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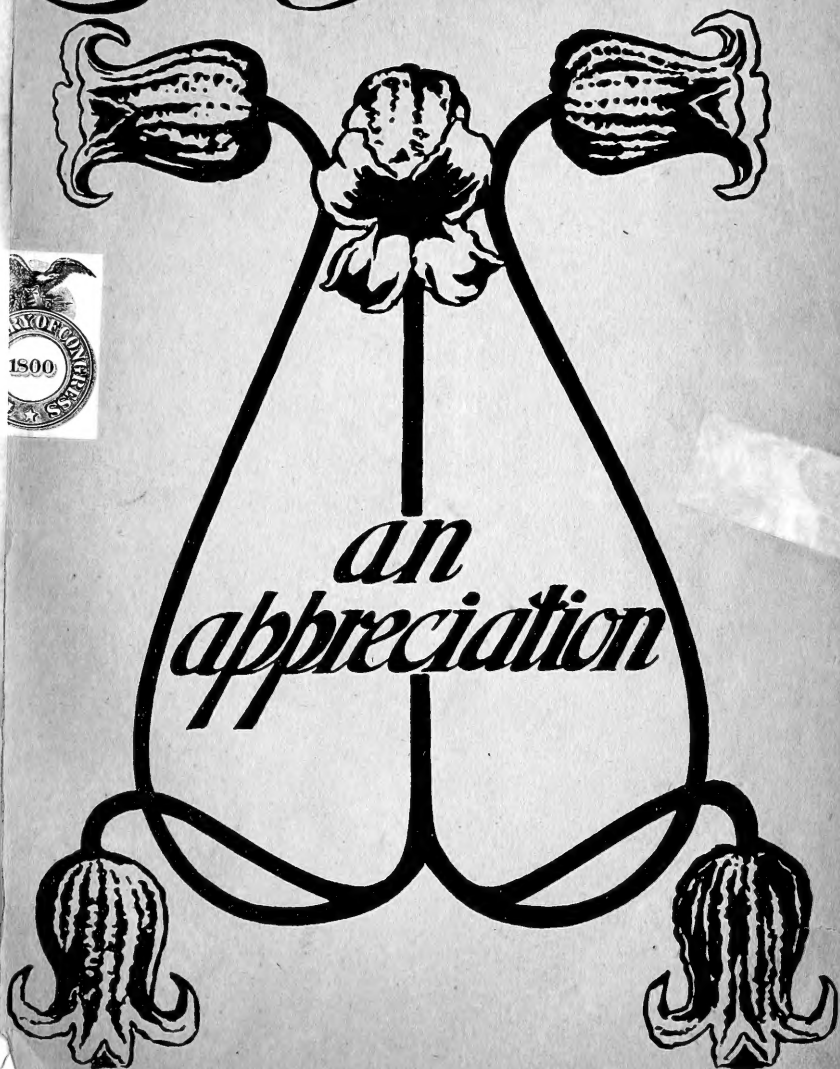
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Luther Burbank



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LUTHER BURBANK

MAN, METHODS *and*
ACHIEVEMENTS

AN APPRECIATION

BY

EDWARD J. WICKSON

PROFESSOR OF AGRICULTURAL PRACTICE, UNIVERSITY OF CALIFORNIA

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LUTHER BURBANK, OF SANTA ROSA, HORTICULTURAL SCIENTIST



Not only horticulturists, but all who honor men who do things, will find interest, instruction and entertainment in these papers concerning Luther Burbank, of California, written originally for SUNSET MAGAZINE, by Mr. Burbank's friend and horticultural associate, Professor Edward J. Wickson, University of California.

Wherever "the round world over" men know flowers and fruits, know of their origin, their development and their creation, there is Luther Burbank recognized as a man of wondrous power. He has done things. Like that soldier hero, who at the outbreak of the Spanish war, carried this Nation's message to Garcia, Mr. Burbank, without flourish of trumpets, without asking for fame, has been quietly at work for years at his home farm near Santa Rosa, California, developing and making fruits and flowers. Patiently, tenderly, enthusiastically, he has worked with such results that all men who know them give him the highest honor and praise.

A Nature lover, primarily, he is not a man content merely to sit idly by and admire Nature in her various moods and creations. He has ventured to sport with Nature; to see how bright flowers could be made brighter; small blossoms, larger; imperfect fruits, perfect. Thoreau, a Nature lover, too, was content to rest idly by Walden Pond, but will be famous chiefly through communing with tree, bud and blossom. Burroughs and Muir have roved through forests and over mountains, gaining enjoyment and health for themselves and making the world richer by telling of Nature's grandeur. Different from them, and yet like them, in his simplicity of heart and modesty of manner, Mr. Burbank, week after week, month after month, year after year, has patiently tended gardens of flowers and experimental orchards and berry patches, selecting, rejecting, exchanging, cultivating, watching, waiting and succeeding. The story of it all has been known to comparatively few. To magazine writers and those who sought to give the publicity which he surely has deserved, Mr. Burbank has been extremely reticent. To Professor Wickson, in these papers, he has confided many of the secrets that Nature has told to him. He was fortunate in his confidant, for the writer of these papers by reason of his scientific attainments, his sympathetic nature, his skilful pen, has accomplished well a task that must win appreciative praise.

CHARLES SEDGWICK AIKEN,
Editor *Sunset*.



Luther Burbank

Man, Methods and Achievements.

BY EDWARD J. WICKSON
Of the University of California

FIRST PAPER—MAN

AT the close of the century the world had paid half a billion dollars for California fruit and fruit products, for which reward the California growers had gathered from trees and vines half a trillion pounds of fruit. Through two most responsive centers of human interest, the purse and the palate, California has impressed her existence and horticultural resources strongly upon the attention of the world and has won distinction. But great as is this achievement, both in itself and in its influences, it is not the only horticultural achievement of California and it is not the one which the world will most delight to honor. Certainly results are being achieved in California in higher horticultural arts which appeal to the world's sense of greatness more strongly than do our great undertakings in commercial fruit growing.

To originate new fruits of distinctive characters and value is a higher horticultural art than to multiply the product of old fruits. New achievements in the latter line often of necessity invade established trade and the vanquished but illy brooks the conquest which exalts the victor, but the production of new fruits is hailed everywhere with delight and honor. The volume of the California product, and the profit therein, interest the counting room; the beauty and quality of the fruit enrich and adorn the fair, the market and the sideboard, but the new fruits, with characters hitherto undreamed of and possibilities beneficent and boundless, command the admiration

of the man of science, the philanthropist, the statesman because they involve new contributions to the sum of human knowledge and are new gifts to the elevation and advancement of mankind.

Above even these lofty achievements, the origination of new fruits and flowers is a manifestation of creative power in the mind of man and a demonstration of potentiality in human aspiration, insight and devoted effort. Thus the recent accomplishment of the horticulturist transcends horticulture. It also opens new vistas to the biological sciences. It suggests to those who have set metes and bounds upon evolution in the vegetable kingdom that God's way is not as their way and that no matter how great the results by natural selection hitherto, artificial selection may surpass them all. Along this pathway sublime the world now concedes leadership to a Californian and is eager to know more of him, his methods and his achievements.

Luther Burbank, of Santa Rosa, California, was born in Lancaster, Worcester county, Massachusetts, March 7, 1849. He was the thirteenth of fifteen children born to Samuel Walton Burbank by three marriages. The elder Burbank was a man widely known and in all business and social relations recognized to be strong in conviction and unswerving in his moral standards. He was an admirer and personal acquaintance of Emerson, Webster, Sumner, Beecher and other strong men of his day. He descended from an ancestry of indoor peo-

ple, chiefly active in pedagogical and manufacturing affairs and disclosing no notable taste for open-air pursuits.

In the records of his mother's family, one who delights in evidence of the transmission of tastes and traits can find the source of notable horticultural inheritance. His mother's father, Peter Goff Ross, was a grower of seedling grapes, some of which had very good points, and other members of the family indulged in similar avocations. On the mother's side also were the Burpees, well known in horticultural annals.

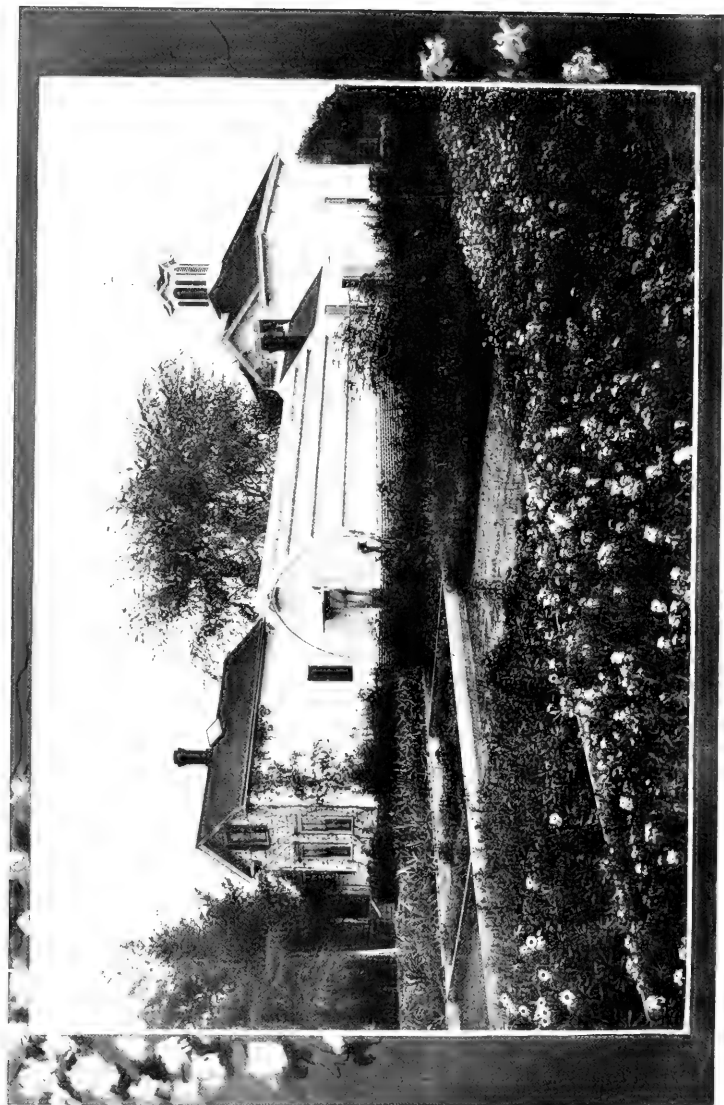
Whether this thirteenth child of his father was thought to lie beneath the ban of an unlucky number or not, his start upon life was not strong and his promise not remarkable, even to those who could be expected to see deeply into such matters. He was slight of build, rather serious in manner and retiring in disposition. At a very early age he began to make playmates of plants and his doll was a cactus plant, fondly carried about until an accident shattered the plant and a young heart at one operation. In school he was a diligent pupil, but never able to overcome the fear of the sound of his own voice in the presence of a throng. He was, however, apt with the pen, free in composition and escaped the terror of declamation by compounding with the schoolmaster for twice the prescribed volume of essay writing. Quantity was no hardship to the pupil and the quality pleased the teacher.

When quite a boy Luther began work in the shops of the Ames Plow Company in which his uncle, Luther Ross, occupied a position of responsibility. This uncle had a liking for horticultural experiment, and the half days when he was released from the shop to work among his uncle's seedling grapes and rhubarbs were pleasant to the shop boy. In fact, he often looked wistfully through the dusty air of the shop upon the distant trees and realized that they were calling him to pursuits more congenial than manufacturing. And yet no allurements could distract the attention of the boy from what was properly before him. Thus early he possessed a concentration of mind and definiteness of purpose which are elements of genius, for when about sixteen years of age, he conceived

and developed an improvement in the wood-working machinery of the factory which was so valuable that the owners offered to multiply his wages more than twenty-five times if he would remain and give the concern the products of his work as an inventor. He decided, however, that the society of plants was worth more to him than shop work, even at its highest levels, and he soon entered upon a horticultural career on the foundation of a seed and plant business.

Before this his attention was fixed upon the origination of improved varieties by the discussion, in the agricultural papers of the time, of the desirability of better potatoes and he soon attracted notice by his achievements in this direction, through exhibits made at the county fairs. His first great success was the Burbank potato, the relation of which to his other work will be discussed later. He was proceeding well with the origination of new varieties and in regular seed and plant business when he became convinced of the desirability of California as a field for horticultural pursuits and a decision to emigrate was quickly made. He reached Santa Rosa in the fall of 1875 with few resources except a resolute, confident spirit and ten Burbank potatoes which he reserved by agreement when the whole stock of that first great achievement of his was sold to a leading Massachusetts seedsman. His first business announcement in California was an offer of new potatoes and it won patronage from enterprising growers who were fully assured of the deterioration of the common sorts and welcomed improvement. He soon built up a general nursery business and, at the same time, made notable advances in plant breeding.

After a little more than a decade of this twofold effort he cleared the way for concentration upon the chosen work of his life and in 1893 published the first of a notable series of announcements to which he gave the title "New Creations in Fruits and Flowers." Other issues followed in 1894, 1898, 1899 and 1901. They contain descriptions and pictures of his most striking achievements, suggestions of his horticultural beliefs and purposes, and tributes of many who have expressed opinions upon his work and



THE BEERMAN HOME AT SANTA ROSA, CALIFORNIA

its results. These publications produced a profound sensation throughout the horticultural world.

Such, in mere outline, is Mr. Burbank's life. Phases of it may intrude as the effort is made to show what manner of man he is.

