Water Supply and Farm Irrigation in Illinois--The Cost of Artesian Wells.

A correspondent of the Chicago *Tribune* gives an account of his visit to the agricultural portion of the State of Illinois, from which we extract as follows:

The question of water supply for farm stock is becoming one of no small importance in many parts of the State. Our prairie soils are capable of holding a large amount of water, but there are times, like the present, when a long continued drought exhausts this supply. It appears to me that one of the most important duties of the State Geologist is to give this department of practical geology his most earnest attention; for it is one that has much to do with agriculture.

A short time since, I spent a couple of days in the county of flowing wells, in order to learn something in regard to them. They vary in depth from 30 to 120 feet. The boring is through blue clay, such as is common to the northern part of the State, showing that the drift is of the same age as the country to the north and south of the location. Just before reaching the water, which appears to be infilliated through a fine white sand, which, in places, is more or less mixed with gravel, there is a crust, or shell, of cemented sand and gravel, about two feet thick, and of great firmness, through which the auger is forced with difficulty. The well laborers know that, when they strike this band of hard pan, as it is called, they are near the coveted water. As soon as the "water sand" is penetrated, the real difficulty is met; for, if the sand is fine—that is, unmixed with gravel,—it is forced upward, and often fills the hole so firmly that it is difficult to clear it out. The value of the well depends upon the quantity of gravel present in the "water sand," as this allows the water a freer flow upwards, while the fine sand is liable to pack so closely that little or no water can find its way to the surface.

BORING AND PIPING.

A two inch auger is used in the boring. This is made for the purpose by a blacksmith, and is similar to a common auger, with a pad of some twenty inches. The boring is done by hand, and the auger is raised with a common hand windlass, with ropes and pulleys attached to a common three-legged derrick.

It often occurs that the augur meets a small granite boulder. Then the boring is abandoned and a new hole started, generally within a foot of the first. Sometimes three or four of these holes are made. It is difficult to drill through these isolated pebbles that are scattered through the clay drift, for they have been rounded by glacial action, and the blows of the drill make them change position in the bed of clay; hence it is found to be the most economical to start a new boring, and try the chances of passing down without meeting them. Formerly a four inch hole was bored, and this was tubed for some thirty feet, with wood tubing; but the two inch hole is now considered the better size, and this is tubed with one and a fourth inch galvanized gas pipe.

After the hole is bored, and the flow of water ascertained, the point of the gas pipe tube is prepared. If the flow is free, indicating a gravel stratum, large orifices are made in the point; but, if the flow is limited, indicating fine sand, the orifices are made of less size. This is attached to the pipe, and a careful measurement made, that passes the point into the "water sand," which is often quite shallow; for, if the point should go into the clay below this sand stratum, the water would be cut off. Sometimes the sand fills up the tube, and shuts off the flow of water. In this case a small pipe is inserted in the larger one, and water poured into the larger one; and by thus producing a hydrostatic pressure, the sand is forced up through the small pipe, mixed with the water, and the tube is thus cleared of the sand.

As the water is filled with sand, or, rather, as the water makes its way through this thin sheet of sand, it is evident that the force of the pressure is feeble, and that the flow must be not only moderate, but limited, at any particular point, and that an enlargement of the boring will have little corresponding effect on the flow of water, which will remain about the same, as more depends on the presence of gravel than the size of the boring.

THE COST OF A WELL.

At the time of my visit, Mr. W. H. Mann, of Gilman, had just completed his fourth well. It was 104 feet deep. The cost is as follows:

Man and apparatus, four days, at $5 per day	$20.00
Two men, four days, each $1.50 per day	12.00
Hauling apparatus to and from well	3.00
104 feet pipe, at 27 cents per foot	28.00
One drive well point	3.00
Well trough	2.00
Total cost	$68.00

The usual price by the well jobbers is $1 a foot for the well completed.

