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### FIFTEEN THOUSAND PATENTS SECURED THROUGH OUR AGENCY.

The publishers of this paper have been engaged in procuring patents for the past sixteen years, during which time they have acted as Attorneys for more than FIFTEEN THOUSAND patentees. Nearly all the patents taken by American citizens in FOREIGN COUNTRIES are procured through the agency of this office.

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### TO OUR FRIENDS.

#### NOW IS THE TIME TO FORM CLUBS.

Only two more numbers after the present and another volume of this journal will be closed. We appeal to its friends in all sections of the country where mail facilities exist to endeavor to form clubs for the coming year. We feel justified in asserting that no other journal in this country furnishes the same amount of useful reading, and especially at the extraordinarily low price at which it is furnished. Ten persons can club together and get the paper at \$1.50 each for one year. Twenty persons clubbing together can have it at the rate of only \$1.40. Think of getting a volume of 832 pages of useful reading matter, profusely illustrated with between 500 and 600 original engravings, for such a small sum of money. Single subscriptions, one year, \$2; six months, \$1. Even though the times may be hard, the long winter evening must be relieved of its dullness, and we must keep reading and thinking, and thus be prepared to overcome temporary difficulties and open new channels of wealth and prosperity. Friends, send in your clubs; at least renew your own subscriptions promptly.

See prospectus on the last page of this sheet.

### OUR COUNTRY AND THE SCIENTIFIC AMERICAN.

In the ways of Providence, peace, industrial progress and international comity sometimes happily prevail and extend for a period of many years. Then again there will come fearful changes, in which the very fabric of society will appear to be torn up and shattered, and war, with all its attendant evils, will pass before us in dread reality. We are living witnesses of such scenes and convulsions in our own land. In the history of the world, the United States of America, in origin and progress as a nation, appear almost like a splendid miracle as compared with other nations. Within less than a century we have sprung into

independent existence, and from dependent colonies, containing about three millions of people, and a domain confined along the fringe of the Atlantic shores, we have grown to be the second greatest commercial nation in the world. Our empire extends from ocean to ocean, embracing every variety of soil and climate, and our people number more than thirty millions. Our cities have sprung up, rivaling in extent and wealth those of the old world; and as regards power, intelligence, unity and all the great blessings of civilization, we called ourselves, perhaps truly, "the most happy people in the world." But evil times have now fallen upon us, so far as human vision can discern, and civil war "has been met as a stern necessity" by our regular and established government. We are engaged in grappling with the most gigantic rebellion on record, and all institutions, classes and interests are deeply interested in the issue; but we confidently hope that good will ultimately result from present evil. The SCIENTIFIC AMERICAN, like all its contemporaries, has experienced depressing influences, but it still rears an unaltered front. Its entire subscription in the Southern States has been destroyed, and in a pecuniary sense the effect of the conflict has been very severely felt. Yet, although several of the daily, and many of the weekly papers in New York and other places have finally succumbed to the pressure of the times, or have curtailed their dimensions and reduced their expenses to maintain an existence, the SCIENTIFIC AMERICAN has gone forth to its subscribers weekly, the same in dimensions as formerly, and more elaborately illustrated than ever. Our great efforts to maintain its usefulness for literary, scientific and mechanical excellence, we believe will be appreciated by our readers, who, we hope will use their influence in a special manner at the present time to extend its circulation among their friends. If each reader would induce one neighbor to become a subscriber our Southern list would be more than redeemed. The price of subscription is only one dollar for six months. Even in these hard times, we do not know where a mechanic can make such a profitable investment of one dollar for half a year or two for twelve months.

In three weeks hence this volume will be concluded. We trust all our old subscribers are making preparations for a renewal accompanied with like remittances from many friends. We most earnestly appeal to the friends of the SCIENTIFIC AMERICAN to come forward now and show their regard for it. The publishers would strongly urge upon their numerous friends not to forget them, even in time of war.

### HARBOR DEFENCES—MARTELLI TOWERS.

We notice that the good people of Philadelphia are somewhat alarmed respecting the defenceless condition of the river approaches from the sea to their goodly city. A correspondent of one of their daily papers has made the startling suggestion that the steam frigate *Merrimac* may steal out from Norfolk some dark night, enter the Delaware, ascend the river under a false flag, and lay Philadelphia in ashes within thirty hours after leaving the Chesapeake. This is more easily said than done, but it could be done with impunity so far as the defences of that city are concerned. Many of the leading men of Pennsylvania seem to be apathetic on the subject of harbor defences, but not the people of Philadelphia. Their daily papers are discussing the question in its various aspects, and several contributors have presented their views upon it. Different kinds of defensive military works are proposed, and among the number martello towers. It is suggested that several of these be erected on favorable situations along the Delaware river, and mounted with large Rodman guns. A single shot from one of these huge pieces of ordnance striking a war ship—it is stated—would sink her, and from this assertion the conclusion is drawn that such towers armed with such guns would form the best modes of harbor defence. Perhaps this is true and perhaps not. The officers of the engineering corps, U. S. A., are the best judges of these things, and we exhort the people of Philadelphia to submit all such propositions to a proper board before they adopt any plans for protecting their city. When there appeared some probability of a war between the United States and Great Britain, arising out of burning the steamer *Caroline* in the Niagara river, in 1837, we remember that it was pro-

