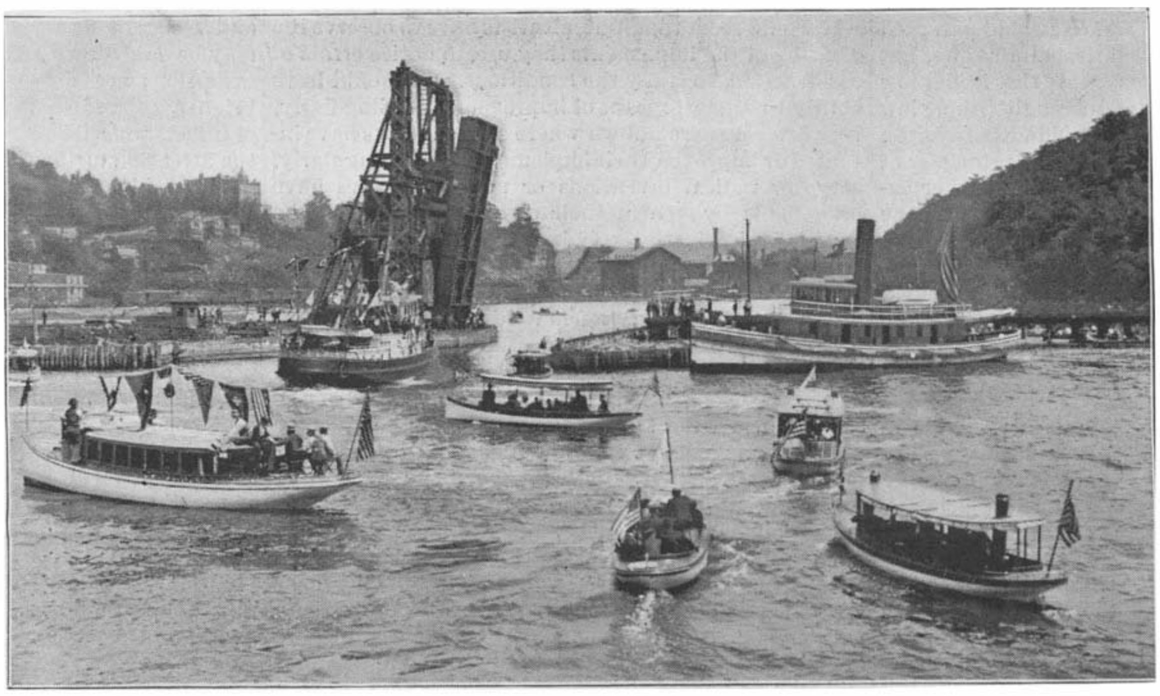
THE OPENING OF THE HARLEM CANAL.