In the village of Gilman, a few rods west of the depot, is one of these flowing wells, that serves to supply the inhabitants with water. The water of all these wells is very clear, but slightly charged with iron, which, in time, coats the vessel with its oxide. The temperature is about 52 degrees. It is used for all domestic purposes, except washing, where rain water is preferred.

ITS VALUE FOR IRRIGATION.

Mr. Mann had given it a limited trial on some beds of forest evergreen seedlings and cuttings of the small fruits; but, not being familiar with the management of water in this manner, only made a partial success. From what I could see of this one experiment, I have little doubt of its final success.

In irrigating, the land must be made even, that is, the water must run in small drains flush with the surface, but, at the same time, must not be allowed to overflow, as the water is to simply soak into the soil, and to fill it with watery vapor. In case it flows over the surface, it forms a crust that excludes the air, and is also liable to induce sun-scald of the plants, as we often see in the fields after a heavy rain, in places where the water stands on the surface for a longer or shorter period. That these flowing wells will materially add to the value of this part of the State, there can be no doubt. For the strawberry, nursery stock, garden vegetables, and grass, they must be invaluable.

The writer closes by recommending careful boring in all parts of the State to determine the water supply; and to this should be added a general topographical survey, connected with the Geological Department. Such a survey would no doubt show that the flowing wells of Iroquois county have their water supply from the east, near the Indiana State line; and it would also give us some idea of the bounds of this water district. Will some member of the Legislature look to these matters, and thus do something of practical value to the State?

NEW PUBLICATION--THE SCIENCE RECORD, FOR 1872.

We have in press, to be issued January 1st, a new book of 350 pages octavo, entitled as above, which, we think, will be read everywhere with interest. It will be a compendium of the scientific progress of the previous year, and is to be profusely illustrated with steel plate and wood engravings.

The following is a partial outline of the general contents of the *Science Record:*

Notices and descriptions of the leading discoveries and improvements invented or introduced during the past year, pertaining to Engineering, Mechanics, Chemistry, Philosophy, Natural History, Agriculture, Architecture, Domestic Economy, and the various Arts and Sciences, with many engravings.

Biographical notices of prominent men of science, with portraits.

Descriptions of the most important public works, begun or completed during the year, with illustrations.

Notes of the progress and extension of railways, telegraphs, and other means of communication.

Descriptions of the new applications of steam, electricity, and other motive powers, with engravings.

A complete almanac for the year, with the usual astronomical calculations, and a chronological table of notable scientific events and phenomena.

Reports of Patent Office proceedings. Classification of inventions at the Patent Office, with the names of all examiners, officials and employees.

Portrait and biographical sketch of the Hon. M. D. Leggett, Commissioner of Patents.

Full description of that great engineering work, the Mount Cenis Tunnel through the Alps, with engravings of the tunneling machinery, portraits of the chief engineers of the work, and other illustrations.

Description of the great Government works at Hell Gate, New York, with many illustrations, showing the wonderful galleries now being cut in the rocks under the bed of the East River, preparatory to removal of these obstructions by explosion, the drilling machinery, the electric apparatus, and other interesting objects.

Description of the great Suspension Bridge between New York and Brooklyn, now in process of erection, with interesting engravings.

Steel plate engravings of the celebrated Gatling Gun or Mitrailleur, showing its construction and use in various forms, upon wheels, horseback, camels, boats, etc.

Illustrations of recent improvements in cannon, fire arms, etc.

Reports of the important law trials, and decisions pertaining to inventions and scientific matters.

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Useful tables and practical recipes pertaining to the principal branches of industry.

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Grinding Wheat without Millstones.