posed to erect a great tower, several hundred feet in height, in New York city, and mount it with a monster gun, so as to sink every war vessel that might pass the batteries at the Narrows. If we can form an estimate of the utility of such towers from the condition of those in England, they must be useless structures. They are tall circular buildings of masonry, and a great number of them were erected along the British coast at the beginning of the present century for defense against the anticipated invasion of Napoleon. Their name is supposed to be derived from such a tower, that once gave the English a hard tussle to reduce, in Mortella Bay, Corsica. They are provided with vaulted roofs, and usually consist of two stories—the lower one for stores, the upper one for troops. The wall terminates in a parapet which secures the gunners in working pivot guns capable of firing in any direction. Most of these towers have been dismantled; not one, we understand, is now used as a fort.

The great defect of martello towers arises from their very limited dimensions. When war frigates were no larger than our ferryboats, and when their heaviest guns were 32-pounders, such towers may have been effectual for repelling attacks by sea, but the broad-sides of a single large frigate of the present day, we think, would soon destroy any martello tower that we have seen.

The best structures for harbor defenses are regular casemated forts. The forts at Hatteras Inlet and Port Royal were easily taken because they afforded no protection against the terrific showers of shell that were thrown into them. Had they been casemated and bombproof they could not have been taken so easily.

All permanent works for harbor defense should be casemated structures, but, at the same time, it appears to us that new modes of defense must be instituted for the new modes of attack, so scientifically carried out by Commander Dupont at Port Royal. By the agency of his steam engine the captain of a frigate can shift the position of his vessel continually, and thus baffle the gunners confined in a fort. When sailing vessels were exclusively used in attacking harbor defenses they became fixed targets like forts, and the contest was simply between wooden and granite walls. All this is changed; there is now much less danger of steam frigates being destroyed by land batteries than formerly, and a first-class iron-clad frigate could sail past any of our land batteries at 600 yards distance without being much injured.

To prevent war vessels passing up rivers and into important harbors, huge iron chains have been suspended at some depth across the channel. A boom of this character was thrown across the Hudson river at the Highlands, during the revolutionary war, and several of its links may still be seen in the State Museum at Albany. It was prepared by an ancestor of Col. F. Townsend, U. S. A., and the same agencies may again be used with advantage. There are nine forts and three batteries completed for the defense of New York harbor, and we think it would not be very easy for a hostile foreign fleet to come nigh the city; it is the Long Island and not the Staten Island shore, that appears to us the most inviting for a daring, skillful and powerful foe.

### ROCK OIL.

There is nothing in the industrial world at the present time more remarkable than the production of petroleum. That great lakes of this valuable substance should have lain a few feet beneath the surface undiscovered for thousands of years, is one among innumerable proofs that the intelligence of civilization is required to enable man to bring to light and render available the natural resources of the planet which we inhabit. One very curious circumstance in the development of this industry was the tardiness of even our enterprising community to direct their attention to it after it was discovered. In 1826 an account of the Little Muskingum region, in Ohio, was published in *Silliman's Journal*, in which the statement was made that in boring for salt water vast quantities of petroleum was obtained, which was beginning to be in demand for lamps in workshops and manufactories. The writer says:—"It affords a clear, brisk light when burnt in this way, and will be a valuable article for lighting the street lamps in the future cities of Ohio." Though this account was published

in 1826, the discovery was made in 1819, and yet this mine of wealth was suffered to lie unappropriated in the heart of this country for thirty-five years. Attention was again called to it by the success of the coal oil manufacture, and in 1854 two gentlemen in New York, Messrs. Eveleth and Bissell, secured the right to the upper spring on Oil Creek, in Pennsylvania, and organized a company to search for the oil. The operations were slow, and the first oil was struck at a depth of 71 feet, on the 26th of August, 1859. The drill suddenly dropped into a cavity, and oil rose within five inches of the surface. A pump being introduced the company were soon in the receipt of one thousand gallons of oil per day.