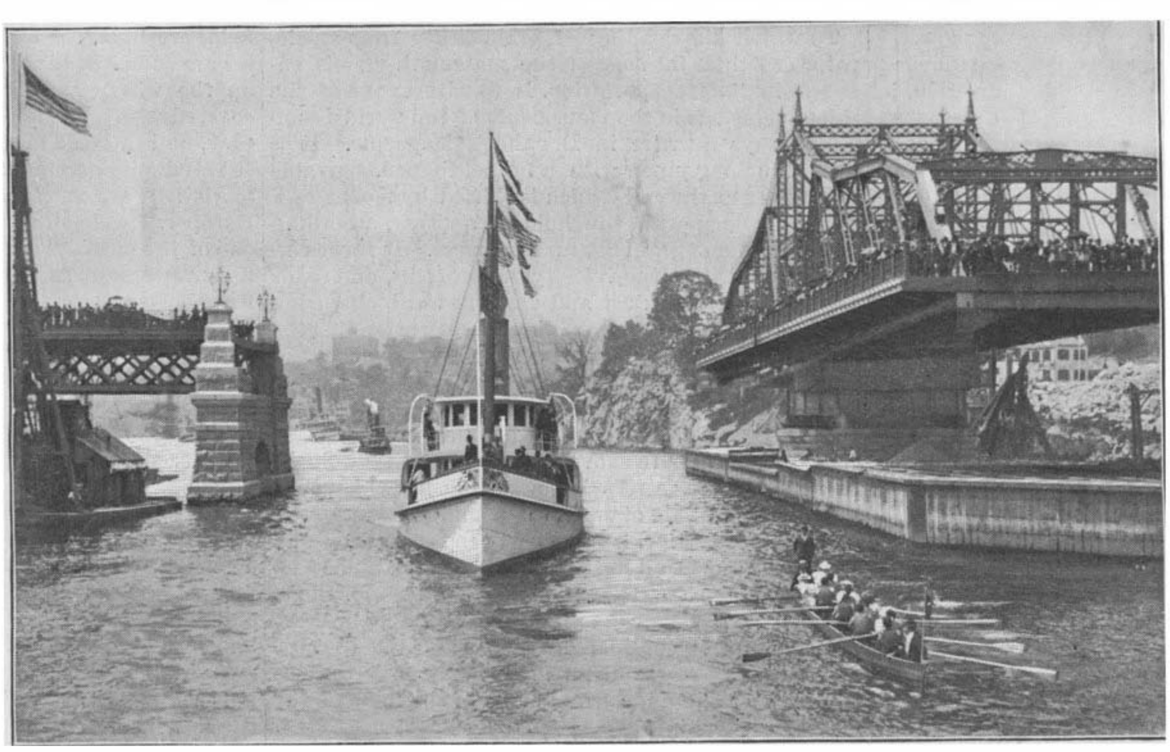
The improved waterway through the northerly part of this city, joining the North and East Rivers, was thrown open for navigation on Monday, June 17, 1895, with elaborate ceremonies, including a land and marine parade by civic and federal dignitaries. The ceremonies concluded with a banquet and fireworks. The term "ship canal" is really a misnomer as applied to the Harlem Canal. The canal is designed only for canal boats and small inland water craft. The Harlem River, before the canal was begun, narrowed to little more than a creek at Kingsbridge and there connected with the waters of Spuyten Duyvil Creek and then with the waters of the Hudson; this allowed a depth of only two feet of water.

The work has been carried on by the federa authorities under the direction of Geo. L. Gillespie, Lieut.-Col. of the Corps of Engineers, U. S. A., who was appointed chief engineer of the operations. It was provided that the sum of $2,700,000 should be expended to make to make a navigable waterway. $900,000 of this sum has already been spent. The channel is ultimately to be 350 feet wide and 18 feet deep. It is now only 150 feet wide. Several years will elapse before the work is completed. The present minimum depth of water in the river is nine feet. At present the Harlem River is practically limited for navigation to the point marked by High Bridge. When dredged out and completed to the Hudson River a clear waterway will be provided for all vessels able to pass through the draw and under the High Bridge. In transit from the North River to the Sound this route will cut off a distance of 10 or 12 miles.

We have heretofore illustrated this great engineering work, and full details thereof are reproduced in our SUPPLEMENT, No. 1015.



OPENING OF THE HARLEM CANAL—VIEW FROM THE HUDSON RIVER.



OPENING OF THE HARLEM CANAL—THE KINGSBRIDGE DRAW.

Testing the Great Lens.

A test of the 40 inch lens for the great Yerkes telescope took place a few days ago at the establishment of Alvan G. Clark, at Cambridge, Mass. The observatory of the Chicago University was represented by Prof. T. J. See. The test was made with Arcturus, Saturn, and double stars. The astronomers present were much pleased with the lens, which will soon be ready for delivery. According to the Boston Evenint Transcript, a most novel form of telescope, which was highly praised by the company gathered at Mr. Clark's shop, was the binocular telescope constructed for D. W. Edgecombe, of Newington, Conn. This may be popularly described as a huge opera glass. It consists of twin telescopes of 6¼ inches aperture, which lie side by side precisely as do the tubes of the opera glass.

A Milk and Cream Separator Bursts with Fatal Results.

At Pittsburg, Pa., on June 18, by the explosion of a milk and cream separator, revolving at the rate of 13,000 times a minute, an accident occurred at 2110 Carson Street, south side, resulting in the death of Philip Deihl, vice-president of the Milk Dealers' Exchange, of Western Pennsylvania, and the serious but not fatal injury of James R. Miller, Otto Winterhalter, and Albert Winterhalter, milk dealers. It required 8,500 revolutions per minute for the machine to separate the cream from the milk. A greater number of revolutions is dangerous. In some manner the separator did not perform its work, and the revolutions increased suddenly to 13,000, when it exploded.