The little cottage in which Mr. Burbank has long made a home for himself and his mother, a lady of nearly ninety, is within the corporate limits of Santa Rosa, a beautiful and brisk town of about nine thousand inhabitants, situated about fifty miles northerly from San Francisco. Here he purchased a tract of four acres in 1878 and upon it has maintained his residence and business headquarters until the present time. Here, too, part of his propagation has been done, though he owns other lands, a few miles away, of lighter soil and warmer exposure which, because of superior fitness, have been used for his largest cultural work.

The visitor approaches the modest cottage through closely trimmed box borders which must be taken as a reminiscence of old-fashioned, New England gardening, for such are seldom seen in California. In its summer garb of deciduous climbers the little dwelling loses its conventional outlines in picturesque verdure. All around the dwelling are areas of lawn and beds of plants, the latter being in many cases the working collections of the propagator for there are many enclosures of small area which contain an almost incredible number of species. In one case, for instance, forty species of golden rod are grouped for close study of their characteristic growth and bloom, while in another a large collection of sedums is massed as "mother plants" of new races of their kind. All the world makes contributions to these study tables of Mr. Burbank, and the visitor to the home takes particular delight in them. Upon the lawn are various trees, the chief being an ivy-clad *dracœna* and a towering *araucaria*. Contiguous to the dwelling are greenhouses, potting shed and barn—exceeding in cost and impressiveness the owner's house, which is an orthodox arrangement for farm structures. Along the street front are six trees of great beauty, a hybrid of Eng-

lish and California black walnut—the first cross-bred tree of Mr. Burbank's growing.

In his modest home and in the very simple arrangements with which he carries on his notable work, the discerning visitor can find many suggestions of the spirit and disposition of the man. He utterly neglects the impression upon people which even what might be considered the proper paraphernalia of his work would make. He grows no show plants; he gives no prominence to rare things; he indulges in no display of instruments and accessories which one who works so largely by plant surgery could excusably delight in. He shows no library, no laboratory, no case of medals and certificates. He is, in fact, so utterly regardless of the furniture and bric-a-brac of his profession that casual visitors are disappointed that so great a man should have so few things, and even the visiting expert is misled into the conclusion that, because he is ushered into no library, Mr. Burbank is neglectful of the garnered wisdom of the ages. Such an error is the fault of the observer. He is widely read in biological science in all its leading lines, but he approaches no work by the compilation route. His strange insight and memory enable him instantly to seize upon and retain the facts and principles which he desires for direct use, or as contributions to the fulness of his conceptions. For many years he read largely to doubt and disprove, for his experience and observation led him to different conclusions. This was only natural because his work was in advance of the records; but he still diligently sought for gleams of truth available to him in current scientific literature and was strengthened and encouraged thereby.

Mr. Burbank never surrounded himself with elaborate appliances of research because he believed that he was dealing with very simple propositions. By patient search through the infinite variety of manifestations, which appeared in connection with each experimental effort, he saw principles and laws revealing themselves so clearly that he could reach their demonstration with the naked eye and hand. For such a gifted seer neither weird altar fires, nor incense cloud, nor ecstatic state could add to in-



Tibbitts, photo

MR. BUREANE AMONG HIS FLORAL FRIENDS



MR. BURBANK IN CHARACTERISTIC POSE

sight. He could hear the "still small voice" without preparatory earthquake or whirlwind. Like David of old he could do his work with smooth pebbles from the brook; and he cast aside the elaborate armament of his scientific brethren lest it should impede his movements. Mr. Burbank's methods and results are a new illustration of the old truth that great discoveries are often made with the simplest means. The victory inheres in the man, not in the appar-

atus. Some intimations of this fact may appear later, in connection with the discussion of his methods.

The simplicity of Mr. Burbank's home and surroundings is a manifestation also of his simple tastes and requirements. He is generous in his expenditures, broad in his views and a lover of the best in all lines he pursues, but such has always been the nature of his work and his associations that high living has not intruded upon his horizon. All its hollowness and ostentation would be hateful to him, but so liberal is his view and so tender his regard for the tastes and desires of others that he would be forgetful of condemnation. The simple life and home environment of this man, whose name is so widely honored, are not maintained as a rebuke to those who adorn their successes with luxurious surroundings and strive for social effinence as wider recognition of that success. All such things are absent from his thought, either to possess or to condemn them.

Of Mr. Burbank's personal appearance little need be said. The ample portraiture which the publishers provide in con-

nection with this writing will give the physiognomical reader opportunity for original analysis. He is of medium stature and rather slender form; light eyes and dark hair now rapidly running to silver. His countenance is very mobile, lighting up quickly and as quickly receding to the seriousness of earnest attention, only to rekindle with a smile or relax into a laugh, if the subject be in the lighter vein. He is exceedingly quick in apprehension, seeming to anticipate the speaker but never intruding upon his speech. There is always a suggestion of shyness in his manner and there is ever present a deep respectfulness. Those who do not know him well may easily misinterpret this as reserve or preoccupation. These characters are notably absent in the man. He is frank, open-hearted and outspoken, though all these traits must be sought beneath the cover of his reticence. All his actions are artless and quiet; even the modulations of his voice follow the lower keys. He talks freely, confidently and enthusiastically of his work to one who manifests interest in it, but says little of his own relation to it. This is merely because his personality appears to him as incidental to the work rather than one of its leading factors.

Those who meet Mr. Burbank but casually are prone to err in their judgment of him. They are apt to magnify his reticence until they see in it timidity, self-depreciation, inexperience, embarrassment and the like. All these forms of weakness are absent from the man. He is self-confident but not self-assertive. He is fearless and not to be easily turned from the way he expects to go, but he does not insist that others shall go his way. He seldom errs in his judgment of men and he usually gives the loud and effusive visitor the right of way in conversation, studying him meantime with a wondering eye. Even from this defensive state into which he is thrown, quiet repartee will occasionally come to show that he is holding an upper hand and suffering neither from embarrassment nor inexperience. To one whom he admits to the inner circles of his friendship he is a most delightful man. To such he shows strength, self-trust and wonderful resources of mind—all these master-

ful traits, however, being ruled by a spirit of exquisite tenderness toward all men and unbounded charity for their beliefs and actions. For his few close friends he has a depth of affection and gratitude and self-denying devotion which are seldom met with. Upon their views of the man, from the advantage of the closest acquaintance, must the public form its conception of him. One well-known Californian, Mr. S. F. Leib of San Jose, president of the Board of Trustees of Stanford University, stands nearer to Mr. Burbank by the ties of full knowledge and reciprocated affection than any other man. To him Mr. Burbank delights to acknowledge debts of encouragement, stimulation and incentive which have sustained him and carried him through the periods of depression which come to all lone workers. At the writer's request Mr. Leib pays this expressive tribute to his friend:

Friendship has arisen between us which makes us like brothers. I think I know as nearly the innermost part of his life as any other man in existence. I have never known

a nature more full of absolute sweetness. He is absolutely honorable in every way and is honest to a fault. He lives, what is termed in the parlance of the day, a strenuous life, far too much so for his physical endurance. He is an intense man, a man who carefully plans for results and then works for their fulfilment with a patience that exceeds that of Job himself. It may be a question of years to arrive at a single result. Necessarily before arriving at success in seeking to accomplish a given result, he must meet with many failures, but nothing seems to daunt him until success finally crowns his efforts.

In disposition Mr. Burbank is an optimist. He is filled with enthusiasm which lacks nothing of strength and warmth because its manifestation is always ruled by the characteristic quietness of the man. Optimism is the force which underlies his self-confidence and his great expectations; it sustains him through the most protracted effort and enables him to seize strongly upon slight indications of progress. Optimism enters into his most fundamental conceptions and imparts courage to pursue them. Without optimism he could not think of his work; much less achieve it.



IN THE BURBANK EXPERIMENTAL GARDENS

From his optimism proceeds enthusiasm, but his temperament saves him from being an enthusiast. His imagination is ample and varied in its richness, but the keenness of his insight frees him from visions and fallacies. It is true that his trustfulness and tenderness have at times been misplaced and he has experienced disappointments and sorrows, but these have added to his worth as a man by their refining and softening influences. Disciplined by his experience he has learned well the lesson that disappointment is incidental and not the conclusion of any valuable work, nor of any true thought, and he will remain hopeful, enthusiastic, self-reliant and forceful to the end.

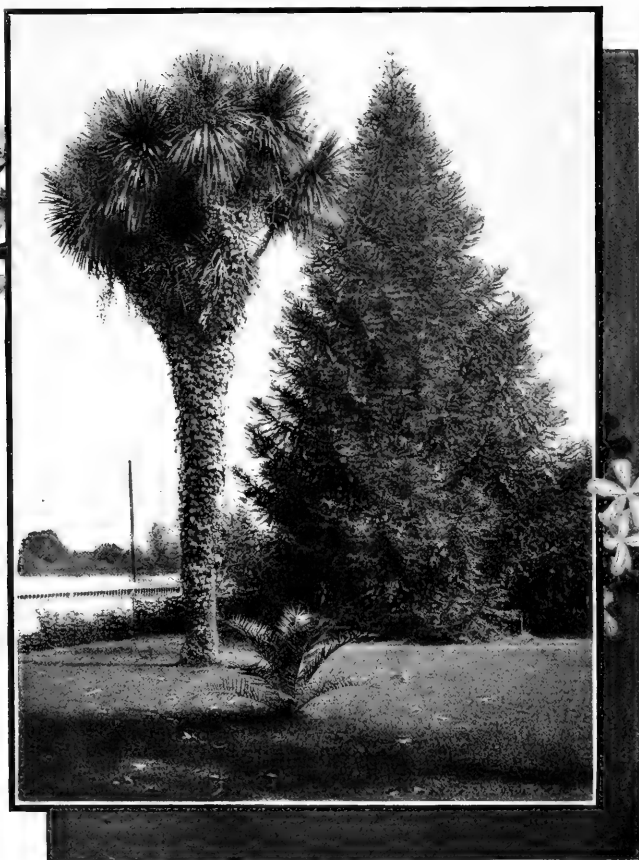
Mr. Burbank is a better business man than one usually finds among optimists. As already suggested, he came to California with scant resources and with some responsibilities. He began forthwith to establish himself and to lay the foundation for the greater work which he held steadily in mind and for which he knew considerable funds would be required. He secured land and entered upon a nursery enterprise, fortunately just at a period when great fruit-planting fervor prevailed and good prices were paid for trees. He accumulated money rapidly and made investments in real estate which have, on the whole, proved satisfactory, though they had to take the tortuous path to which such ventures are generally born. The net result of his financiering is a competence fit to cover the moderate requirements of his modest living to its end. In this respect, Mr. Burbank departs from the usual course of optimists in science and invention and secures respectable standing as a business man. It is also a sign of business ability that the last decade, which has been wholly given to his chosen work of creation of novel-ties of a most striking character, as will be shown later in these papers, has brought income equal to the great cost of the work.

According to commercial standards, the wonderful production which Mr. Burbank has achieved should have yielded him wealth, but the man with the ledger should remember that commercial profit is not the measure of such work.

It is not in that class. It is comparable, rather, with scientific discovery, for which nations, institutions or wealthy individuals lavishly provide; and the demonstration that a man can pursue his quiet course amid discoveries fit to craze an ordinary enthusiast, and can command money enough to meet the large expenditures necessary to original investigation, work and experiment upon so large a scale, entitles Mr. Burbank to high rating as a business man. He had no time to organize companies and capitalize his enterprises, nor to strive for subsidies because of the vast public value of his achievements. He encouraged no promoters, he made no appeals to those who have influence with governing boards or legislatures. So far as the writer knows he never asked a favor in the way of support or influence, though the air has been filled with suggestions along such lines, from his friends. He undertook his campaign like an adventurous general who strikes into the heart of an unknown region, confident in his own purposes and strength and resolved to command his supplies from the country traversed. Of course, he could not stop for the development of enterprises. His purpose was conquest of the unknown. He is emerging now into the full sunshine which gilds the brows of conquerors, and the country he has traversed is open to development of incalculable richness.

This achievement demonstrates Mr. Burbank's possession of unique power and resources. Confidence, self-containment, conservative commercial ability, uncompromising rejection of speculation in his own glittering commodities, gentle declination of all suggestions of eleemosynary appeals to the public—all these are characteristic of his progress. He stands today, as he has always stood, a man great enough to cherish great ideas and to attain results without allowing the heart flutters of satisfaction or the promptings of ambition to lighten his pressure upon the solid ground of safe and secure advancement along his chosen course.

It is probable that every man of balance and force feels satisfaction and a just pride in the possession of such powers and does not enjoy belittlement of



*Upon the lawn are various trees, the chief being an
ivy-clad dracoena and a towering araucaria*

them. Mr. Burbank rightly feels that the suggestion that the public ought to provide for his work is too often a reflection upon his own ability to provide for it. He is pained by disclosures of that point of view in the eyes of his friends, and they have wounded his delicate sensibilities by what seemed to them complimentary allusions. The claim that his work ought to be assumed by the government or by an institution in the public interest, because it is capable of

indefinite expansion under his direction, by multiplying agencies to work out his suggestions, is a somewhat different proposition, and will be considered in another connection later.

In spite of the strength which that proposition discloses at first glance, fuller consideration of it begets a doubt whether, indeed, Burbank might not mean less to coming generations as a sidelight to a bureau than as a lone star glowing in the horticultural horizon.