A very remarkable paper the contents of which are of especial interest to that large portion of our readers engaged in the manufacture of flour, was read at the late meeting in Edinburgh of the British Association by Mr. Thomas Carr. The document consisted of a description of a new mill for grinding wheat, called a disintegrating flour mill, and claimed to possess such extraordinary advantages as to entirely supersede the use of burrs. The wheat is reduced to flour by percussion instead of grinding, being projected through the air unsupported and with extreme velocity. In passing through the machine it is struck by a series of bars moving swiftly in opposite directions; and Mr. Carr asserts that by the action of these bars the wheat is so instantaneously reduced to a proper condition for bolting that no injurious heat is caused. One of these "disintegrating" mills is in use by an Edinburgh firm and has been some time in operation; and Mr. Carr describes in his paper the advantages it is claimed to possess over the millstones which it is expected to supersede. It is said to be much less frequently in need of repair than millstones, to require the labor of fewer men, occupy less space and call for less driving power. To the saving in wages and incidental expense is added by Mr. Carr the exemption from loss by scorching and consequent saving of fire insurance—the latter item being, we judge, of more theoretical than practical importance. The distinguishing feature, however, of the recommendation which is offered of this novel device, is that by the avoidance of injurious heat, claimed as a result of the peculiar method of reducing the wheat by percussion, a superior quality is produced. The theory is—unless, indeed, the practical experiment has been carried so far as to establish it as a fact—that the instantaneous nature of the process prevents the evolving of heat; an object which it is certainly very desirable to attain.

It is not easy to gainsay an ascertained and demonstrated fact; and if Mr. Carr's representation of the working of this remarkable machine is founded throughout on actual trial, we can only wait for an explanation of what now appears a very surprising statement. That no heat is produced in the reduction of the wheat to flour, simply because the process is swift and sudden, is a circumstance which certainly does not harmonize with other manifestations of the effect of the instantaneous force. A bullet fired from a musket strikes a wall with as sudden contact as can readily be imagined, but it does not follow that no heat is evolved in the concussion. The amount of the force applied in reducing, the wheat determines the amount of heat generated and it does not appear that, in the process described the force exerted is less than in the ordinary method. In point of fact, it might be reasonably expected that the more sudden and instantaneous the concussion, the higher will be the degree of temperature observed.

The real virtue of the new disintegrating process may after all consist, not in preventing the evolvement of heat, but in speedily and completely remedying its effects. As the wheat is reduced while passing through the air, this rapid motion and exposure to the air may serve as an immediate antidote to the effect of the heat upon the flour, preventing, according to the claim of Mr. Carr, any injurious results to the product of the mill. As "the proof of the pudding is the eating," and a practical test the only conclusive argument—a fact which holds good in the manufacture of flour as strikingly as in any branch of industry with which we are acquainted—we shall wait with some eagerness for further reports of the working of the new process which is to revolutionize the flouring business and make the familiar mill burr an obsolete relic of the past.—*Leffel's Mechanical News.*

Lace Knitting Machine.

Mr. Henry Williamson, of Williamsburg, has invented a machine for knitting or crocheting lace, which consists in an arrangement of the hooks or needles so as to be capable of working independently of each other, and operated by Jacquard patterns, cards, or cylinders, with the thread guides all mounted on one bar. The object is to provide machines wherein the patterns can be varied to a great extent.

In this improvement, the arrangement and operation of the guides are the same as in other crocheting machines, except that, in this case the lateral movement of the guides is limited to crossing one or at most two needles, and all the guides used are mounted on one bar; while in the common arrangement the guides are divided among a number of bars, and the bars have a greater range of lateral movement, and are worked by a Jacquard mechanism to form the pattern.

Commonly, for making figured goods, there are from three to twelve of these bars, one above another, each having an equal number of guides arranged in the order of the said bars—that is, beginning at one end, one bar (say the top one) will have the first guide, the second bar from the top the second guide, and so on, repeating for every sixth or twelfth guide according to whether there be six or twelve of the bars; or they are sometimes arranged by twos or threes in each bar, but in the same order, and the said bars (as before stated) are worked laterally by a Jacquard to carry the thread across the hooks, according to the pattern to be made, one bar being moved laterally at each forward movement of the needle, while the others are allowed to rise and fall between the same needles, without supplying thread to them.