OF the English Bench of Bishops twelve are pledged abstainers.

The Bicycle.

The value of the bicycle as an aid to health has been dwelt upon since the beginning of the sport, but there are other advantages to be derived from it of equal or greater importance.

Cycling cultivates the habit of rapid thinking—indeed, one whose mind is not more than ordinarily alert, and whose muscles cannot be trained to be the instant servants of the will, is not liable to pass through the several stages of cycling without accidents. Keen perception and good judgment are two qualities, above all others, which the rider of the wheel should strive to acquire, and they are cultivated in a high degree by the "king of sports." Not only must the urban cyclist thread his way among many vehicles, electric cars, and numberless other impedimenta, but his rural brother as well has need of a cool brain, sharp eyes, and steady nerves in order to avoid the ever possible mishap. The rider should invariably be cautious, yet ready to make a bold dash to escape danger or to avoid giving annoyance to others awheel or afoot. But still more important is the cultivation of accurate observation and of the sense of beauty developed by the proper use of the wheel. Since the cycle became the vehicle of the masses, thousands to whom their rural surroundings were practically terra incognita are turning their steeds away from city life and by a study of flowers, trees, rocks, and other natural objects are broadened in mind while strengthened in body by the vigorous exercise. To him who travels aright, landscapes become a delight and he grows to love Nature in her varied moods. He learns, too, much of the country around him—its people and their pursuits—not only in his immediate neighborhood, but within a radius proportioned to his leisure.

As a teacher of practical geographical knowledge the wheel is the most thorough in the world; nothing approaches it in the encouragement of the love of outdoor life and appreciation of the beauties of nature, which are so apt to be lost sight of in a world almost canopied by commercial life.—Bicycling World.

French Inhumanity.

The isolated spot where Captain Dreyfus has to serve his sentence comprises three small islands off the coast of French Guiana, a few degrees north of the equator, and except a narrow sea frontage, are covered with tropical forests. The climate is simply murderous, certain death being the result of standing bareheaded in the sun even for an instant. From November to June is the wet season, during which the average rainfall is 180 inches; yet the temperature is never less than 85 degrees, and rises to 115 degrees during the four dry months. Convict ships bound for these "Islands of the Curst" generally sail either from the Ile de Re, in the Bay of Biscay, or the Ile d'Aix, in the Mediterranean. A month is occupied by the voyage, the horrors of which are a fit prelude to those yet to come. Dressed in their convict garb, the prisoners are confined in batches of fifty in great iron cages on the spar deck. Benches are placed round the sides of the cage and hammocks are slung at night. But day and night they are watched by guards standing beside loaded mitrailleuses, ready to fire at the first sign of mutiny. Sometimes, indeed, such outbreaks do occur, but they are invariably quelled with remorseless severity. The horrors of the passage are too repulsive for description, the scenes resembling rather those observable a century or two back than what one would associate with the present times.

On the arrival of the prisoners at the Iles de Salut they are taken to the "Camp," a clearing occupied by strongly-built iron-barred huts, furnished with double rows of hammocks. But at night the fetid atmosphere within, combined with the noisome vapors of the outer air and the ever-present swarms of stinging insects, render any but the sleep of exhaustion impossible. From the moment of his arrival the convict has no name. He is known only by the number of his hammock. The new arrivals are put to the most severe tasks—draining marshes and clearing ground—"to break their spirits." They are conducted to their work by armed guards, who are ordered to fire at the least attempt at flight. Hardly any try to escape, for they know that if they evade the bullets of the guards and their pursuit, it will be necessary to traverse the sea and the virgin forest. At every step will lie in weight for them death by hunger, by fatigue, by disease, or by the poisoned arrows of the natives, who receive a reward for every convict they bring back, dead or alive. Meanwhile, with bodies broken by their awful toil in a climate where a walk of a hundred yards is a formidable task, they labor in the blazing sun with spades and picks. About their heads hang clouds of stinging insects. Great red ants cover their bare legs, and sometimes poisonous serpents twist about their ankles and inflict mortal wounds. They stand in trenches up to their knees in water and mire, and the exhalations rising from the earth consume them with fever, or set their teeth chattering as with cold, while the sweat rolls from their foreheads. Occasionally, in their despair, some of the convicts revolt, in the hope, which is seldom disappointed, of finding in the bullets of their custodians a relief from this living torture. Others again go mad, or end their lives by deliberately exposing themselves to the sun, while very few ever succeed in escaping. Indeed, only once have any fugitives reached civilized countries again, and even then their period of freedom was comparatively brief.—Public Opinion.