Christopher Columbus, from a central office at Cadiz, with ample funds and telephonic connection with all the ports of Europe, could have ordered voyages of discovery to all points of the compass and have placed every continent and island on the map in a few years. The world would have found itself and have lost its hero. The devotion to conviction and the heroic struggle of Columbus, and the picture of him as, in the moment of his triumph, he fell upon his knees on the shore of the new world, have been, for more than four centuries, a sublime incentive and example. From these the world has realized vastly more than if Columbus, as chief of an international bureau of discovery, had won the ultimate acre of existing land. It is not what is given to men, but what they are incited to do for themselves, that makes for exaltation and progress. The world has unfolded as civilization has risen to use new areas. Plant development is one of the phases of civilization, and it makes new conquests as they are needed in the onward rush of mankind. We are now at the beginning of an epoch of accelerated motion in this direction. Burbank is the prophet of this epoch. Obeying the command of the Infinite, he is carrying the gates of Gaza. Let not the Delilah of modern organization shear him of his god-given strength and make him like other men.

Current conceptions of Mr. Burbank involve errors more or less serious. Conservatism, as embodied in efforts at hybridization along what are called scientific lines, has not hesitated to place him on the plane of charlatanry, while credulous people have lifted him to what seems to them an exalted state of wonder-working magic and wizardism.

He has worked through a country not yet officially surveyed, above the pathway of the contemporaneous scientists, and it is not wonderful, then, that they should fail to recognize him for a time. Confident of his earnest desire to read nature aright and convinced of the accuracy of the results of his patient efforts in this direction, he has been hurt in his sensitive spirit by what seemed to be academic distrust of him. Comments have been made by recognized authorities which seemed to charge that he was

holding to fallacies in recognizing principles which he had fully demonstrated in his own researches and experiments. Conservatism, in fact, almost claimed that he was making a travesty of science for the amazement of the horticultural gallery.

All through this affliction, Mr. Burbank has been patient, never taking up the pen except to correct some misconception of the science involved in his work. He was strong in his faith that judgment of his motives and methods would ere long be just, and he was willing to wait, but he became restless when any one proclaimed limitations in nature which he knew did not exist. But though Mr. Burbank bore, in his quiet, serious way, the burdens of distrust and misapprehension which fall usually to the lot of those who extend the frontiers of human knowledge, it has been his good fortune to realize relief sooner than many other frontiersmen in science. He submitted his novel achievements freely for expert judgment. He gave the fullest information of their origin and development. He cordially welcomed those in whose judgment and intelligence he had confidence to full examination of all his materials and practices, and people from all parts of the world satisfied themselves of his honesty and frankness as well as of the wonderful novelty and originality of his accomplishments. Probably the last doubt of Mr. Burbank's genuineness passed from the academic mind when the assembling in San Francisco, in 1899, of the Association of American Agricultural Colleges and Experiment Stations gave a large group of scientific men from all parts of the country an opportunity to critically examine him and his work on his own grounds at Santa Rosa and Sebastopol. The reports which these visitors published, through many channels at the east, were eloquent of doubts removed and demonstrations accepted. Since then, as though to atone for the errors of the past, distant comments upon Mr. Burbank and his work have been most cordial and appreciative.

An opposite phase of Mr. Burbank's experience is found in the admiration of those who have looked upon his achievements as involving superhuman elements.



TREES OF GREAT BEAUTY IN FRONT OF THE BURBANK PLACE AT SANTA ROSA

They are a hybrid black walnut, the first cross-bred tree of Mr. Burbank's growing

They early proclaimed him the "Wizard of Horticulture." Nothing but his extreme amiability enabled him to undergo the imputation of witchcraft which the term implies. He accepted epithets of this character as merely conveying the popular acknowledgment that his achievements were wonderful. No one knew better than he how new and wonderful they really were, and, in his measureless kindness of heart, without protest he allowed all people to speak of them in the terms which seemed to them most appropriate. Some of his friends doubted the wisdom of this course. They would have approved a mild rebuke upon those who seemed to cast a shade upon the genuineness of his effort by applying to him epithets which pertain to fakirs, and it may be that his seeming acceptance of the terms encouraged the impression of the academicians that he might be, indeed, a man of visions and fallacies. But in the end it matters little. The universal acknowledgment now that he is working with wonderful industry and insight for the demonstration of new truth and the application of it, makes it of little moment whether the term, "Wizard of Horticulture," was employed in admiration or interrogation. In both cases it has outlived its usefulness.

Mr. Burbank has been too fully occupied with the chief work of his life to develop other lines of talent and taste

which are manifestly within his command. One of these is literary effort. Aside from his announcements of finished work which have already been mentioned, he has written three papers for public occasions. In these he disclosed a depth of thought, originality of conception, tenderness of sentiment, and withal a breadth of view, which were something of a surprise to those who had only thought of him as an industrious and skilful plantsman. In these writings his conception of the nature of the plant and of the relation of the mind of man thereto, are stated, not only with clearness, but with charming literary style.

In what has been written about Mr. Burbank there have been full tributes to his industry, the breadth of his work and of the patience of his pursuit of his achievements, but in his own writings we have an intimation, such as we have never had before, of the richness and keenness of his imagination, without which all his other qualities would fail of fruition. Here lies his creative faculty, and it is not unlike that which has given the world its great poems and works of art. The world recognizes Mr. Burbank as a great man for what he accomplishes; it is waiting to grant him similar honor for what he thinks. The relation of his thought to his methods and achievements will appear later in the discussion of those branches of our subject.

SECOND PAPER—METHODS

Illustrations from photographs by William Shaw, Santa Rosa, California

EVER since Mr. Burbank's new fruits and flowers began to attract attention there has been the keenest anxiety to learn his methods. The wildest reports have been current and the ordinary person has been ready to believe that either some tricks of horticultural jugglery were practiced, or at least some profound secret was relied upon to secure the wonderful results. To those who held such beliefs it seemed clear that a revelation from Mr. Burbank was a thing to be most ardently desired. This idea largely prevailed in the invitation extended to him, by the American Pomological Society, to prepare an essay on "How to Produce New Fruits and Flowers," for its meeting in Sacramento in 1895. The announcement of his consent thereto was widely taken to mean that Mr. Burbank would make public his methods of wonder-working. The audience was alert to catch every word of the anticipated recipe. Here are a few of the ingredients:

In pursuing the study of any of the universal and everlasting laws of Nature, whether relating to the life, growth, structure and movements of a giant planet, the tiniest plant or of the psychological movements of the human brain, some conditions are necessary before we can become one of Nature's interpreters or the creator of any valuable work for the world. * * * Preconceived notions, dogmas and all personal prejudice and bias must be laid aside: listen patiently, quietly and reverently to the lessons, one by one, which Mother Nature has to teach, shedding light on that which was before a mystery, so that all who will may see and know. She conveys her truths only to those who are passive and receptive * * * accepting truths as suggested, wherever they may lead, then we have the whole universe in harmony with us. * * * At last man has found a solid foundation for science, having discovered that he is part of a universe which is "eternally unstable in form, eternally immutable in substance."

Some of Mr. Burbank's hearers were rather disappointed when he gave them philosophy instead of prescription. They were surprised to be told that, in the work of producing new fruits and flow-

ers, a correct conception of the constitution of the universe, involving the relation of the mind of man to the phenomena of Nature, is the very starting point. All aims, purposes and methods in origination of new plants are conditioned upon such a conception, and Mr. Burbank, deeply conscious as he is of this fact, could not lose sight of the philosophy which actuates his efforts. He met a perverse generation seeking after a sign, but he could give them no sign, except such as they could descry in the very nature of things with which they had to deal.

A little more definite statement of his view of the relation of plant nature to human insight and effort is found in another of Mr. Burbank's public utterances:

The chief work of the botanists of yesterday was the study and classification of dried, shriveled plant mummies whose souls had fled, rather than the living, plastic forms. They thought their classified species were more fixed and unchangeable than anything in heaven or earth that we can now imagine. We have learned that they are as plastic in our hands as clay in the hands of the potter or color on the artist's canvas, and can readily be molded into more beautiful forms and colors than any painter or sculptor can ever hope to bring forth. * * * The changes which can be wrought with the most plastic forms are simply marvelous, and only those who have seen this regeneration transpiring before their very eyes can ever be fully convinced.*

In this connection it would not be wise to go beyond this mere suggestion of the philosophy underlying Mr. Burbank's work. The words, "eternally unstable in form, eternally immutable in substance," which he delights in quoting, disclose his conception of the welcome which Nature extends to those who work diligently and intelligently for new forms. It is a broad view, of course. It recognizes no limitations nor classification barriers, except as they arise in the mind of man, and then they are indications of narrowness in man and not in the Creative plan. Mr. Burbank is dis-

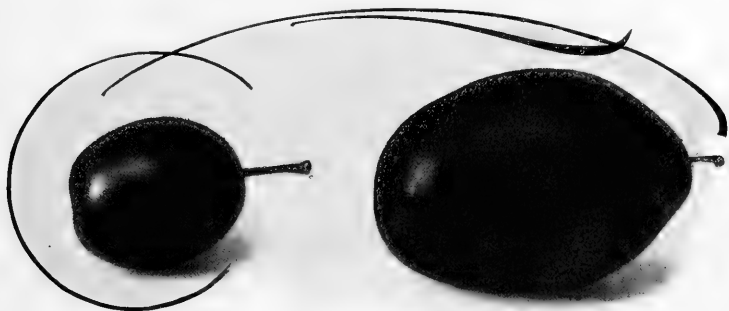
*Proceedings of the American Pomological Society, 1895, page 59.

*Essay at Floral Congress in San Francisco: Pacific Rural Press, July 6, 1901.

posed to insist strenuously on his view of Nature, and it has been an inspiration in all his work.

Having established in his own mind this natural tendency to variation, by

variation in his chosen field, is a gem of many facets, shooting bright gleams of significance through all the many phases of his work and revealing opportunities apparent only to his trained perceptions. Selection, to Mr. Burbank, is a constantly



THE FRENCH PRUNE AND ITS OFFSPRING, THE GIANT PRUNE

wide reading of the great works on evolution and by a wider experience in instances of variation in plant life than has ever fallen to the lot of any other man, Mr. Burbank naturally looks upon artificial selection as the chief agency through which his many achievements have been attained. All the methods by which variation can be induced or promoted are merely avenues through which forms are led to the bar of selection. Of course, selection is an old art. It was practiced even in prehistoric civilization, because history begins with improved forms of plants and animals. But one can readily see that selection, in the hands of a man of Mr. Burbank's broad conceptions and almost illimitable obser-

unfolding principle. It excited his youthful interest and curiosity; it engrosses the deepest thought and employs the finest arts of his manhood; it will irradiate his last glance at earthly scenes.

Selection is, then, a first and last art in the development of new forms of plant or animal, interesting or useful to mankind. With the founders of civilization it was selection of the results of natural variation which seemed desirable; with the beginner of the present day it is usually the same. Mr. Burbank began that way and it became the first of his methods. It was his fortune that one of his earliest achievements proved so notable. In his youth the older va-



FOUR OF THE OLD STANDARD VARIETIES AND ONE OF THE NEW



—seedlings capable of budding or grafting are introduced to the forcing influence of old plants of the same class

rieties of potatoes gave clear signs of degeneration and interest was keen for better varieties. Many were striving for them and splendid results had been secured. He cast his twine line and pin hook in the same waters. He planted a lot of Early Rose potatoes in his mother's garden in Massachusetts and watched for the seed balls in which his possibilities would be enclosed. Varieties of potatoes, with vegetative energies diverted by long multiplication from the tuber, become scant in seed production. On the whole patch young Burbank found but a single seed ball, and watched its growth day after day with anxious interest. One morning it could not be found and the youth was crushed in spirit. After a time the thought came to him that possibly some dog bounding through the patch had dislodged the precious seed ball, and the ground was searched. It was soon found some feet away from its parent stem. Twenty-three small seeds were well developed. From one of them came the Burbank potato which gave its originator his first grasp upon fame, and exerted an influence in determining his life work. Thus,

selection, in its simplest form, was the first of Burbank's methods. Thus fortune, in her most generous mood, decreed that one of the boy's twenty-three seedlings should be notable, that, in after years, the man might have courage to burn over sixty thousand plants of one kind at one time because none of them were notable.

But, though artificial selection, practiced simply upon the forms resulting by natural variation, may do for the boyhood of the race or the individual, it is only a beginner's art in either case. As there is progress in mastery of the art, there must be richer material for its exercise. Nature has her sportive disposition under control; she has developed character; old allurements have lost their force; she must be given new temptations to lightness. Herein lie Mr. Burbank's chief methods. In their essence there is nothing new; but the daring, the subtlety, the volume and the patience with which they have been pursued have never been equaled, or even approached.

To create a disturbance in those parts



A WHITE BLACKBERRY
ONE OF MR. BURBANK'S MOST STARTLING
ACHIEVEMENTS

Shaw, Photo, Santa Rosa, Cal.

of the plant world which he chooses for his operations is one of Mr. Burbank's first aims; to shape the form and direction of that disturbance is another; to select, from the myriad manifestations of such disturbance, those forms which possess new beauty, usefulness, or other significance to mankind, is the ultimate motive of his effort.