This arrangement is necessary to work out the patterns when the needles are all connected together, as in all the machines of this character heretofore made; and it has two important objections, which it is sought by the present improvement to avoid, namely: first, it necessitates the use of a large number of guide bars, and the supports and adjuncts thereof, which are objectionable and expensive; and second, with all the guide bars that can be used, practically, it is impossible to knit wide patterns; for there must necessarily be a repetition of the patterns as often as the order of the guides is repeated on the bars; with one bar only plain goods can be made. These objections are completely overcome by shifting the Jacquard to the needles arranged to work independently of each other, in connection with only one guide bar operating as described, and carrying all the guides, by which the single pattern may be as wide as the fabric knitted, with no repetition, as will be clearly understood; for the number of needles receiving the yarn at each movement, and the order of their receiving it, will be governed entirely by the pattern cards or cylinders.

AT the last meeting of the Council of Directors of the Iron and Steel Institute of Great Britain, it was decided that the next general meeting shall be held in London, on March 19, 20, and 21, 1872; and that special invitations be addressed to foreign metallurgists, soliciting the honor of their presence at the meeting.

WHEN a storm commences in the United States, the line of minimum pressure does not come from the "far west," but commences with the storm, and travels with it towards the eastward.

Improved Torpedo Boat.

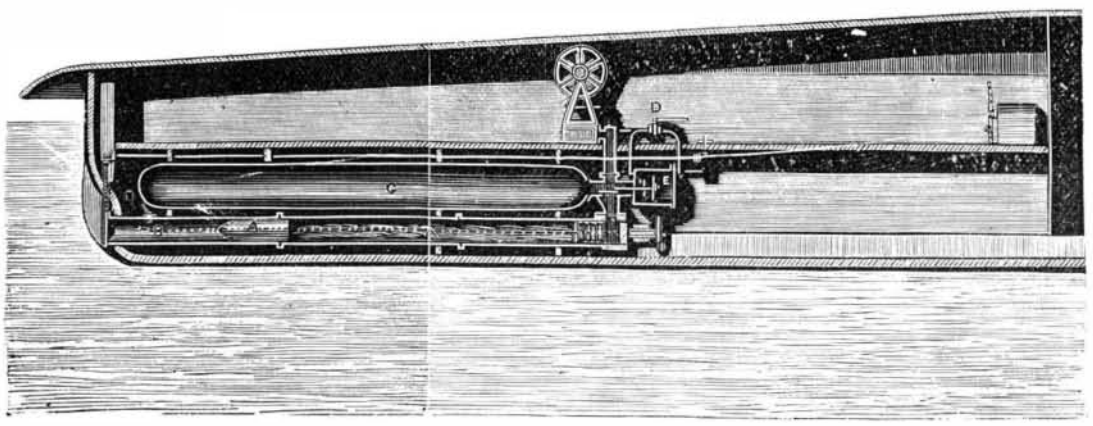
We illustrate, in the accompanying engraving, a torpedo boat, which was made the subject of a paper, read at the last meeting of the British Association, by Mr. Philip Braham. The torpedo, A, consists of a chamber filled with dynamite at the pointed end—a shaft of wood of any convenient length, and a corrugated iron cap, of sufficient weight to make the torpedo or submarine rocket float nearly horizontally.

The torpedo is propelled through a bored cast iron tube, B, from the boat, below its water line, by the expansion of compressed air.

The compression chamber, C, is a strong double riveted boiler, into which air can be compressed to 500 lbs. to the square inch, by machinery driven from the boat engines. The boat is plated to render it practically invulnerable; the boilers are high pressure; the twin screws, driven by a differential motion of novel construction, are below the bottom.