WOMEN are not permitted to be photographed in China.

The Faults of the Plow.

The primitive Egyptian and Assyrian plow consisted of a forked branch of a tree, one arm of which served as a share, loosening the soil, the other as a beam, drawn by human or by animal power. This was the original double mouldboard or lister plow, throwing the soil both ways. An improvement was made by so shaping the wooden mouldboard as to form a twisted wedge, which elevated, inverted, and carried the soil to one side only of the plow. A further improvement was made by making the point of the share of iron. Simple as it seems, it was not until April, 1831, that center draught was given to the plow by Meares, who inclined the beam inward. In 1797, Newbold patented a cast iron plow, and commenced its manufacture, but abandoned it, for the farmers said the iron plow poisoned the land. The steel and wrought iron plow was not invented until 1808. In 1788, Thomas Jefferson improved the plow by showing its proper principles of construction, and in 1836 and 1837 Daniel Webster experimented in plow manufacture, and said that none of his successes in public life had given him so much pleasure as seeing the improved plow of his own construction, drawn by six yoke of oxen of his own raising, cut broad and deep furrows through brush and saplings. In 1845, Governor Holbrook invented a method of shaping plow mouldboards symmetrically, either convex or concave.

All of the improvements which have been made in the plow, from the earliest agriculture until now, are simply modifications of the original idea: a wedge drawn through the soil, pulverizing and displacing it. No better method has been found.

The faults of the plow are serious ones. The bicycle may be credited with having brought ball bearings into general notice and showing the striking decrease of friction when sliding friction is converted into rolling friction. All of the wearing surfaces of the plow are sliding frictional surfaces, and the loss of power occasioned by friction of sticky earth upon the plows of this broad domain of ours is past computation. The plows of the day are rigid and inadjustable in form. In sandy or in loose and light soils, and in lumpy or clayey soils, in shallow or in deep plowing, in plowing at slow or at fast speed, no adjustment or change of form can be made to suit the special conditions of the work, yet these different conditions are often found in one plantation, and the plow should be capable of being modified to suit these conditions.

If a perpendicular line is drawn from the point of attachment of the harness tug and hame to the ground, and another line from the same point to the center of work in the mouldboard of the plow, and a horizontal line connecting the center of work with the perpendicular line, then the hypotenuse of the triangle thus formed represents the total tractive effort, the horizontal line, or base of the triangle, represents the useful tractive effect, and the perpendicular line represents the part of the traction which is expended in pulling the horse down upon the ground. In some cases one-third of the tractive effort of the horse is expended in increasing the pressure of the horses' feet upon the ground instead of in advancing the plow.

In a 14 inch plow the earth is elevated say 14 inches, carried sideways 14 inches and deposited, inverted, in the preceding furrow. It is easy to see that each inch of unnecessary elevation represents a great amount of unnecessary labor during the lifetime of a plow, and that the carrying of all the surface soil sideways to the preceding furrow represents a great aggregate travel of soil; that is, effort in plowing large fields.

The share of the plow, like the fluke of a ship's anchor, is shaped so as to draw down into the soil. The line of traction, from the center of the mouldboard to the center of the horse collar, tends to draw the plow out of the ground. The plow advances horizontally as a sort of compromise between these divergent lines, and there clearly results a loss of power occasioned by the line draught being in one plane while the line of traction is in another plane.

When the total weight of all the surface soil which is elevated, and also carried sideways, in plowing all the cultivated area of this country is calculated, it is clearly seen that the agriculturists of the country waste each year, in incidental but not in useful work, in excessive sliding friction, in indirect lines of traction, in unnecessary resistances caused by imperfect forms, and by inadjustability of form of the plow, a greater amount of labor than was wasted by the builder of the great Pyramid in Egypt, or in the building of the Chinese Wall. If all the soil thus removed were transported to the aggregate distance which it is transported and elevated to the aggregate height which it is elevated, in one heap, no one would dare to attempt the removal of the heap with no better implement than the plow.