It is an old experience of mankind that plants and animals are changed in form and habit by transfer from native wildness to domestication. Relief from the old struggle and enjoyment of what may be called care and comfort promote variation. In the wild state variation is repressed, because only those exceptional variations which minister to success in the struggle survive. In the cultivated state variation is not measured by this cruel standard. This fact is of constant value in Mr. Burbank's work, and the importance which he attaches to cultivation and domestication, as a method in his work, cannot be better told than in his own words:

There is not one weed or flower, wild or domesticated, which will not, sooner or later, respond liberally to good cultivation and persistent selection. What can be more delightful than to adopt the most promising individual from among a race of vile, neglected weeds, down-trodden and despised by all; to see it gradually change its sprawling habits, its coarse, ill-smelling foliage, its insignificant blossoms of dull color to an upright plant with handsome, glossy, fragrant leaves, blossoms of every hue and with fragrance as pure and lasting as could be desired. * * *

Weeds are weeds because they are jostled, crowded, cropped and trampled upon, scorched by fierce heat, starved or, perhaps, suffering with cold, wet feet, tormented by insect pests or lack of nourishing food and sunshine. Most of them have no opportunity for blossoming out in luxurious beauty and abundance. A few are so fixed in their habits that it is better to select an individual for adoption and improvement from a race which is more pliable. This stability of character cannot often be known except by careful trial, therefore members from several races at the same time may be selected with advantage; the most pliable and easily educated ones will soon make the fact manifest by showing a tendency to "break" or vary slightly or, perhaps, profoundly, from the wild state. Any variation should be at once seized upon and numerous seedlings raised from this individual. In the next generation, one or several even more marked variations will be almost certain to appear, for when a plant once wakes up to the new influences brought to bear upon it, the road is opened for endless improvement in all directions, and the opera-

tor finds himself with a wealth of new forms which is almost as discouraging to select from as, in the first place, it was to induce the plant to vary in the least.*

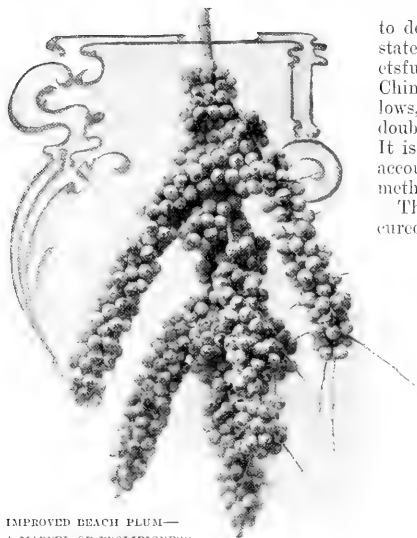
Mr. Burbank's comments are given at such length, in part to emphasize the importance he attaches to this very old and very simple method of securing new plants. Of course, the penetrating reader will see that, though the method is simple, the application of it affords opportunity for insight, for keen discrimination, for acute perception of slight tendencies in variation and for patient work, beyond description. But all these would fail of notable results were they not actuated by a true conception of what is desirable—an ideal toward the attainment of which every effort is directed.

Beyond the elementary forms of disturbance in plant life which pertain to changes in environment lie the methods which are popularly looked upon as more wonderful, viz., crossing or hybridization. Without attempting any exposition of the results of this act, for they are amply set forth in the literature both of science and horticulture, it may be briefly suggested that Mr. Burbank has two main purposes in his recourse to cross pollination. One is to promote disturbance, or, as it may be stated, to upset the equilibrium which has been established in the plant. Seedlings from cross-bred parentage show wide range in variation, while the seedlings from either parent without crossing may rarely depart from the established type. When, therefore, something more than can be secured by change of environment is desired, crossing is resorted to. The result is conflict between the dominant traits of the ancestry, and while these champions contend and, perhaps, disable each other, other traits of remote ancestry, long held in bondage by these dominant traits, rush to the front and display their old prowess in some of the offspring of the unwonted parentage. Thus, there is spread before the propagator a new field, rich in strange forms, endowed with strange characters, upon which he applies the underlying principle of selection, wisely or otherwise, according to the depth of his insight and the acuteness of his perceptions.

*Address before Floral Congress, loc. cit.



THE SHASTA DAISY AND ONE OF ITS PARENTS, THE EASTERN OX-EYE DAISY



IMPROVED BEACH PLUM—
A MARVEL OF PROLIFICNESS

The other purpose in crossing is the combination of characters so that the offspring may show, in one new entity, the desirable traits of both parents, or, by continued crossing, accumulate such traits from several ancestors. Of course, bad traits are accumulated or intensified by the same process, so here again selection is invoked, with fullest powers, to escape the evil and secure the good.

In his crossing Mr. Burbank has gone beyond all old conceptions of affinity within lines of botanical relationship and has secured startling results, but mention of them pertains rather to the discussion of his achievements than of his methods, and will appear in that later connection.

What, then, are Mr. Burbank's methods in cross pollination or hybridizing? In this branch of his work the admiring multitude has scented magic and the conservative scientist has suspected deception. Both have thirsted for information as to methods. The most absurd reports have been current, which have deceived many. Mr. Burbank's public utterances have not given the details of his work. In his few addresses it has seemed to him more important to contend for the principles he had demonstrated than

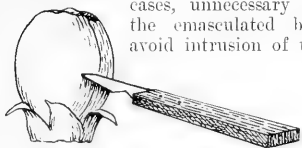
to describe manipulation. When it was stated that he gathered pollen by bucketsful and pollinated with gangs of Chinese armed with dredges and bellows, he regarded as a jest what, no doubt, some credulous people believed. It is pertinent, therefore, that a careful account of Mr. Burbank's pollinating methods be presented to the reader.

The supply of pollen is generally secured by gathering a quantity of the anthers of the desired pollen parent, usually the day before the pollen is to be used, and drying them carefully. When in proper degree of dryness, the pollen is secured by gently shaking or sifting the mass of dry anthers over a watch crystal until its surface is dusted over with the pollen, the dust film appearing most clearly on the lower parts of the curved surface. Each genus, each species, and sometimes each variety requires modifications which are suggested by experience. The largest

quantity of blossoms of a single variety which Mr. Burbank has handled at one time is about a pint. He has found that properly dried pollen ordinarily retains its efficacy about one week; it might, perhaps, in many cases retain its power much longer.

The preparation of the blooms of the seed parent consists in removing about nine-tenths of the bloom buds when they begin to show the petal color, leaving, in trees which bloom freely, about one in ten of the natural bloom to be operated upon. This is for convenience of operating and to avoid the setting of too many seeds for the tree to properly perfect. Before the petals open, each of these buds is carefully cut into with a small, sharp knife blade, in such a way that the petals and a part of the sepals and all the attached anthers are removed as the knife makes its circuit, leaving the pistils exposed but uninjured by the operation. The accompanying sketches will assist the lay reader to an understanding of the process. The removal of the corolla balks the bees and other honey-seeking insects, either by the loss of color or by absence of alighting place, or both. The buzzing Archimedes finds no place for his lever and wearily goes his way,

the honey unsipped and the pistil free from contact with his pollen-dusted body. Mr. Burbank finds it, in most cases, unnecessary to cover the emasculated bloom to avoid intrusion of undesira-



—the petals and a part of the sepals and all the attached anthers are removed (enlarged)

ble pollen by insect agency.

He chooses for pollination the time when the first hum of the bees is heard in the trees. He finds all conditions at that time most favorable, and believes the pistil is then in its most receptive state. The instrument of pollination is the finger tip. Applied to the dusted surface

of the plate, either by a mere touch or a slight rubbing, enough pollen adheres. The finger tip is then quickly touched to the pistils of the prepared blossoms one after another. They welcome the pollen and the fructifying agency begins at once its journey to the



Before the petals open, each of the buds is carefully cut into with a small, sharp knife blade (enlarged)

ovule. No matter what comes now, on the wind or otherwise. The opportunity for outside pollen has passed. The touch of the finger has covered the stigma with the chosen element and sealed it safe from further intrusion.

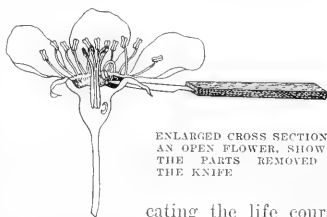
In his choice of the unaided hand as the instrument of pollination, Mr. Burbank has not only vastly simplified and made more expeditious the act of pollination, but there

is also involved a profound tribute to the superiority of the trained hand

in directness and delicacy for what lies within its unaided scope. Recourse to instruments and appliances is often es-

sential, but, in many lines of human effort, the direct contact of the finger tip works wonders impossible with intermediaries. It is an interesting reflection that when Nature's direct agencies, the bustling bees, are put to flight, the human hand enters directly for man's specific purpose. Naturally, particular skill is acquired by long practice, and some of Mr. Burbank's most trusted employes have done much of this work for years.

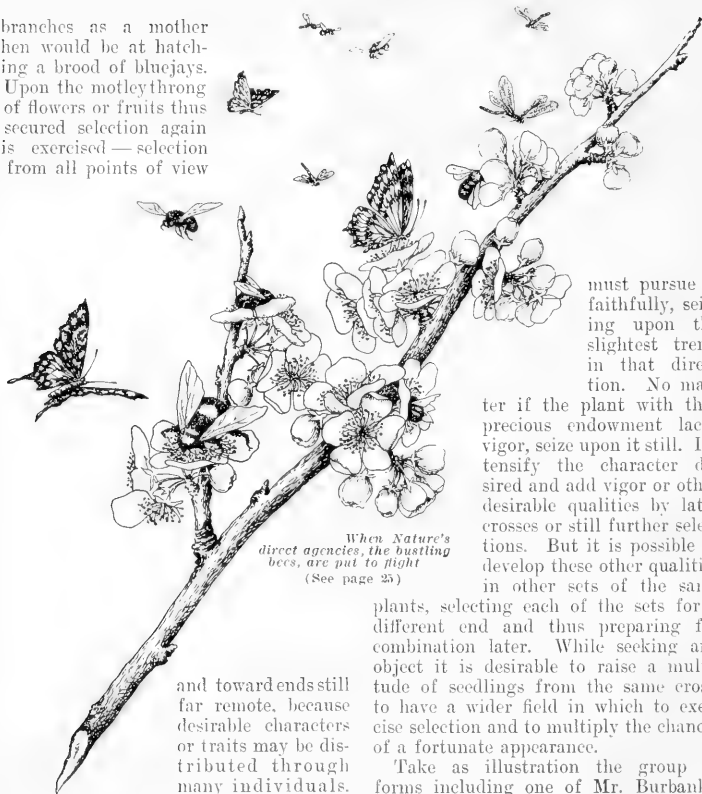
The seed resulting from cross-pollinated bloom is, of course, gathered with great care; seedlings are grown, and the closest watch is kept upon their characters and habits from germination onward. The little seedling may disclose its combined parentage or give sign that it has drawn up something from the profound depths of the converging streams of its remote ancestry, long before it reaches blooming or fruiting stage. Tokens which would escape the ordinary observer become clear as milestones indi-



ENLARGED CROSS SECTION OF AN OPEN FLOWER, SHOWING THE PARTS REMOVED BY THE KNIFE

cating the life courses of the new plant to the skillful propagator. The art of selection begins, then, early in the development of the crossbred plants. Incalculable numbers of them may be destroyed for their too evident adherence to the old types, and only one or, perhaps, thousands, be retained because they give promise of breaking away from such bondage. Whenever such selected seedlings are capable of budding or grafting they are thus introduced to the forcing influence of old plants of the same class and hurried to flower or fruit in this well known way. A single old plant or tree may thus force its sap into the cells of hundreds of buds or grafts of new varieties, and can be conceived to be as surprised at the multitude of strange forms and colors appearing on its old

branches as a mother hen would be at hatching a brood of bluejays. Upon the motley throng of flowers or fruits thus secured selection again is exercised — selection from all points of view



When Nature's direct agencies, the bustling bees, are put to flight (See page 25)

and toward ends still far remote, because desirable characters or traits may be distributed through many individuals.

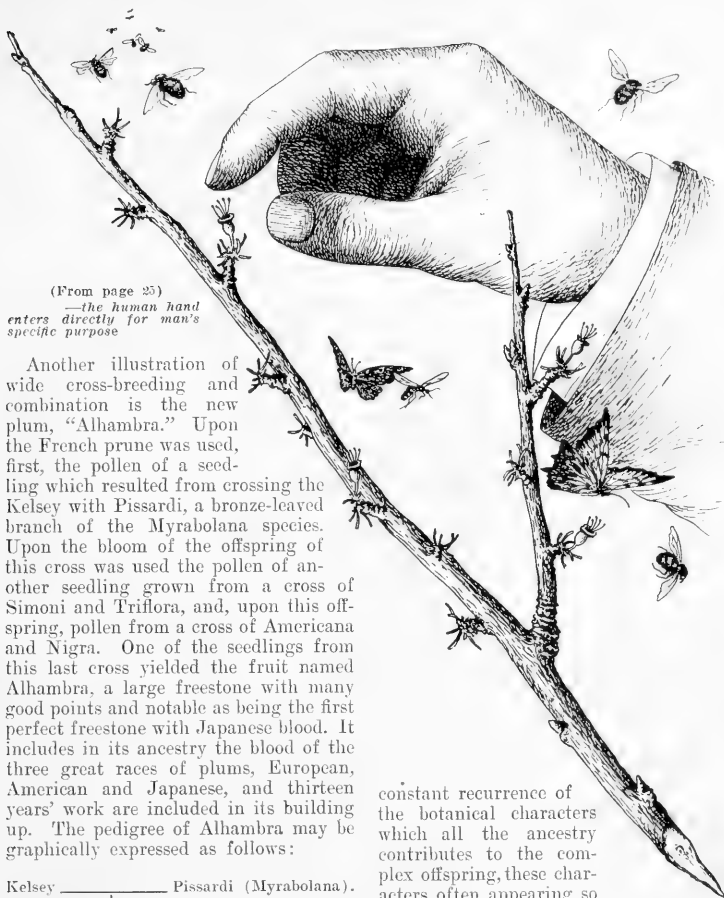
They must be combined and concentrated. Cross pollination, now, between such individuals must be employed, and from this new shuffling of the cards another discriminating, patient effort for arrangement into suits or sequences. It is a stupendous game of solitaire which the capable hybridizer plays among the innumerable forms, colors, odors, flavors, textures, growing, blooming and fruiting habits, which surround him as his reward for disturbing the natural order of things in the plant world. Amid this indefinite variety there must be in his mind no confusion. He is wise if he has had an object from the beginning—a conception of something new and desirable, perhaps a definite combination of objects to be attained. If he has a main object, say a certain color in a flower, he

must pursue it faithfully, seizing upon the slightest trend in that direction. No matter

if the plant with that precious endowment lacks vigor, seize upon it still. Intensify the character desired and add vigor or other desirable qualities by later crosses or still further selections. But it is possible to develop these other qualities in other sets of the same

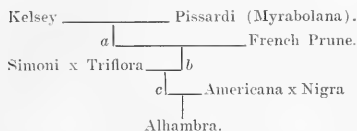
plants, selecting each of the sets for a different end and thus preparing for combination later. While seeking any object it is desirable to raise a multitude of seedlings from the same cross, to have a wider field in which to exercise selection and to multiply the chances of a fortunate appearance.