When the boat arrives within striking distance of the ship attacked, the officer in charge, who views the enemy by a mirror to prevent his personal exposure, turns the handle of a four-way cock, D, which admits air from the compression chamber under the piston in the cylinder, E, and opens the valve leading from the compression chamber to the tube, arranged so as to give a powerful, elastic, and prolonged impetus to the submarine rocket, which, strikes the enemy below the water line, exploding the percussion fuze, and smashing in square yards of the side

By the reaction of the force driving the rocket forward, which would average upwards of 80 tuns on 1 foot 9 inches, shown, the boat would have its speed considerably diminished, if not entirely neutralized. There is also a sluice valve and breech, whereby a fresh rocket can be introduced when the first has exploded.—*Engineer*.



BRAHAM'S TORPEDO BOAT.

Adjustable Elastic Measuring Scale.

Baptist Edme Chassaing, of Buenos Ayres, Argentine Republic, has invented a new adjustable scale and equi-divider, the object of which is to provide an improved instrument for quickly and accurately constructing a drafting scale, and for dividing lines within certain limits of length into equal parts, it being designed and adapted chiefly for use by the draftsman, civil engineer, and architect. A round rod of brass or other suitable metal, has a fixed head or radiating arm at one extremity, and a similar arm movable throughout its length, provided with a set screw. Throughout the length of the rod there is a small groove, into which pins upon the heads fit, preventing them from turning. Between the two arms is stretched an elastic rubber band, fastened to the arms. This rubber band is divided upon its four face edges into a certain number of equal parts, which are subdivided into equal minor parts, and is the scale proper. The band is a tube of soft rubber, about two and three fourth inches external diameter, one fourth inch wide, and about one twenty-fourth inch thick, being perfectly accurate in its dimensions and homogeneous throughout. A small pin, having a T shaped head and perforated with a small hole, works loose in the fixed head and is held in place by a washer and rivet or nut. The object of the circular form of band is two fold: First, to compensate for any tendency to unequal stretching. Second, to provide a means of attachment, without forcibly confining any portion of its surface between fixed jaws, or in any way reducing the strength of the band at the points of attachment by piercing or otherwise.

To use the instrument, let it be desired to provide a scale of one eighth, one fourth, one half, five eighths, three fourths, one, one and one fourth, one and one half, two inches, etc. Then imagine that one side of the adjustable band is divided into one hundred equal parts, and that its capacity is twelve inches. The ten inches equals eighty eighths; hence, if we apply the scale to a standard rule, making eighty divisions, equal to ten inches, upon the rule, we have at once an eighth scale. Secondly, ten inches equal forty fourths; hence, if we apply the scale to a rule making forty divisions, equal to ten inches, we have at once a one fourth scale, and so on for the remaining scales enumerated; but no one side of the scale will admit of all of these adjustments; hence the four edges are differently divided, to suit all requirements. Suppose it be required to measure a plan or map having a drawn scale depicted. It is only necessary to adjust the scale to the scale of plan or map, and use it accordingly. If it be desired to divide a line of length not greater than twelve inches—though lines of greater length, when required to be divided into equal parts not prime, may be also divided by previous subdivision—it is only necessary to extend or contract the band, using the edge giving the required number of divisions within the scope of the instrument, so that the required number of equal parts will correspond with the length of line to be divided; then point off with pen or pencil the divisions so indicated. This last feature of the instrument renders it essentially useful to the draftsman, as it avoids the old long and tedious way of stepping off with dividers, which often requires that a line should be frequently gone over, and, unless great care is taken, it is seriously marred. The band is made of white rubber, as soft and pliable as possible. It will, of course, be required to be made for this special purpose, and must be made with perfect accuracy of dimensions throughout. The divisions will of course be made by machinery, and all sides of the scale will be graduated when stretched to its utmost capacity. The figures will, however, be stamped upon the band when it is extended to half its scope, as they will then be most legible at all points of the extension.

The scale will be divided as follows, though other divisions may be found more suitable than those enumerated: First side, one hundred equal parts, subdivided into halves and fourths. Second side, fifty equal parts, subdivided into sixths. Third side, eighteen equal parts, subdivided into twelfths. Fourth side, eleven equal parts, subdivided into twenty fourths.