Although 10,122 patents have been granted on the plow, in this country alone, it still offers a promising field for future inventors. The killing strain on the muscles of horses in starting street cars was not fully considered until the electric motor took the place of horses in street car work; then it was found that it required three times as powerful a motor to start a car as to run it after it was started. The loss of power in vehicles by sliding friction was not understood until the bicycle, propelled by human muscle, showed the utility of converting sliding into rolling friction by ball bearings, and the labor wasted in dragging the plow will never, perhaps, be rightly considered unless inventors themselves drag the plow, and inquire into the reasons and causes of the excessive effort required by this ancient and indispensable implement upon which all civilization depends. The horse and the mule cannot complain, and so the plow remains the plow, improved in material and in workmanship, but retaining many of the faults of the plow of our remote ancestors.

It would seem that agriculturists have to observe the working of the implements they use, to notice errors of construction, to study the conditions, and should have ability to suggest means of improvement. Singularly, very few cases are known where agriculturists have invented or improved their implements. More singularly, very few radical inventions or new departures have been made by men in their own lines of work. The machinist instinctively judges a suggested improvement in mechanics by what he has seen. The lawyer naturally tests innovations by past decisions. The physician unavoidably refers to his reading or practice for approval or condemnation of anything new in his line. The agriculturist can but seldom divest himself of preconceived notions. Morse, the inventor of the telegraph, was not an electrician; Watts, the inventor of the steam engine, was not a machinist. The list may be extended indefinitely. To make a new departure, a radical invention, seems to require an ingenious man, untrammeled, open to new ideas and approaching a subject from a new side. Ask an agriculturist how a plow may be improved, and instinctively his mind will picture a crooked thing of steel and wood, which is essentially what he has seen. There are few of us who are not mentally hide-bound, fewer still who do not travel in mental ruts. There are very few who do not inherit religions, or absorb politics from newspapers, or form associates or their ideas from those they admire, or their mechanical opinions from what they have seen, or read, or heard of.

The inventor who will furnish a superior substitute for the plow will probably not be a plowman. He will almost surely be poor, for rich men cannot invent. When an inventor becomes rich, which happens but rarely, his attempts at further invention are passing queer. He will meet opposition. Others will develop his invention and reap the reward, and long after he is dead a statue will be raised to his memory, and his name will appear in the list of benefactors of the race, though but few of the millions benefited by his work will know of him or his work, or will care to know.

If the statesmen of the present time, trained as they are in the acute political methods of the times, should imitate Jefferson and Webster, their illustrious predecessors, their names might go down to distant posterity in the list of those benefactors of the world—the "Improvers of the Plow."—La. Planter.

The Care Required in Loading an Ocean Liner.

To watch the loading of grain either from an elevator or lighter into one of the mammoth vessels engaged in its transportation, is to witness one of the chief operations in the movements of the world's commerce, says a writer in Donahoe's Magazine. It is carried in long pipes, with a funnel-shaped, movable appendage at the end, which is shifted by means of a rope from one part of the hold to another, according as the stream of grain fills up the spaces. It rushes into the vessel with the velocity of a torrent, and sends a dense volume of dust and chaff upward, obscuring the depths beneath, and making the men attending the stowage below look like ghosts in the rising mist.

The "trimming" of the grain in the holds is an important part of its storage. After several thousand bushels have streamed into the hold, a dozen or more men are delegated to shovel the downpouring column in between the vessel's beams, a job for which they are paid at the rate of one cent a minute. In vessels of the Cunard stripe, it takes between twelve thousand and fifteen thousand bushels to fill a hold, and these vessels average 50,000 bushels in the total cargo. Ships carrying grain alone can take as high as 125,000 bushels, and when it is considered that from 4,000 to 7,000 bushels can be stored in an hour, every forty bushels weighing a ton, an idea can be had of the force of the torrent directed into the vessel.

Large vessels have four or five holds, and a distinction is made in storing the cargo in them. Grain, from its compact and dead weight, is reserved mostly for the center of the vessel, while cured provisions are packed as far forward and as far aft as possible, for their better preservation from the heat of the ship's fires. In some vessels, like the great Cunarders, which carry passengers as well as freight, the heaviest weight is stored in the lowest hold; this is to steady the vessel, and is called in the technical parlance of the stevedore "stiffening" the ship. It takes about 1,500 tons to "stiffen" a great Cunarder, and when this is done the lower hold is fastened and battened down, and work is begun on the next.