Take as illustration the group of forms including one of Mr. Burbank's most popular recent creations, the "Shasta Daisy." It was built upon a combination of the grace of the Japanese, the tall, stiff stem and bold but coarse flower of the European and the whiteness and abundant bloom of the American species. After the combination was effected size was secured by selection, but the bloom was flat, with large center; next, selection was made for cup shape and superior whiteness; next, to secure doubling of the petals and to maintain size, and now a fully double flower has been reached, of good size, but not quite so large as the largest single variety. This work included numerous cross pollinations and the growing of hundreds of thousands of seedlings, all of which passed beneath the quick eye of Mr. Burbank in the process of selection.



(From page 25)
—the human hand
enters directly for man's
specific purpose

Another illustration of wide cross-breeding and combination is the new plum, "Alhambra." Upon the French prune was used, first, the pollen of a seedling which resulted from crossing the Kelsey with Pissardi, a bronze-leaved branch of the Myrabolana species. Upon the bloom of the offspring of this cross was used the pollen of another seedling grown from a cross of Simoni and Triflora, and, upon this offspring, pollen from a cross of Americana and Nigra. One of the seedlings from this last cross yielded the fruit named Alhambra, a large freestone with many good points and notable as being the first perfect freestone with Japanese blood. It includes in its ancestry the blood of the three great races of plums, European, American and Japanese, and thirteen years' work are included in its building up. The pedigree of Alhambra may be graphically expressed as follows:



The letters, *a*, *b*, *c*, signify unnamed cross-bred seedlings which are included in the ancestry of the resultant Alhambra. Mr. Burbank has quite a number of plums with six crosses in their pedigrees, the parents, in many cases, being themselves the offspring of earlier crosses. In the wide combinations thus resulting selection has to deal with the

constant recurrence of the botanical characters which all the ancestry contributes to the complex offspring, these characters often appearing so clearly as to be easily recognized at a glance, even by the most casual observer.

This writing has probably already wandered too far into the drouth of technical discussion to interest the general reader, and yet only a few hasty outlines of methods have been given. To fill in these outlines with the shading necessary to develop special features and the perspective desirable to show the mutual relations of the outlines would require a volume.

Treatises on color and perspective can-



PARTIAL VIEW OF BURBANK'S TRIAL GROUNDS AT SEBASTOPOL

not make artists. There is, beyond the material and method, the creative brain, which employs them in a way to excite wonder and admiration. It is not otherwise with Mr. Burbank's methods. He has no secrets which he recognizes and guards as such. He has, of course, the teachings of many years' experience and of observation keener, more penetrating and more patiently pursued than any other worker in his line can command. He uses this endowment constantly and

it grows with use. It needs no safeguarding, for it cannot be stolen nor can it be given away. It is non-transferable, just as are the mental penetration and grasp and the unflagging energy and industry which, using all these methods and materials as creative imagination conceives their suitability, is compassing achievements which are new and grand, both in science and horticulture. A sketch of these achievements will be the next undertaking in this series.



THE BEUTIFUL CUP-SHAPE AND DAZZLING WHITENESS OF THE SHASTA DAISY

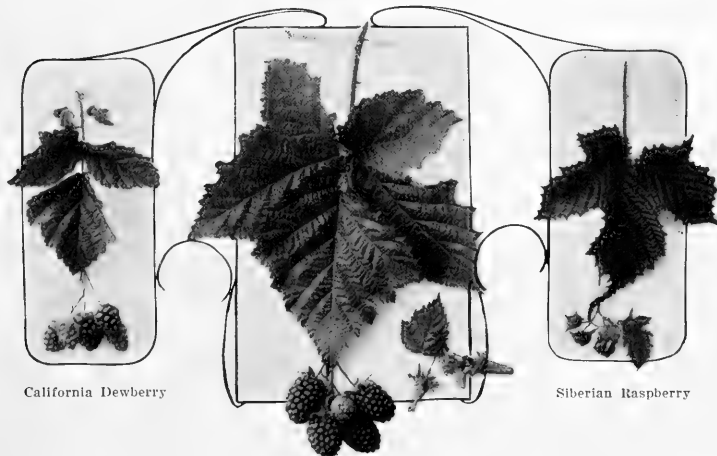
THIRD PAPER—ACHIEVEMENTS

Illustrations from photographs by William Shaw, Santa Rosa, California

WE come now to the division of these sketches of the life and work of Luther Burbank which will seem to many the most interesting and important. What has the man, endowed as has been claimed, and following methods which have been outlined, achieved for himself and for humanity? Obviously, it is premature to ask this question concerning one who is still so young that it may be reasonably doubted whether he has yet reached his greatest wisdom and work: but what matters it, if the present point of view be true, that it command a beginning rather than an ending? In fact, there can be little more accomplished within the necessary limits of these sketches than to disclose a point of view—possibly to slightly assist the observer to occupy it—and then to trust to his sight and discernment for appreciation of relations and significance. There is in the work of Mr. Burbank, even at this point in his career, an array of facts and a wealth of suggestion which are almost overwhelming to one who has head and heart for them.

In the account given of his life it was intimated that although he began as a horticulturist and still remains an honor to the guild, Mr. Burbank's thought and work have passed beyond even the highest levels of horticulture, known as horticultural science, into the domain of science itself. To be judged, then, by his peers, men of science, as well as horticulturists, must review his achievements through all coming years. Let us realize in advance this method of the future, by an appeal to one upon the side of science, well acquainted both with the dicta thereof and with the work of Mr. Burbank to briefly characterize him and his achievements. For this purpose permission has been kindly granted to transcribe from the manuscript notes of Dr. W. J. V. Osterhout, assistant professor of botany in the University of California, the following significant sentences:

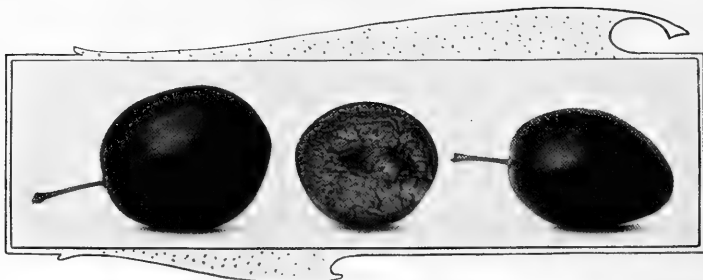
Mr. Burbank has become widely known to scientists by reason of the extraordinary interest and value of his work. Untrammelled by traditions, he has not hesitated to enter fields which the scientific worker would have ignored. The value of his work in thus open-



California Dewberry

Siberian Raspberry

THE PRIMUS BERRY AND ITS PARENTS—THE FIRST RECORDED FIXED SPECIES PRODUCED BY THE HAND OF MAN



The kernel is fully developed but naked; no hard substance intervenes between it and the pulp STONELESS PRUNES

ing up new possibilities and stimulating research in these lines is immeasurable.

Not only for stimulus, but also for methods of work, are we indebted to Mr. Burbank. A botanist, who is known for his researches on plant hybridization carried on during the last twenty years, was quite incredulous when told of Mr. Burbank's methods of work. After a visit to Santa Rosa, he confessed that Mr. Burbank's skill was well nigh incomprehensible, and that he had learned enough during the brief visit to compensate him for the journey from Europe.

Since the passing of the scientific dogma of the fixity of species, the study of variation has come steadily to the fore. We wish to know not only what variations occur naturally, but what can be produced by various artificial means. I know no better student of variation in both aspects than Mr. Burbank. Throughout a long series of years he has been gathering plants from every quarter of the globe. With patience akin to Darwin's he has familiarized himself with this great store of material growing under his eyes. He has succeeded, to an extraordinary degree, in mastering the intricacies of variation in a very wide range of plants. By observation and intuitive insight he has gained wonderful knowledge of the nature of these plants, their possibilities and latent characters. As a result of his labors we have, at Santa Rosa, a laboratory for the study of variation on a gigantic scale and a magnificent array of facts and discoveries of great value to science.

The true scientist is not satisfied with details; he wishes to reduce them to formulae, to general laws which shall vitalize knowledge and provide for future progress. Such a one finds in Mr. Burbank a kindred spirit, who seems to discover great laws by a flash of genius, such is the swiftness of his intuition. His thought is so fresh and unbackneyed that it is impossible to give an adequate impression of its suggestive and vitalizing quality. From his unbroken study of Nature he comes with a word of authority and power. In his ability to penetrate behind the facts to the laws which make facts significant he resembles Darwin, whose spirit and method he exemplifies.

On the basis of this candid statement

from Dr. Osterhout, we can claim for Mr. Burbank achievement in science which will forever link his name with those whom the world counts greatest in the interpretation of Nature, and as those only thus live who earn the right by great deeds, his fame will always stand witness to his service.

Having thus taken a sweeping glance through other eyes at Mr. Burbank's achievements from the point of view of science, the horticulturist returns to his own standards of interest in them without further reference to their value to science. The scientific reader must develop that aspect of the facts for himself. Even the facts themselves are so varied and numerous that they defy enumeration, and a few generalizations, some of which involve many years of close effort on the part of Mr. Burbank, are all that can be undertaken.

Let us look, first, at some general characters of fruits which he has demonstrated to be susceptible of striking and valuable modifications, illustrating by brief reference to specific achievements.

1. Varieties have been secured which are prolific where the older sorts have proved unsatisfactory. The intermingling of the native American and Japanese species of plums, which has been a leading line of Mr. Burbank's work, has made it possible to grow luscious fruit in various regions of the United States where the old species failed. Professor Waugh of Vermont, speaks of the increased production east of the Rocky mountains as remarkable, and adds: "The introduction of the hybrid plums

marks an epoch in plum culture."* And he traces the opening of this epoch to the introduction of two of Mr. Burbank's creations. In the south, both on the At-



--the ennobling of the beach plum

lantic and Pacific sides of the country, the Japanese species and its hybrids are making plum growing successful where the long-tried European varieties yielded failure and disappointment. This is strikingly the case in Southern California.

Mr. Burbank is now working largely on hardy varieties, and the effort will result in securing luscious fruits where at present trying conditions destroy all but small and often ill-flavored wildlings. A striking instance of this is found in work

*"Plums and Plum Culture," 1901, page 80.

now in progress in the ennobling of the "beach plum"—*prunus maritima*. This hardy savage never fails to bear everywhere and is thrifty under most trying conditions of dry rocky or soggy, saturated soil, and its fruit, which is not much larger than a full-sized huckleberry, is also utterly worthless for anything but preserving: It blooms a month after

other plums, but, by extra arrangements, eastern and Japanese plums were retarded so that their pollen held its vitality to be used in uplifting this dejected species. By many crosses it was proved to be possible to retain its wonderful productiveness, while the lowly bush assumed better foliage, more upright form and fruit with

really good flavor, which, while about as large as an ordinary eastern plum, retains a seed as small as a cherry stone. This group of new fruits has bright colors, oval and round forms which are never flattened and have no suture. Most of the best varieties thus originated came, not from the first seedlings of the cross, but from seedlings of them, or from the "second generation," as it is called in plant breeding. Many thousands of selected third-generation seedlings are being grafted this winter (1902) for fruiting. These, by growth



PARTIAL VIEW OF MR. BURBANK'S TRIAL GROUNDS

—a laboratory for the study of variation on a gigantic scale

and foliage, readily show that still more startling improvements have been produced.

The change in characters developed in a California wild plum—*prunus subcordata*—is also notable. Some varieties have been secured which are twice the size of the wild forms, greatly improved in quality and matchless in beauty of coloring. The plant is also of larger growth and increased productiveness.

