles F. Brush and Moses G. Farmer, in relation to the coppering of electric light carbons, and it was held by Paine, commissioner, that Farmer had invented the process in controversy before Brush, but had also abandoned it, so that while priority was therefore awarded to Brush *pro forma*, the invention was thrown open to the public by Farmer's prior invention and failure to patent.

But as a matter of fact Jablochkoff had, as early as 1876, plated the carbons of his candles with copper; and though the invention had prior to that time been patented in France by Reynier, Jablochkoff disdained to recognize the Reynier patent, depending upon prior patents and publications; and it appears that Jablochkoff was right, since the Reynier patent was subsequently voided by the French courts, and held to be anticipated by a prior Carré patent and by Van Malderen's work in 1868. Bouliguine and Tchikoleff, also in Russia, plated their carbons, and published accounts of their practice.

The history of this feature of electric lighting is closely paralleled by many other features; and all other branches of applied electricity likewise disclose similar instances of anticipation. Electric lighting, however, is so old an art in itself, although commercially young, that inventors in this field cannot go far without running foul of something which had been invented (though very likely not much employed) years before.

And they acquire a decided impression, which they may voice, as others have done before them, in the complaint that "the people of *former times* had little honesty, they have stolen all my inventions."—*Electrical Engineer.*

Spectrum of "R" Cygnis.

A cable message has been received from Lord Crawford, at Dunecht, Scotland, saying that on August 13 and 22 the variable star "R" Cygnis was observed by Espin at Walsingham, and that the spectrum was found to contain bright lines. The observation was confirmed at the Dunecht Observatory.