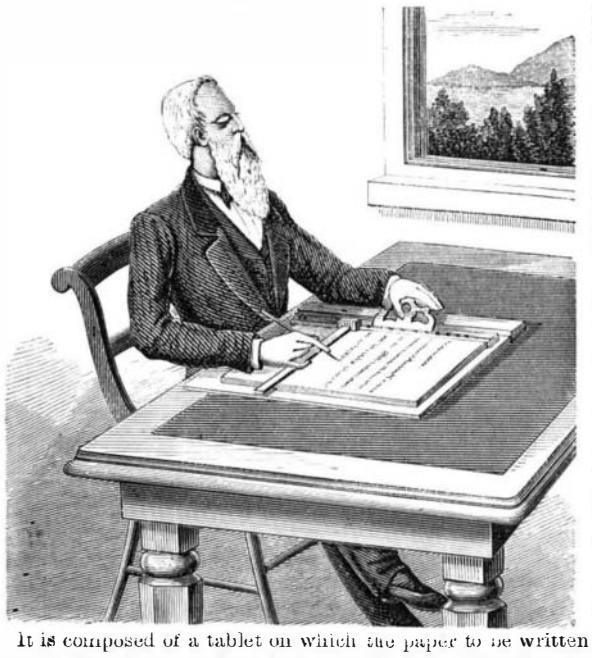
Fire Safes--Test of Material.

We have received, from an eminent chemist, the following suggestion:—"Can you induce some of the rich fire safe manufacturers to have an investigation made into the heat conducting and other powers of various substances, with a view to their use as an exterior covering of safes?"

No doubt many of our readers are interested in this question as safe makers and sellers, and many many more as safe buyers and users. Will any practical man let us know the result of a few experiments on this subject, which is now engrossing the attention of the public?

BRIESEN'S WRITING APPARATUS FOR THE BLIND, ETC.

The subject of the accompanying engraving differs materially from the general run of modern improvements, as it is not intended to perfect anything already in use, nor to subserve the comfort of the general public. The object is primarily to relieve that most unfortunate class of our fellow beings, the blind, from their chief enemy, inactivity; and also to prevent injury to or loss of the eyesight, in persons who find their sight failing by too close and constant attention to literary pursuits. In fact, this little machine is no more nor less than an apparatus by the aid of which one can write without using the eyes.



It is composed of a tablet on which the paper to be written upon is placed, of a spring clamp on the left side, whereby the paper is held firmly on the tablet, and of an adjustable hand guide which can slide up and down on a rod that is connected with the clamp. The hand guide is similar in form to an ordinary wooden ruler, and extends transversely across the paper.

The writer guides the little finger of his right hand along the top edge of the ruler, and is thereby enabled to carry the pen or pencil in a straight line. When a line has been written, a small knob at the left end of the hand guide is touched, and raised out of a notch in the rod *a*, which causes the hand guide to slide on the rod, until the knob springs into another notch and locks the hand guide in position for another line. The rod is notched at proper intervals from one end to the other, so that the hand guide will be arrested at each adjustment, to properly space the lines written.

The inventor considers the machine to be valuable for persons who have lost their eyesight after having previously learnt to write. For these it will be, as it has already been proved, a perfect boon, enabling them to occupy themselves, and giving them a degree of independence never before enjoyed by persons similarly afflicted. But also, literary men, clerks, copyists, and all writers whose eyes are materially strained by constant writing, are expected to profit by the use of this machine, as they may, by its aid, write without continuously looking at their work. The apparatus was patented through the Scientific American Patent Agency November 14, 1871. Those desirous of availing themselves of its benefits may address the manufacturer, V. E. Mauger, at 110 Reade street, New York city.

The Royal Condor.