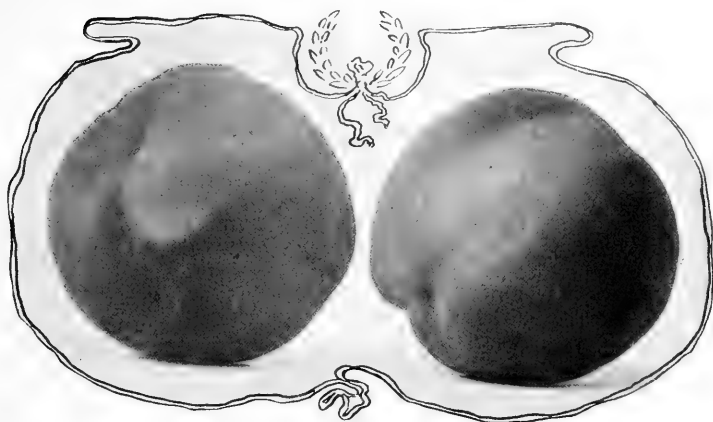
Another very important undertaking in the line of developing hardiness in the popular kinds of fruits lies in the direction of frost-resisting blossoms. Mr. Burbank has selected a class of Japanese-American hybrid plums which seem to have iron-clad or steel-lined, frost-resisting blossoms. He has watched them in all stages of bloom during seasons of the heaviest frosts, morning after morning, and even when the petals would be frozen and brown the first morning and the young leaves frozen at the tips, the stamens and pistils would withstand all

the frosts and the trees afterward show a full crop of fruit. This is, perhaps, an observation never before recorded in fruit culture.

2. Varieties have been produced which, by early and late ripening, prolong the fruit season three or four months. This has been done with plums, as varieties have been originated which ripen two or three weeks earlier than the cherry plum, the old standard of earliness, and others which do not reach maturity until the holidays. The same wide range is shown by Mr. Burbank's new grapes, descended from an Isabella sport of California origin, known as Isabella Regia. The parent is a large black grape; its offspring are various in colors and flavors. One is a white, seedless variety of exquisite flavor, which ripens with the earliest of its class, and another ripens for Christmas and New Year's. These have been selected from thousands of seedlings for their distinctive and startling characters.



The pineapple quince, suggesting the characteristic flavor of its namesake



Crossing plums and apricots has yielded a distinctively new kind of fruit which Mr. Burbank fitly names the "plum-cot"

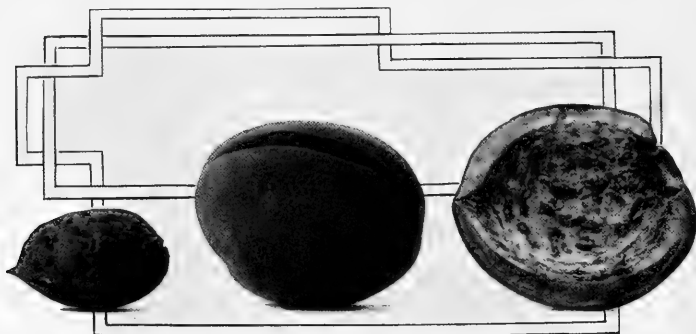
Another phase of the effort for the extension of the fruit season is to secure varieties with long-keeping qualities, either on the tree or after gathering. Mr. Burbank has seedlings of the Wickson and other plums which will remain on the tree in prime condition for use for six to nine weeks in hot weather, when many of the older varieties collapse as soon as ripe.

Development of varieties with particular times of ripening has also received due attention. The Sugar prune with the full density of juice of the Prune d'Agen, twice its size and a month earlier in ripening, is an achievement of world-wide significance and in this condensed account must stand as an exponent of much other work in creating varieties to meet definite needs in time of ripening.

3. Varieties have been produced which show almost incredible precocity in bearing fruit. Mr. Burbank has reached such wonderful results in his wide experimentation that he is convinced that precocity can be bred into all plums so that they will show fruit as early as seedlings of herbaceous plants like blackberries and strawberries. His work for years has been in the line of encouraging this habit by selection, and he follows the practice of rejecting those seedlings which do not fruit the second

year after the grafting of their seedling wood into older growths—that is, the third year from planting the seed. In the same degree, perhaps, this precocity can be developed in other hard-wood fruiting plants. Mr. Burbank has had chestnuts in fruit in eighteen months from the time of the sprouting of the seed, and the seedlings of these are found generally to possess the same early bearing habits.

4. Surprising changes in the natural structure of fruits have been secured. Perhaps the most notable is the elimination of the shell inclosing the kernel in which are called stone fruits. Mr. Burbank has a number of plum varieties of this character which are called "stoneless." The kernel is fully developed but naked—no hard substance intervenes between it and the pulp. To take up a plum and bite through it without hesitation requires education, so strong is the conception of the danger involved; but to bite freely and find the flavor enhanced by the nutty savor of the kernel brings reward in the new sensation which the palate experiences. This is particularly the case with the stoneless prune. The kernel of the French prune has, after cooking, a delicious and unique flavor. To combine the flavors of pulp and kernel, to gain the nutritive proper-



THE PEACH-ALMOND—A HYBRID OF WAGER PEACH AND LANGEUDOC ALMOND

ties of the latter and to escape the tedium and awkwardness of ejecting the stone, constitute an advance in prune character and motive which it is difficult to overvalue. Mr. Burbank has done this with the plum. There is every reason to think that adequate skill and patience would do the same thing with all stone fruits. Similar in kind would be the removal of the shell from the almond and walnut. Mr. Burbank is sure he could do this in ten years if it were desirable, but the protective function of a thin shell on a nut might make the change of no practical advantage.

5. The ranges of flavor and aroma in several fruits have been enriched and extended. The flavors which have, by long experience, come to be regarded as characteristic, can no longer be relied upon, and the sense of taste alone has become an unsafe guide in identification. The Asiatic element has brought to the new plums most novel characters in flavor and fragrance which, by combination with the old, have wrought surprising effects. In fact, a new scale of these characters must be made by careful observation and analysis. Mr. Burbank's Bartlett plum has the flavor and fragrance of the popular pear for which it is named, and his Pineapple quince not only suggests the characteristic flavor of its namesake, but it suggests also the apple by its tender flesh in both fresh and cooked form. His Climax plum fills a room with fragrance like that of the pineapple, and in the same fruit striking deliciousness of flavor shades down to an

after taste suggesting the banana, in marked contrast to the acidity which, in some plums, almost leads the palate to regret preceding delight.

6. Radical changes in form and color have also wrought havoc with old forms of speech. "Plum colored" and "plum shaped" may live as the memory of an old conception, but, judging by the wide change in varieties chosen for planting, they may soon pass beyond the possibility of proof, for in color plums now add all the shades of the cherry to their former range of hues. In form they have entered the domain of the apple and the tomato and have inverted the conventional form of the pear.

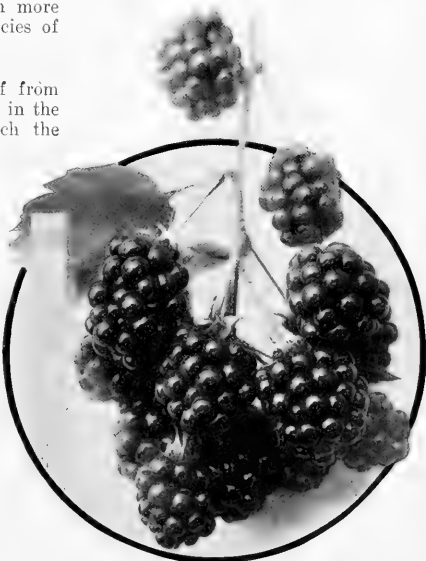
7. The foregoing results have been attained by selection and by crossing within the limits of species and variety. Still more surprising achievements have been reached by crossing fruits which belonged to genera heretofore supposed to be hedged about by impassable barriers. The crossing of plums and apricots has yielded a distinctively new kind of fruit, which Mr. Burbank fitly names "the plum-cot," and of which he has a number of varieties. All have the general form and aspect of an apricot, but are more highly colored than either a plum or an apricot and have a skin uniquely soft, with a silky down and a slight bloom. The flesh in one variety is yellow, but some of them have deep crimson, pink and white flesh, and they are both free and clingstone. The seed often resembles a plum pit, but not always. A rich line of flavors is developed which

bid fair to be a surprise to fruit eaters.

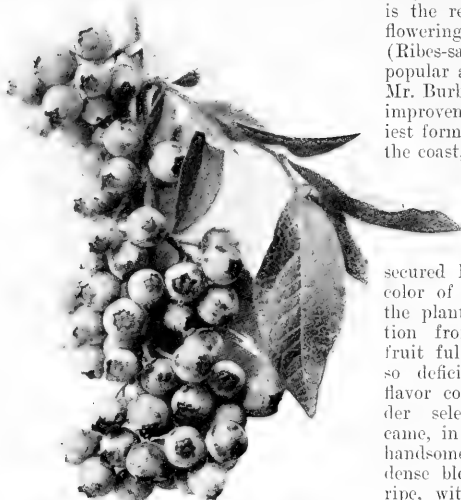
While the group of plum-cots is, perhaps, the most notable of the products of crossing fruits of different botanical genera, many other such crosses have been successfully made, not always, however, with results of value from a horticultural point of view. While peach and almond crosses always give good bloom and fruit, the almond and plum crosses have only yielded monstrosities in bloom, sometimes lacking stamens or pistils or petals, and no fruit has been secured. The peach and plum cross has never resulted in fruit. The apricot and Japanese plum cross is attended with difficulty and the results seem dependent upon varieties used. Seedlings from the pear and apple cross never reach size, and, so far, have never borne fruit. The strawberry and raspberry cross, though blooming profusely, never bears fruit, while the black raspberry and dewberry cross always dies when it blooms. On the other hand, the blackberry and raspberry crosses are usually good, and some of those which have become popular, like Phenomenal and Primus, are so fixed in their type that they reproduce their composite characters from seed with more regularity than the accepted species of *rubus* as found in nature.

Let the reader now find relief from the categorical form of statement in the story of an experiment in which the achievement consisted in the lessons of a failure. About ten years ago Mr. Burbank, having fresh in mind the results in crossing what are usually considered non-related forms (such as we have mentioned and many others like them) by the hundreds of instances, began to think that the limit of possibility in crossing had hardly been approached and decided to prospect over a wide range. He chose a plant for a seed parent which would not intrude fruit from its own self-fertilized bloom. Such a plant is the native California dewberry. He placed a plant in the middle of a ten-acre lot, remote from others of its own kind, and found that it bore no fruit except on

hand-pollinated blossoms. Here, then, was a receptive plant in isolated situation, and he proceeded to treat the blooms with pollen of apple, quince, pear, cherry, hawthorn, Chinese quince, strawberry and a few others of the rosaceæ, and kept record of fruits and seeds of each berry obtained. He saved all the seeds, planted them in one plot, and secured over five thousand seedlings. They were the strangest lot of plants ever seen. About nine-tenths of them grew shoots as smooth as an apple twig, and the other tenth had short prickles. Some had foliage like a raspberry, others like a strawberry, and others single leaves, like the apple or pear. The plants, for the most part, assumed rather an upright or tree-like form. What wonderful novelties might be expected from such plants! Disappointment dawned, however, when it was found that a large part gave no bloom, but those which blossomed had flowers various in size and in all shapes from deep pink to white. Disappointment increased when only two plants bore fruit. One was somewhat like a blackberry, but larger, with



ONE OF MR. BURBANK'S HYBRID BLACKBERRIES



IMPROVED BLUEBERRY GROWN IN CALIFORNIA,
FROM AN EASTERN VARIETY

a unique flavor and pale color; the other, of a similar general appearance but more nearly globular, was of a dark mulberry color. Disappointment culminated when the closest scrutiny showed that neither of the fruits had any seeds. Observation of the growth seemed to indicate that some startling crosses had been secured, but as there was no seed from which second generation revelations could be gained and no fruit which promised to be of horticultural value, the ground was cleared and the cost of the large experiment charged to the experience account. This account runs into many figures, but the result is wisdom. In one year Mr. Burbank burned up sixty-five thousand two and three year old hybrid seedling berry bushes in one grand bonfire, and had fourteen other grand bonfires of similar size on his place the same summer. Just after fruiting time the unworthy are destroyed, and it is not strange that Mr. Burbank should be known to some of his wondering neighbors as "the man who used to have a big nursery, but now raises acres and acres of stuff and every summer has it all dug up and burned."

Quite in contrast with the foregoing is the record of achievement with the flowering currant of the Pacific coast (*Ribes sanguineum*), which is quite popular abroad as an ornamental plant. Mr. Burbank considered it susceptible of improvement. To start with the hardest form, he secured plants from far up the coast, in British Columbia, and gave

it the opportunity to respond to generous care and cultivation. He soon found variation upon which to practice selection, and in this way

secured larger size and more brilliant color of bloom. He noticed also that the plant was disposed to show variation from the scantily borne, small fruit full of large, angular seeds, and so deficient in pulp that distinctive flavor could hardly be discerned. Under selection and cultivation there came, in unusually long clusters, large handsome blackberries so covered with dense bloom as to appear white when ripe, with lessened toughness of skin, fewer and smaller seeds, great increase of pulp and improvement of flavor. Thus the same series of careful selections has yielded strikingly better flowers and fruits of both earlier and later ripening and borne on more sturdy and compact bushes. Other generations of the plant will be grown before introduction to the public. In addition to these results by selection a cross has been secured between the foregoing and another native currant from near San Francisco (*Ribes sanguineum* var. *glutinosum*). The vast number of seedlings secured vary exceedingly, and there is promise of unique and valuable new fruit—in fact, it would not be surprising to attain size and quality of fruit, beauty of bloom and strong growth, all superior to any currant now in cultivation.

Another satisfactory excursion into the unknown is found in Mr. Burbank's plum and cherry crossing. This cross is readily made, and fruit is borne abundantly. A decidedly new element was introduced by having the evergreen cherries of the Pacific coast, both the local species, *Prunus illicifolia*, and a Mexican species. These have been found to cross readily both with deciduous cherries and with plums. Fruits of this ancestry are

still under trial, and are promising.