Insects and Flowers.

No side of natural history is more curious than the relation between insects and the flowering of plants. In the primitive and simpler plants that live in the sea the male cells are discharged into the water and row themselves along by the screwing motion of minute bristles until they reach and fertilize the egg cells of the female. In many land plants the male cells, discharged as clouds of golden pollen, are blown about by the wind; myriads perish, but a few reach their goal, and, fertilizing the young egg cells, cause them to ripen into seeds. In many cases, however, Nature has curbed so reckless a prodigality, and the colors and scents of flowers are fruits of her parsimony. It may be laid down as a universal truth, to which the exceptions are only apparent, that plants bearing brightly colored or perfumed flowers require the aid of insects to fertilize them. The colors serve to attract the attention of insects; the scents, especially in flowers that blossom by night, serve the same purpose. The insects come for the store of honey, or for the pollen of the plants, and their return gift to the plants is that, flitting from blossom to blossom, they unconsciously carry the golden fertilizing grains from plant to plant.

For most flowering plants the visits of insects are a necessity. Let one but grow some common plant, like geranium or mignonette, under glass and muslin, so that no stray insect may reach them; the flowers will be formed, the perfume will be as sweet as usual, but the blossoms will fade without forming seeds. Many of our English flowers are capable of being fertilized only by one kind of insect. Thus, to choose a familiar instance, the common red clover is visited by the humble bee; the petals are fused together, forming a narrow tube surrounding the honey glands and the organs that form the pollen. The long proboscis of the humble bee is able to reach the deeply hidden stores; but the hive bee, whose tongue is shorter, though bidden to the feast by attractive color and smell, is perforce an inactive spectator. When clover was first grown in Australia it never seeded, and it was found that the tongues of the native bees were too short to reach the pollen. Still more often the gorgeous blossoms of the tropics remain sterile in England in the absence of the particular moth or fly to which they are adapted.

Sometimes, as Darwin showed in his fascinating volume on "The Fertilization of the Orchids," the devices to secure that an insect shall not visit a flower without coming in contact with the pollen are extraordinarily complicated. An insect alights on a gaudy and sweet smelling blossom. An inviting landing place is ready in the form of a conveniently placed floral leaf; but the thing is a trick. No sooner is the platform touched than it gives way with a jerk, precipitating the hapless insect into a well of fluid. His wings are wetted, and he has to crawl out slowly. But pointed bristles prevent exit except by a narrow funnel, and, as he squeezes through that, his back becomes dusted with the sticky pollen. In most plants, however, the lures are simpler, and are adapted to many different kinds of insects. In spring, when the fields are bare, the blues and whites of the early flowers are sufficient to attract the notice of the few insects on the wing. During summer, when the world is covered with green, more glaring contrasts come into play, and the bold masses of orange and gold, of crimson and pink, appear. It is curious, however, that scarlet, the most clamant of colors, is the rarest in Europe. In the tropics and in South America it is one of the most common, and it were worth inquiring if European insects be color blind to scarlet. At night, when crimson and blue, pink and orange, become invisible, pale yellows and luminous whites attract the night-flying insect by their phosphorescent radiance.

The scents of plants are almost more potent lures than their colors. At night they are naturally more varied and more potent. To drift in a backwater in a summer night, or to loiter in a wood, is to set one dreaming of the spices of the tropic isles. The scents of the day are shy and indistinct; only in the mass one notices them, as in passing through a bean field, or by a thicket of gorse. But at night each blossom that is not asleep sends out a clamorous and insistent odor, and at the same moment one notices a dozen distinct and striking perfumes. But, by day or by night, the scents are not all such as are pleasant to us. Some indeed are not even within our consciousness. Thus the flowers of the Virginian creeper are almost invisible; they have green corollas and are hidden under the foliage. To us they have no scent, yet bees come to them from great distances, and during their season they are always crowded with visitors. Some of the scents most dear to us are despised by many insects. Butterflies will pass honeysuckle itself, or, indeed, any flowers with a honeysuckle scent, unnoticed. At night, however, large hawk moths, by their attention to honeysuckle, show that they share our ideas of what is pleasant. Butterflies and bees, like ourselves, are unattracted by the carrion-like smell of many plants, but these latter are visited by many beetles and flies, to which the perfumes of the rose and the violet are unattractive.—London Saturday Review.