This success created an intense excitement in the neighborhood, and boring for oil became the great business of the community. The petroleum was found not only along Oil Creek, but in numerous other localities, extending from Virginia to Canada West, and the supply has increased so rapidly as to bring the article down to a very low price, and to make it a great staple for domestic use and for export. The Erie railroad has a large number of cars devoted exclusively to its transportation, its pungent and peculiar odor rendering the cars thus employed unfit for other uses. At the depot of the company in Hoboken thousands of barrels may at any time be seen on their way to this city either for export or distribution. The peculiar power which the substance has of penetrating capillary tubes covers the barrels with grease, and fills the air with its odor.

Petroleum has just begun to play the great part which it is destined to fill in the industrial arts. It yields a good lubricating material, and produces the whitest, best and cheapest of all artificial lights. A great variety of hydrocarbons result from its distillation, and these, in combination with other compounds and elements, produce thousands of new substances for innumerable untried uses of the chemist and the artisan. We anticipate for petroleum a more rapid extension to a great variety of applications than marked even the introduction of india rubber.

#### THE WAR AND BUSINESS.

Those of our dry goods merchants who have stocks of merchandise to sell at the market rates have been doing a better business this fall than usual. The sales have been large, to a very considerable extent for cash, and the credits granted have been far better selected, and therefore safer than usual. It is true that a good many of our traders complain of dull times; but they belong to a class who try to do a business beyond their means, and who are inevitably destined to bankruptcy whatever the state of affairs. But those who have capital or credit to buy goods at the lowest market rates have been doing an unusually good fall trade.

The war is demonstrating to our merchants that the value of the Southern trade to New York city has been considerably overestimated. We have long been satisfied that if the facts could be ascertained they would show this very result. This opinion was based on the general law that the business of every community is mainly at or near by home.

Though England is called the workshop of the world, and though it is true that she exports a large quantity of manufactured goods, still the statistics show that she is her own best customer; the exports forming but a small per cent of the total amount of her manufactures, nearly all being consumed at home.

The Boston merchants constructed the railroad to Albany for the purpose of bringing in the western trade. It was known that the road was to run through a comparatively barren and sparsely populated portion of the State, and very little support was anticipated from the inhabitants along the line. When the road was put in operation it was found that over eighty per cent of the receipts was from local business. The Boston and Providence, and nearly all other roads have had similar experience. The great number of trains which it is found expedient to run a short distance in the neighborhood of the cities also demonstrate the tendency of the business of every community to grow up near at home.

The proprietor of the New York *Herald* has stated repeatedly that the main support of that profitable paper is derived from the chamber maids of this city; and that its circulation in the State of Connecticut

has always been greater than in all the Southern States combined.

It would be easy to multiply proofs of the existence of this law, but it is unnecessary. A moment's reflection will convince any one that the expense of transportation and the risk and inconvenience of distant operations must always exert a powerful tendency to confine the principal portion of the trade and industrial operations of any community to its own neighborhood. On another page will be found some statistics from the *Railroad Journal*, showing that the whole cotton crop of the South is certainly not more than equal to six per cent of the industrial operations of the North. We are satisfied that such diminution of trade as has taken place is to be attributed mainly to the interruption of labor at the North by the war, and, to a very limited extent, to the destruction of Southern commerce.

#### BENZOLE—ITS NATURE, PROPERTIES AND USES.

Robert Nichol, in his beautiful poem "Do not scorn," has taught us a moral lesson in regard to the wrong of despising the meanest of God's creatures; and a far higher teacher of morals—the Saviour—has rebuked the pride of man by placing "the glory of Solomon," in his kingly robes, beneath that of the flower which blooms in the valley. As it is with moral lessons drawn from natural objects so is it in regard to useful lessons derived from art and science. Perhaps there is not a more foetid and offensive substance to be found than coal tar, and yet from it we derive some of the most useful, pleasant and beautiful substances adapted to the wants, the pleasures and tastes of refined and common life.

Who would have imagined that this foetid substance could be made to yield a product which "the fair and the gay" would use as a perfume for the toilet, but it is even so. And from that dirty, black substance who could ever have imagined that dyes rivaling the Tyrian purple, the cochineal crimson, and orchillo filac could be obtained, and yet it is even so. At the present day rich perfumes and brilliant colors are manufactured very extensively, as profitable branches of the arts, from coal tar. But beside these, there are other useful products obtained from the same source, and none more so than the liquid benzole. Many persons have heard of it and have wondered what it was—whether solid, liquid or gas; or whether it grew upon a tree, or came up out of the caves of the earth like petroleum oil.

Benzole was first discovered by Professor Faraday, many years ago, when experimenting with the condensed vapors of oil; but it derived its name afterward by having been obtained in distilling benzoic acid with lime. Benzoic acid is a product of the odorous gum-resin obtained from the *styrax benzoin* of Sumatra and Borneo. Benzole is a clear colorless liquid of a peculiar ethereal, agreeable odor; it boils at 168° Fah.; its specific gravity is 0.85, and it freezes at 32° Fah. and becomes a white crystalline mass.