The cherry-like fruits of the *elaëagnus* are also being brought forward into truer cherry character. The bush has been cleared of its thorns, its form improved and its vigor increased. The main purpose, to enlarge and improve the quality of the fruit, which is produced in surprising abundance, has also been attained to a notable degree. There is a prospect that it may be as good as a cherry.

Though Mr. Burbank has made and named a few peaches of unique and estimable characters, he has as yet, in that direction, only looked into a field of wonderful novelty and richness. He has crossed peaches and nectarines as far as the fifth combination, and has secured fine fruit, but not superior to that which exists in the varieties separately. He has, however, demonstrated that in the second and third generations there is a wonderful tendency toward new forms; white peach seedlings have borne yellow-fleshed nectarines with deep crimson skin, while white and red nectarines have borne white peaches in great variety in appearance, character and season of ripening.

Pears and apples have yielded less notable results than other fruits. With great patience for eight years apple seedlings were grown, the seeds of each variety separately, and the seedlings afterward grafted into separate trees. About half the cases showed crossing, half did not. The second generation did not show promising variation. Apples are by nature very variable, with a strong tendency to revert to wild forms. Mr. Burbank believes they can be bred into classes according to season, color or other character, but they do not show the plasticity under breeding that other fruits do, and do not offer such desirable individual traits to the process of selection.

In this sketch reference has been chiefly restricted to the commoner kinds of fruit as embodying the widest interest to the reader. Almost innumerable growths of obscurer origin and less repute are being carried along similar lines of ennoblement, which may lead them to eminence and great service to humanity. But the whole range of food plants constitutes only half of Mr. Burbank's sphere of activity. His achievements with flowers will next receive attention.

FOURTH PAPER ACHIEVEMENTS

Illustrations from photographs by William Shaw, Santa Rosa, California

MR. BURBANK'S achievements with flowers, which, from a horticultural point of view, must be regarded as a wonderful elevation and ennoblement of floral growth, are a demonstration of the breadth of the man. He has done more than any other man ever did with fruits, and to this must be added achievements greater than can be conceded to any other man with flowers. Others have accomplished wonders with a single fruit or flower, or with small groups of each or of both, but in his breadth Mr. Burbank stands alone. That he could thus extend his effort and still retain the marvelous penetration which has enabled him to bring from profoundest depths wonders undreamed of by

others, may seem somewhat at enmity with the modern claim that close specialization is the secret of depth in work. But really there is no contradiction. Mr. Burbank's close specialization consists in his conception of Nature as simple in plan and principle and in his application of methods which embody the few principles which he describes. In this respect he is a most rigid specialist and the fact that he uses hundreds of kinds of plants and millions of individual plants does not militate against the wonderful concentration of his mind upon the simple, but profound phenomena which unfold under his eye and hand. That he can do this; that he can recognize and employ innumerable manifestations in the pur-



HYBRID YELLOW CALLA

suit of his special purposes is wonderful because it is only possible through the possession of rare mental endowment and exceptional industry, lighted and brightened by enthusiasm.

Is aught more required for achievements with flowers? Yes, indeed; the common mind will not accept insight and industry as adequate equipment for true work with flowers. One must have sentiment rich, free and impulsive. Ardent love of flowers is a prerequisite to all cultural success. That Mr. Burbank is not lacking in devotion, let his own words declare:

"Who does not love flowers? For whom will not flowers make more sunshine? Flowers from the hand of a loved one—what sweeter, sunnier gift can be thought of? Flowers speak to us of poetry, music, life and love. Flowers always make people better, happier and more hopeful; they are sunshine, food and medicine to the soul."

Evidently, then, Mr. Burbank lacks not full appreciation of the esthetical and ethical influence of natural beauty and though our space limits will require us to discuss his floral achievements from other points of view, it will be comforting to remember that love incites his devotion to the ennoblement of flowers and lightens his labors.

Mr. Burbank began his work with flowers in his old home in Massachusetts. At first he used the seedsmen's collections, testing, selecting and crossing them. He began growing eastern wild flowers to gain better acquaintance with them. Soon after arrival in California in 1875, he began collecting seed of native plants for foreign patrons and this necessitated a close study of the plants, their times of blooming, etc. To his

perceptions thus sharpened there came



HYBRID LILY, SHOWING PROLIFIC BLOOMING HABIT

impressions of marvelous tendency toward variation in California. Striking differences appeared in the same species grown under different conditions of soil and climate; almost incredible differences, though the localities were not far distant from each other. This observation not only suggested lines of effort, but furnished incentive and encouragement beyond anything he had experienced at the east. Early also in Mr. Burbank's experience there came the thought to improve the popular garden flowers, to enhance their charms and attractiveness and to render them more serviceable for various purposes. This work faithfully pursued for a quarter of a century has produced results which are

now recognized in all parts of the world, and so varied that brief writing cannot fully enumerate them, much less compass any adequate characterization. The attempt must be made to convey striking facts concerning blooming plants which are best known to the general reader and for this reason most widely interesting.

One of the garden plants which Mr. Burbank first took in hand was the gladiolus, which has long been a popular flower in California, but it had obvious defects; the stem was wind-whipped because of its length and lank because thinly set with florets. Their petals, too, were so scant in substance that they lost form and color in the face of the hot sun, the long spike becoming unsightly below,



A NEW HYBRID AMARYLLIS—FIVE-EIGHTHS NATURAL SIZE

while still newer bloom was expanding above. Mr. Burbank used the *gandavensis*, a Belgic hybrid, for his foundation, and added later several species from South Africa. After working ten years with perhaps a million seedlings, selecting first for endurance of sunheat and wind, then for more colors and for clearness, novelty and distinctiveness of hue, and then for more compactness of bloom upon the spike, he reached a variety which set florets with lasting petals all around the spike like a hyacinth and not the single, flat, side-bloom of the old forms, and the first of this type was patriotically named "California." Selected seedlings gave more of this improved type of bloom with better lasting qualities, and more surprising shades and with petal-substance thick and lasting so that, to use Mr. Burbank's own appreciative words:

"The first flower remains fresh to say good morning to the very last one to bloom, even though the sun may be doing its best; none of the older varieties can stand such a test."

That was in 1893, and soon afterward the whole gladiolus stock found an appreciative purchaser in Mr. H. H. Groff, the leading American specialist in that line, whose knowledge of Mr. Burbank's achievement with his favorite plant is outspoken. He says:

"This collection is the best strain of *gandavensis*. * * several with specially stiff petals quite distinct from ordinary types; the peculiarity of the flowers blooming around the spike like the hyacinth was also his contribution * * the vitality of the Burbank strain is remarkable * * greater than that of all the other strains of so-called American hybrids which constitute the principal stocks of commerce on this continent."

Nor does America constitute their field of victory; they are displacing other strains in other parts of the world.

In the ennoblement of the amaryllis his achievements are not only notable in themselves, but they illustrate well how in his work Mr. Burbank looks upon his own efforts from all points of view and endeavors to meet all considerations. He

began very early with the amaryllis, when he was, in fact, too poor to buy bulbs, so he took seed from all sources for a start. Later he bought bulbs, paying as high as five dollars each in some cases. Thus, with seedlings of his own and with purchased bulbs, he proceeded for ten years, crossing in a small way and selecting seed from the best types of flowers alone. As his materials multiplied his aims extended; he worked for more abundant bloom and secured more flowers to the scape and more scapes from the bulb; then he sought more rapid multiplication of bulbs and off-sets and greater precocity in bloom. This was a more protracted effort. Some bulbs at first gave five or six new bulbs each year and they were slow to change this habit. It was about fourteen years before they took freely to the expansion doctrine, but now Mr. Burbank's trial plots show, in some cases, ten to fourteen large blooming bulbs and several off-sets each season around the old bulb. At the same time the old bulbs have increased in size so that it is common to find them from two to six times as large as in the older varieties. The plants also produce seed which give bloom at half the age of seedlings of the old types and the blooming season is also extended so that flowers can be had nearly through the long California summer.

Of the flowers themselves words fail to describe the forms and shades which are appearing. In size they are grand—eight to ten inches in diameter is the measurement of some of the best single flowers; the petals are very broad and overlapping, so that a very solid bloom is produced. The coloring at this period of their development is fully equal to any amaryllis known, the general form and size are all that can be desired. Vigor has been secured which not only is involved in the size, rapidity of multiplication, large scapes and thick petals which have been mentioned, but gives the plants a strong constitution which resists parasitic attacks. This vigor is also a strong foundation upon which the selection now in hand will proceed. The colors now prevalent are solid crimson or nearly pure white or wonderful combinations in stripes of crimson, pink and white. Now comes the selection for clearness of color and markings. In short, Mr. Burbank

*H. H. Groff, in *Cyclopedia of American Horticulture*, page 647.



A NEW TYPE OF BELL-SHAPED CLEMATIS—
THREE-FOURTHS NATURAL SIZE

has his amaryllis highly and deeply educated, but he will still add graces which will make them irresistible in the eyes of the connoisseur.

With this ambition for one of his favorite creations, however, their originator longs to have these new forms clustered around the cottage, as well as displayed upon the broad lawns of the mansion. To this end, the greater rapidity in the multiplication of the bulb is a most important contribution, for the prices now prevailing among florists for bulbs will be in time proportionally reduced. This achievement with the amaryllis shows well, as suggested above, how highly esthetic, sharply commercial and broadly humane considerations all unite in Mr. Burbank's work and demonstrate his possession of what is a puzzle to the world today—the up-to-date American spirit.

Closely allied to the amaryllis and interwoven with it in Mr. Burbank's work is the crinum, a grand flower, chiefly dis-

tinguishable from the amaryllis by its longer perianth tube. The crinums are chiefly grown under glass, for the hardy species in northern climates are few. Mr. Burbank wisely conceived California conditions to be most favorable for uniting the charms of the greenhouse species with the hardiness of the open-air species to lead forth new forms which could be taught to endure garden exposures. At first he took up the training of his hardy parentage, choosing the Florida swamp lily (*crinum Americanum*) and for several years selected the finest seedlings that they might be best prepared for the high alliance he proposed for them. This estimable wildling of the Florida swamps and gardens showed that care, culture and selection would notably improve its growth, habit and bloom. Simultaneously Mr. Burbank had growing in his greenhouse all the tender crinums he could secure, studying their different forms, colors and fragrance. Upon the bloom of the best hardy plants in the open air he used the pollen from the greenhouse varieties and splendid results were reached. Most beautiful flowers, improved in size and waxy whiteness, in breadth of petals and in fragrance appeared in large numbers upon stronger and more upright scapes and, best of all as events proved, the new ones were hardy in the open air in California. The achievement in view was accomplished.

Having thus carried the amaryllis and the crinum along similar lines of improvement, each by itself, a cross of the two was undertaken with strikingly satisfactory results. The crinum was pollenated with amaryllis belladonna and a true hybrid was secured with bloom ranging from pure white to deep rose, inclining to crimson. The flowering is not so abundant as with the improved crinums, but the multiplication of the bulbs is very rapid. The hybrid shows its parentage in a very notable way in the form and arrangement of its leaves. The leaves of belladonna rise from the earth with rounded ends and flattened against each other like plates; crinum leaves clasp each other and are long and pointed. The hybrid has leaves with pointed ends, but with the upper parts, down to where they cluster, flat; then there is an off-set which clasps around like a crinum, giving the plant a very

peculiar appearance, especially when grown in the greenhouse. The bulbs have necks like *crinums*, while still resembling in some respects the *belladonnas*. Thus the hybrid presents a very interesting association of the several characters of its parentage.

The splendid open-air growth of the calla in California, coupled with the memory of the affection which eastern people have for it as a house plant, induced Mr. Burbank to take it up very soon after coming to this state and he put much effort upon it, both by selection and by crossing many species to secure combination of characters, as well as striking originality. He proceeded first by selection and grew many thousands of seedlings of the several forms of the common calla (*Richardia Africana*) securing varieties ranging all the way from giant to dwarf, the most important named variety resulting was "Fragrance," which exhaled a pleasing perfume, while other callas usually are destitute of odors save those suggesting dankishness. It is a semi-dwarf variety and has become generally recognized among eastern florists as the most free blooming of all its group of calla varieties. Mr. Burbank has also raised thousands of seedlings of the spotted calla (*albo-maculata*), one of the most striking results being a variety which has not only spots, but broad stripes of yellow and white.

All these were, however, simple as compared with the grand combination of characters involved in the hybridization of several species, viz.: *Hastata*, the yellow "Pride of the Congo"; *Elliotiana*, rich, dark yellow with spotted leaves; *Pentlandii*, also rich yellow with dark purple spot; *Rehmanni*, pink without and rose-purple with crimson spot within; *Nelsoni*, small, pale yellow and purple. Out of this wide crossing came "Lemon Giant," as a product of *albo-maculata* and *hastata*, while from the many crosses of the others named, various combinations have resulted which show many curious forms and almost startling flowers. Long hairy leaves, shades of purple, green and white on leaf stalks and leaves—color effects not existing on any cultivated plant. Some of the hybrids make bulbs

eight to ten inches across and six to eight pounds in weight and show leaves and flowers of proportionate vigor. The best of the old yellows are difficult to raise under ordinary conditions. Mr. Burbank has worked to get fine flowers and foliage and ease of growth. He has selected about twenty varieties with these characters, but as the most striking forms and qualities come from the second and third generations of seedlings after a cross, he is still continuing his effort with expectation of even more remarkable results.

