canal begins, the bottom is 24.488 feet below datum. The entire descent would be sufficient to send a very rapid current through it, but at Lockport controlling works are established, consisting of gates or movable dams, by which the flow of water from the canal into the Des PlainesRiver beyond it is controlled. Thus the course of the Chicago River, whose waters now run to the lake, will be reversed; the lake will in the future run into the Chicago River and down the canal, and the outflow will be regulated by a dam at Lockport in the distance.

The Des Plaines River, whose stream is subject to the widest fluctuation, has also been taken care of. Accordingly, diversion works, as they are termed, are established, one of our smaller views showing the work in progress upon them, to keep the water out of the canal. Thirteen miles of new river channel were excavated parallel with the main drainage canal, nineteen miles of levee were built between river and canal for the same purpose, while at the head of the river diversion a spillway is to be built for letting surplus water run back into the lake, as arrangements have not yet been made to carry the entire flow of the river with that of the canal to the city of Joliet below Lockport. It will thus be seen how very perfect the whole system is.

Looking at the bird's eye view, the terminus of the canal marks Lockport. Below Lockport the sinuous river can be traced to Joliet. This portion is a relatively steep declivity, involving a fall of some 42 feet in a distance of 4½ miles. Lockport, therefore, is the critical point; the raising or lowering of the control gate a few inches means an immense difference to the flow through the canal. Up to the limit of the canal's capacity the level of the great lakes rests in the hands of the engineer.

It is not only as a drainage canal that the work is being prosecuted. The Chicago people fondly hope that it will eventually be a fully developed ship canal, and some believe it possible that communication with the ocean may be made by it. Our view of the canal as completed, with a railroad on the bank, the steamship and steam barge running through it, gives an idea of what it will be like when finished. The other view shows operations incident to the excavation. Its estimated costs exceeds $21,000,000, and some eighteeen months from to-day it is hoped it will be completed. A number of very different types of excavating machines were employed with various success upon different sections of the canal, as these involved the best appliances that could be devised for the purpose. A special study of them is highly interesting, and for such purpose our readers are strongly recommended to the issue of this paper of October 20, 1894, the one already alluded to.

Birds and the Farmer.

Dr. C. Hart Merriam, chief of the division of ornithology of the Agricultural Department, has just made a report on the results of his examination of the contents of the stomachs of hawks, owls, crows, blackbirds, and other North American birds that are supposed to be the enemies of farmers. He shows that the popular notions about hawks and birds, for the slaughter of which many States gave bounties, are altogether erroneous. Ninety-five per cent of their food was found to be field mice, grasshoppers, crickets, etc., which were infinitely more injurious to farm crops than they. The charge against crows is that they eat corn and destroy eggs, poultry, and wild birds. Examination shows that they eat noxious insects and destructive animals, and that although 25 per cent of their food is corn, it is mostly waste corn picked up in the fall and winter. With regard to eggs, it was found that the shells were eaten to a very limited extent for the lime. Crows eat also ants, beetles, caterpillars, bugs, flies, grubs, etc., which do much damage. The cuckoos are also found to be very useful birds. —Rochester Herald.

A Model Suburb.

Since January, 1893, up to date there have been over 2,000 houses built in San Francisco, of which it is estimated 15 per cent have been erected in Richmond. Miles and miles of streets have been graded and sewered. A scientific system of sewerage, with proper outlet to the bay, has been laid down, and to-day, it is said, Richmond is the only properly sewered district in the city. It also enjoys excellent transportation facilities, and when the Sutro road is completed and the Geary Street line continued it will, with those roads now running through the district, be ahead in this respect also. Salt water mains have been laid in the district for private baths, flushing sewers, sprinkling streets and putting out fires, for which purposes it is superior to fresh water. The Spring Valley mains give an abundant supply of good fresh water. The location, scenery and shelter are unsurpassed. Its closeness to the park and bay, coupled with the advantages enumerated above, make Richmond, with its magnificent marine views, a favored locality for building homes.—Daily Call.