When solely obtained from benzoic it was very expensive, but, in experimenting with coal tar about the year 1847, C. B. Mansfield, of Manchester, England, found, among several of the oils obtained at different degrees of temperature in distillation, benzole, as the second of six—all of different specific gravities. This discovery led to its becoming comparatively cheap, and from that day to this its application has been extending. It is now manufactured from the naphtha obtained from coal tar, in large quantities, in London, Manchester, Glasgow and nearly all the large cities in Great Britain. A few years since its manufacture was introduced from London into this section of our country, and is now conducted in North Second street, in the Eastern District of Brooklyn. Crude naphtha is distilled in an iron still, at a temperature varying from 176° to 194° Fah.; benzole passes over and is condensed. It, however, contains some impurities which are removed by redistillation and washing with dilute sulphuric acid, water and weak alkali, in succession. A fluid called "benzole" is obtained as one of the products of petroleum oils.

When atmospheric air slightly warmed, is passed through benzole, it takes up a portion of it, and becomes a vapor of great illuminating power. In 1836 a patent was taken out in England by M. Beel for forcing common air into a reservoir containing ben-

zole, and burning the vapor thus obtained in the same manner as common coal gas. Since that period several apparatuses have been devised for using it. Were it not that it condenses in cold weather and chokes up the pipes, it would be the most convenient known substance for making gas to illuminate large houses, schools, colleges, &c., in the rural districts.

Benzole dissolves resins and fatty substances, and is used for removing tar, resin and grease spots from light kid gloves and silks. It has been imported from Europe and sold in small bottles at extravagant prices for such purposes. Since the war commenced and turpentine has become so high in price, petroleum benzole has been used, to a large extent, as a substitute for mixing with paints, and in the making of varnishes. In England it is used for scouring greasy wool in carpet manufactories. As it is a powerful solvent of india rubber and gutta percha it makes with them a very adhesive cement.

By adding benzole cautiously to strong nitric acid, assisted by a gentle heat, a compound is formed in the form of a yellow oil, which, when the mixture is diluted with water, sinks to the bottom of the vessel. This oil has a sweet taste and the odor of bitter almonds, is used in perfumery, and is sold under the name of the oil of bitter almonds.

By combining nitro-benzole with hydrogen, aniline is formed, which is the basis of the beautiful purple and red colors that have lately been introduced into the arts of dyeing and printing. As heretofore manufactured, such colors have been subject to deterioration by fading when exposed to sunlight, but this defect, we have reason to believe, has been surmounted. Several samples of fabrics colored with aniline products manufactured in France, have lately been furnished us for trial by exposure to solar light, and thus far the test has been favorable.

Benzole is a carbide of hydrogen. It consists of twelve atoms of carbon and six of hydrogen. As a solvent it is nearly similar to ether and alcohol, and it may be used as a substitute for these fluids. Many of the most beneficial improvements that have been made in recent years have been in reclaiming and applying to useful purposes things which were formerly held to be positively useless. This has been the case preëminently with such products as benzole.

#### Gas Explosion.

We noticed in the Boston papers a few days ago that a serious explosion of gas took place at the residence of Ezra Lincoln, Esq., of Boston. The basement and the walls of the building were damaged to the extent of from five to eight thousand dollars, and Mr. and Mrs. Lincoln were considerably injured. Accidents of this character have frequently occurred.

Illuminating gas alone will not explode, but if the gas is intimately mixed with oxygen—either the oxygen of the atmosphere, or that from any other source—then on the application of fire, the whole of the gas combines at once with the oxygen; in other words, it burns instantly, or explodes. When the smell of gas is strongly perceptible in a room, the windows should be thrown wide open to drive out the explosive mixture; the leak should not be sought for with a lamp or candle, as the escaping jet will take fire on the approach of a flame. In France, several inventions have been patented for detecting leaks in gas pipes.

SOMETHING NOVEL.—Mr. H. Berkeley, M. P., in a recent speech on American affairs at Bristol, England, audibly proclaimed the following striking novelty:—

To such an extent is the distinction carried out, that when, on the 4th of July, the anniversary of American independence is celebrated, the black man is not allowed to celebrate it on the same day as the white man—and therefore the whites celebrate their great national festival on the fourth, and the blacks on the fifth.

Mr. Berkeley is evidently an original genius, else he never could have made so remarkable a discovery. It is entirely original with him. We never heard of it before.

OUR Canadian friends are unjustly alarmed on the subject of a probable war with the United States. The government and the people of the States have no more idea of attempting to invade the Canadas than they have of attacking Belgium. A few irritable newspapers, and a few blatant politicians on both sides are stirring the embers somewhat, but we believe the conservative good sense of the people will prevail and that peace will be maintained.