Mr. Burbank's success with the canna is illustrative of the fact that he can secure notable improvements with flowers which have been greatly developed by others. The modern cannas of dwarf habit and magnificent bloom include the French or Crozy type and the Italian or orchid-flowered type, and striking improvement of them gained by the addition of the native American *canna flaccida* to the foreign blood. Mr. Burbank was early in this work and secured striking results, some of which have become famous. The "Burbank" canna, named by the Chicago florist, J. C. Vaughan, who secured the stock, now appears everywhere in eastern catalogues as bearing "giant orchid-like flowers, the upper petals measuring fully seven inches across, a rich canary yellow with carmine spots." But the latest and widest distinction belongs to the "Tarrytown," introduced by F. R. Pierson of the stopping place on the Hudson, whose name the flower bears. Space does not admit more than a suggestion of the glories of this California achievement. The critics say:

"No variety approaches it for display * * it shows six times as many flowers for the same space as any other variety * * the flowers which are an exceedingly brilliant carmine-crimson, have decidedly more substance than any other variety and last for an unusually long time * * it is as much ahead of all other cannas today for bedding as Mme. Crozy was ahead of all at the time of its introduction." At the Pan-American exposition, Mr. William Scott, in charge of floriculture, said: "There has never been a bed in the country with as much bloom as Tarrytown had."

Soon after he began with cannas Mr.



GLADIOLUS "CALIFORNIA"—FIRST VARIETY WITH FLOWERS ENCLOSING THE STEM

Burbank took up tigrdias, working for size of flower and bulb and vigor of plant, and crossing to secure new colors which would endure sunshine. He has obtained wonderful striped, lined and flaked varieties which are new and have been well received. Ten or twelve years' work with dahlias, including the popular cactus-flowered type, has resulted in achievements not yet ready for announcement.

Though in the floral department of his work Mr. Burbank has apparently given greater attention to herbaceous than to woody plants, he lacks not achievement in the latter class. Of roses he has flowered ten to fifteen thousand seedlings, out of which three worthy varieties have been introduced. By using the hardy *Hermosa* as a joint parent with the tea roses he has secured varieties popular at



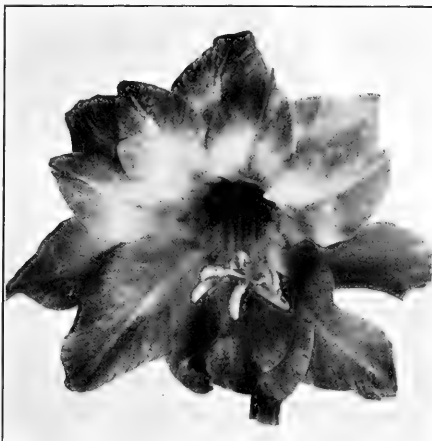
ONE OF TEN THOUSAND HYBRID SEEDLING LILIES

the east because hardy, where the teas fail.

Mr. Burbank has produced a new race of bell-shaped clematis with broadly bell-shaped flowers exquisitely frosted and with blending of colors and shadings not found elsewhere in the clematis family. With the double clematis of the Jackmani and Lanuginosa types he has reached brilliant results. The clematis experts, Jackson and Perkins, in writing for the *Cyclopedia of American Horticulture*, mention the "Duchess of Edinburgh" as about the most desirable and best known in this country, but add: "The Snow-drift, by Luther Burbank, promises to excel it in both floriferousness and vigor of growth."

In this connection mention may be made of the columbines because Mr. Burbank has succeeded in making them so nearly like clematis that he calls his new race *aquilegia clematidea*. They are of immense size, even to three inches in diameter of bloom, and are very striking in that the backward extension of the petals into spurs has been completely suppressed. As it has been usual to classify *aquilegia* species upon the length and form of the spurs, these curtailed flowers must have a new class.

It is manifestly impossible to make even a complete suggestion of Mr. Burbank's work with flowers. The group of which the Shasta daisy was only a forerunner must be passed with reference to earlier mention of its origin and character given in *SUNSET* for February, 1902. Other chrysanthemum-daisies are in training. Larger size, perpetual blooming and ease of propagation are being secured. Colors will be multiplied. The lemon yellow now secured will be carried to other yellows. The pink, which is just disclosing itself, will be deepened to red. Other wild species of chrysanthemum from other continents are being worked into the strain and results cannot even be prophesied. Whether one shall put a daisy in one's hat or put one's hat under a daisy is a question of the future.



NEW DOUBLE GLADIOLUS—THREE-FOURTHS NATURAL SIZE

Perhaps no more interesting communication can be made than that Mr. Burbank is now giving a leading share of his time to the systematic elevation of California wild flowers. He began that way, as stated, but he turned aside a little to work the wonders with exotics which have been mentioned, without, however, forsaking the beauties which so interested and charmed him when he came to this state. For example, he has never failed to remember the lilies. He found at first that the California tiger lily (*Pardalimum*) had nearly as many differences as it had locations and then there are so many other lilies native and foreign. Cultivation, selection, hybridization, introduction of foreign blood and then selection again, then second and third generation seedlings and selection again, until all the known lilies of the world had brought their ancestral characters to the enrichment of his working collection and it did seem at one time that the lilies must need show their gratitude by blooming over his resting place, for what man can safely add the study of half a million seedling hybrid lilies to his other occupations? Lily growers from all the world have stood dazed—intoxicated with the marvels of beauty and the perfumes of this acreage of new lilies in full bloom.

But Mr. Burbank quietly pursued his even course through this bewildering un-



AQUILEGIA CLEMATIDEA—MR. DURBANK'S NEW CLASS OF COLUMBINES, WITH CLEMATIS-LIKE FLOWERS (ABOUT ONE-FOURTH NATURAL SIZE)

dertaking. From fifty to one hundred of the half million were selected and the rest destroyed. These are now being grown under the supervision of Mr. Carl Purdy, who knows the lily in all its haunts and in all its whims, and the end is to come in time. It will be a floral revelation to say the least of it. There will be selected types—several of them. There will be flower stems all the way from one foot to nine or ten feet high, thickly set with bloom and forms and shades widely various, and all of them perfumed and easily grown. There may be in each type something to merit what Miss Alice Eastwood of the California Academy of Sciences said of a cross of *Humboldtii* and *Parryi*: "It is the best lily in the world." Miss Eastwood could not help talking just like other people when her love of the beautiful overcame her scientific reserve. But what else could any one say of a grand pale lemon-yellow lily, shaped like one of the new *amaryllises* with large, flat, slightly revolute petals, pure in color, exquisite in form, grand in size and rich in perfume? But the lilies overpower us.

But what do we gain by flying from them to contemplate the glories which are coming to the brodiaeas, these profuse beauties of the California spring-time? Mr. Burbank has been long growing seedlings from the best-selected plants. He has already secured blooms from four to six times as large as commonly found in nature. He has a white brodiaea with great keeping quality, holding its goodness a month in water as a cut flower. He has bulbs as large as an inch and a half, sending three or four bloom stalks instead of one or two as in nature. He has new forms of the flower appearing and is getting ready for crossing and reselection which promise striking results. Similar improvements are being achieved with a host of California wild flowers. Some of them are already popular abroad, either in the greenhouse or for summer bedding. To present already popular plants in vastly improved form is to meet a warm welcome. Highly esteemed then as California native plants are, Mr. Burbank will add to their honors and distinctions. Much of his time

in the immediate future will be given to this effort.

It is not possible in this connection even to list the plants now in his school, but the way he selects his pupils is too significant to pass over. It is his custom to roam the fields wherever a certain flower grows naturally, looking closely into the faces of all blooms and taking note of the growth, habit and vigor of individual plants. He does this slowly and carefully, sometimes passing half a day on half an acre in such comparative study until he decides upon the most perfect plant of the kind which nature has produced in that locality. If it does not show seed at that moment, the plant is taken up if the flowers are well advanced, for seeds will often mature with the impulse remaining in the drying plant. If this is not likely the plant is marked and revisited later. Whatever is best to do to get the seed from this best of all wild individuals is undertaken and from this seed the first class of freshmen is brought into his floral college. This selection for a start is half the battle, whether it be for vigor or for tendency toward desirable variation or for other reason.

And then how gentle is his care and culture for the promising pupils and how sharp his punishment for the laggards—for such the death penalty. The former cannot be better described than in his own words, which serve also as mention of his achievement with one of our most popular wild flowers:

"We say to our Miss Golden Cup or Miss *Eschscholtzia*, as the bon ton call her, 'This beautiful dress of bright golden hue which you have always worn on all occasions is very becoming to you, and exceedingly appropriate to this land of perpetual sunshine, but, Miss Queen Golden Cup, if you will sometimes adorn yourself with a dress of white, pale cream, pink or crimson we could love you still better than we do.' Now, Miss *Eschscholtzia*, though having her family tastes and characteristics very thoroughly fixed, still belongs to the great *Papaver* race, which has often shown itself willing to adapt itself to the discipline of new conditions, even at first distasteful in the extreme. So, after taking Miss Golden

Cup into our gardens and constantly making these suggestions to her, she hesitatingly consents to don a dress a shade lighter in color, and then lighter still, until now we have her not only in dresses of gold, but in deepest orange, light and dark shades of cream, purest snowy white, or all these combined, and by constant selection and various educational influences in this line she will adorn herself in a dress of almost any color which may be desirable and at the same

time seems to take the greatest pleasure in improving herself in every grace of form and feature."

Here, then, for the present the reader takes leave of Mr. Burbank and his work. It is fitting that we should withdraw while the state flower of California sheds its charming radiance about him, for no man more devotedly loves the land of his adoption and there is none whom Californians delight more to honor.



THE BURBANK CANNA—THREE-FOURTHS NATURAL SIZE

SOUTHERN PACIFIC COMPANY

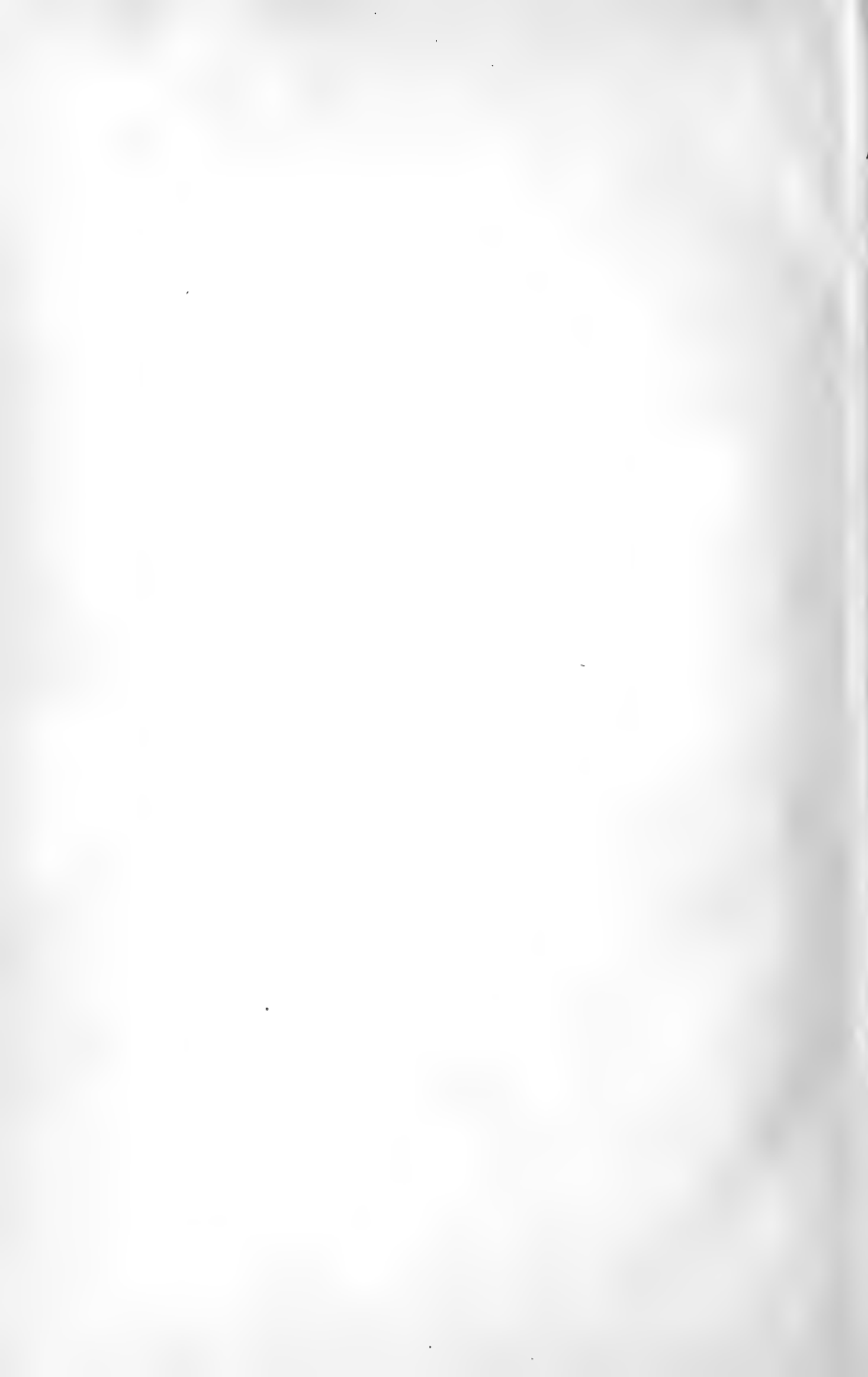
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