The condor has been singularly unfortunate in the hands of the curious and scientific. Fifty years have elapsed since the first specimen reached Europe; yet to-day the exaggerated stories of its size and strength are repeated in many of our text books, and the very latest ornithological work leaves us in doubt as to its relation to the other vultures. No one credits the assertion of the old geographer, Marco Paulo, that the condor can lift an elephant from the ground high enough to kill it by the fall; nor the story of a traveler, so late as 1830, who declared that a condor of moderate size, just killed, was lying before him, a single quill feather of which was twenty good paces long! Yet the statement continues to be published, that the ordinary expanse of a full-grown specimen is from twelve to twenty feet; whereas it is very doubtful if it ever exceeds, or even equals, twelve feet. A full grown male from the most celebrated locality on the Andes, now in Vassar College, has a stretch of nine feet. Humboldt never found one to measure over nine feet; and the largest specimen seen by Darwin was eight and a half feet from tip to tip. An old male in the Zoölogical Gardens of London measures eleven feet.

The ordinary *habitat* of the Royal Condor is between the altitudes of 10,000 and 16,000 feet. The largest seem to make their home around the volcano of Cayarnbi, which stands exactly on the equator. In the rainy season they frequently descend to the coast, where they may be seen roosting on trees; on the mountains they very rarely perch (for which their feet are poorly fitted), but stand on rocks. They are most commonly seen around vertical cliffs, where their nests are, and where cattle are most likely to fall. Great numbers frequent Antisana, where there is a great cattle estate. Flocks are never seen except around a large carcass.

It is often seen singly, soaring at a great hight in vast circles. Its flight is slow and majestic. Its head is constantly in motion as if in search of food below; its mouth is kept open and its tail spread.

To rise from the ground, it must needs run for some distance, then it flaps its wings three or four times and ascends at a low angle till it reaches a considerable elevation, when it seems to make a few leisurely strokes, as if to ease its wings, after which it literally sails upon the air. In walking, the wings trail on the ground, and the head takes a crouching position. It has a very awkward, almost painful gait. From its inability to rise without running, a narrow pen is sufficient to imprison it. Though a carrion bird, it breathes the purest air, spending much of its time soaring three miles above the sea. Humboldt saw one fly over Chimborazo. We have seen them sailing at least a thousand feet above the crater of Pichincha.

Its gormandizing power has hardly been overstated. We have known a single condor, not of the largest size, to make way in one week with a calf, a sheep and a dog. It prefers carrion, but will sometimes attack live sheep, deer, dogs, etc. The eye and the tongue are favorite parts, and first devoured; next the intestines. We never heard of one authenticated case of its carrying off children, nor of its attacking adults except in defence of its eggs. Von Tschudi says it cannot carry, when flying, a weight of over ten pounds. In captivity it will eat everything except pork and cooked meat. When full fed, it is exceedingly stupid, and may be caught by the hand; but at other times it is a match for the stoutest man. It passes the greater part of the day sleeping, more often searching for prey at morning and evening than at noon—very likely because objects are then more distinctly seen. —*Professor James Orton.*

CLAY AND SANDY SOILS.—If you have a light sandy field and wish to fertilize it cheaply, perhaps you cannot do better than to gather, say ten loads of clay, and mix it with ten loads of barn yard manure or compost; this will be found as effective, perhaps more so, than twenty bushels of manure without the clay. And the reverse we believe, will also hold good; that is, to a stiff clay soil, add the same quantity of sand soil and manure; the texture of the surface soil is changed thereby.—*Virginia Real Estate Journal.*

A PIECE of building land, at the corner of the new Queen Victoria street, in London, has just been let at a rental of £5,500 per annum, being at the rate of about five dollars per square foot. Business must be better in London than in New York, at the present time, to enable the tenant to afford payment of such rental.

PROFESSOR GEIKIE, an eminent geologist and writer, is Sir Roderick I. Murchison's literary executor. Sir Roderick has left behind him voluminous papers and documents, and from these and from personal knowledge, Professor Geikie will write and publish a life of the renowned President of the Geological and Geographical Societies.

TRUST him little who praises all; him less who censures all; and him least who is indifferent about all.