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THE ELECTRIFICATION OF THE AIR BY RAIN DROPS AND WAVES.

As the earth rotates on its axis it is in constant receipt of energy from the sun, which energy manifests itself in the production of the tides, of the winds and in the maintenance of the existing temperature. As the earth rotates, the great tide disturbances go round and round it, acting as a drag upon its motion, so that it is easy to see how its rotation is being resisted by the lines of gravitational force, much as a plate of metal is retarded when rotated in a strong magnetic field. The sun, expending its energy in the evaporation of water, released again from the upper regions of the air as rain, and in producing winds which form waves upon the ocean, produces electrical disturbances which have recently been investigated by Lord Kelvin and others, with quite curious results.

A recent paper by Lord Kelvin, communicated to the Philosophical Society of Glasgow, has brought forward two very curious incidents of the electrification of air by rain drops and by waves on the sea. By investigation with apparatus adapted for the purpose, it was found that if a drop of water falls through air a slight electrification of the air is produced undoubtedly, but if the drop is checked in its fall, striking about a solid body or upon a liquid surface, such as that of water, the air is much more strongly electrified, the point of electrification being the place where the water drop strikes. This is not all; experiments were made with salt and fresh water, and it was found that if a drop of fresh water strikes a surface of salt water or a solid body, the air becomes negatively electrified, while if salt water is used of sufficient saltness, the air will be positively electrified.

On the earth many examples of such impact exist; fresh water cascades present them; the waves of the sea, of fresh water lakes and the falling of rain are all instances. When the ocean is calm and rain falls upon it the air is at once negatively electrified, and may be raised many volts in potential. Again, in a dry wind, when the waves are constantly breaking, the impact of salt water against salt water produces positive electrification.

Sir William Thomson believes that the positive electrification of the waves by self-impact is much greater in amount than the negative electrification by rainfall. The positively electrified air also finds its way more quickly to great heights than does the negatively electrified, the greater part of which, he says, may be quickly lost into the sea. Thus we have conferred upon the mighty ocean the attributes of a gigantic electric machine, and just as with the old time plate machine one or the other kind of electricity is generated according to whether its rubber or prime conductor is grounded, so the ocean in a rain storm is a generator of negative electricity and in a wind storm is a generator of positive electricity. In some of his experiments on the seashore, Lord Kelvin found that the east wind at Arran gave strong positive electricity. This he attributed to the fact that in such a wind, even if gentle,countless waves were breaking all over twelve nautical miles of water lying to the eastward of that shore. If this is so other winds should produce positive electrification at places whose exposure is different from that at Arran.

In our this week's SUPPLEMENT we give Lord Kelvin's paper in full.

SUPREMACY OF THE SEA.

Supremacy at sea, whether in the commercial or the warlike sense, has always been a source of pride for the nation possessing it. England in the old days of the walls of oak and muzzle-loading cannon mounted in great broadsides of two and three tiers high was willing to sacrifice anything and everything to win victories at sea. A people boastful of their freedom submitted to the atrocities of the press-gang simply on the plea that his majesty's ships must have men. On board of the ships relentless discipline combined with the frightful sanitary condition of the overcrowded vessels, bringing about virulent ship fever, made life afloat an absolute horror. Smollett, Douglas Jerrold, Defoe and others have pictured old time life at sea. Dibdin wrote his spirited lyrics in praise of the sailor's life under the inspiration, it is alleged, of the English government, who wished to do away with the dislike for naval service which had naturally pervaded the people. The United States, progressive in everything, unfortunately inherited English methods, and imported some of the worst elements of old time discipline into her navy. While the older country was proclaiming that a slave who touched its soil became a freeman, while in the United States the slave States were held up to reprobation because of their treatment of the negro, merciless flogging prevailed in the navies of both countries, and the press laws made service in the English navy a virtual slavery.

The gradual march of reform has ameliorated these matters. Corporal punishment at sea is practically abolished, and many humanitarian associations and enactments have for their object the amelioration of the condition of the sailor. The old spirit survives, and the merchant and naval marine are objects of