to violet light grew more rapidly and developed into much more vigorous individuals than those reared under other colored lights. These results, taken in connection with the like ones obtained by M. Serrano-Fatigati on infusoria, seems to show one general character for aquatic animals. It now remains to be seen whether terrestrial animals are influenced in the same way.

TRANSACTIONS OF THE AMERICAN SOCIETY OF ENGINEERS.

The above named publication for the month of November contains some important papers.

The subject of

"WEB STRAINS IN SIMPLE TRUSSES WITH PARALLEL OR INCLINED BOOMS,"

is ably discussed in a paper read by Mr. Elnathan Sweet, Jr., at the twelfth annual convention of the society, held May 25, 1880. Mr. Sweet, in this paper, aims at greater directness and simplicity in the treatment of the subject than has hitherto been attained; and he asserts that the handbooks hitherto published base their solutions of the problems relating to this class of trusses upon a false assumption. This assumption is, that as a moving load passes over the panels of a truss, each panel is fully loaded before the adjacent triangle in advance bears any part of the load.

"In trusses with a single system of triangulation, or those in which the web strains of any panel pass to the abutment through the web members of the adjacent panel, this assumption is obviously erroneous, for the instant the head of the load passes a panel joint of such a truss a part of it is transmitted by the floor system to the adjacent triangle of the same system."

With this proposition in view, the author proceeds to a somewhat abstruse mathematical discussion, in which he adopts as the most natural unit of length the panel length. By this means he is able to simplify the formulæ necessary so considerably as to justify the wisdom of the adoption of the panel length as the unit of length, and to determine the maximum shearing strain at any panel joint by much less complex expressions than have been heretofore required.

A DISCUSSION UPON INTER-OCEANIC CANAL PROJECTS,

referring to former papers which have appeared in the *Transactions*, together with additional information obtained by recent surveys in Nicaragua, by Mr. A. G. Menocal, throws much light upon current questions relative to the problem of communication by means of canals between the Atlantic and Pacific oceans. As an abstract of this paper cannot be given without reference to the papers criticised in it, we can only glance at one or two salient points. One of these is ably taken. In speaking of a canal on the Nicaragua route, the time of transit ought to be estimated not as though the whole distance were canal transit, but the transit ought to be separated into its component parts, to wit: "Canalization, 62 miles; slack water navigation, admitting nearly ocean speed, 63 miles; and lake navigation, admitting ocean speed, 56½ miles;" total, 181½ miles. The time of transit would, therefore, be shortened very much below that estimated by some engineers; indeed, it could be accomplished in 38½ hours, the transit including a lockage of 108 feet.

The practicability of utilizing the channel of the river Grande is another point strenuously urged by the writer in favor of the Nicaragua route.

Minutes of meetings and the annual reports of the Board of Direction, Committee on Finance, the report of a Committee on a Uniform System of Tests for Cements, and a list of members, with additions, changes, corrections, and resignations, complete the contents.

The Committee on Tests for Cements make only a brief report, enumerating an extensive series of papers received from different parts of the world bearing upon the subject, stating that they will commence an interchange of views during the present winter, and announcing that they will endeavor to complete their duties on or before the date of the next annual convention.

Meteorological Observations by Telegraph.

Mr. N. Hoffmeyer, of Copenhagen, observes that "in meteorological prognoses we cannot expect a scientific certainty; these prognoses are based upon empirical suppositions, and are, therefore, subjected to all possible errors which may be caused by that method. So long as the causes and the real nature of meteorological disturbances have not yet been explained, so long as we are only able to know the *how* and not the why of meteorological phenomena, so long a very exact observation only of the storms which by telegraph is transmitted from one coast to another, will be of practical value to the mariner."

This observation, however, is connected with greater difficulties than has been hitherto supposed. Mr. Hoffmeyer has, during a period of 21 months, made the closest investigations in regard to the storms and winds on the Atlantic Ocean, and he maintains that the conditions upon which these meteorological phenomena depend are so highly complicated that the telegraphic reports sent by the "*Herald* Weather Department" from America to Europe—although being a proof of the energy and ability of Mr. Bennett—have an imaginary value only.

It has been proved that the atmospheric disturbances usually move in the same direction across the ocean as across the continents, viz., from west to east, and that about 61 per cent of the storms which we have to encounter on the Atlantic have arrived there from the American continent; but it is also known that 39 per cent of the storms—a number not to be overlooked—are originated upon the Atlantic itself, and that besides only 50 per cent of the storms observed on the Atlantic arrive at Europe. The direction which the atmospheric disturbances show in America, before they arrive at the coast of the Atlantic, can be no secure basis for conclusions regarding the further course of these disturbances and the phenomena connected with them. Even if the observations on the European and American coasts were to be combined, a reliable prediction of what will happen on the ocean will be impossible. If, therefore, meteorological observations shall have a real benefit for our mariners, such observations must not only be made on the coast, but also on the Atlantic itself, and Mr. Hoffmeyer proposes to erect for this purpose a regular meteorological service, the stations of which are situated upon the ocean—*i. e.*, upon islands which lie between the two continents. These stations should be connected by telegraph with the continents, so that Faroe Island, Iceland, South Greenland, and the Azores may be brought into communication with the European coast and the Bermudas with North America.

Although these stations are very distant from each other, the meteorological observations made there will, on account of a meteorological peculiarity of the Atlantic, be of value for predicting the weather and atmospheric disturbances which will occur between these stations.

Mr. Hoffmeyer, by daily constructing synoptical maps, discovered that the barometric minima in the atmosphere which rests upon the Atlantic have a tendency to approach Greenland and Iceland on the one hand, and the Azores on the other, while from the latter to the Bermudas may be usually observed a high pressure of the air and fine weather. Even a slight change taking place at this part of the ocean predicts almost to a certainty great disturbances in the other regions. This barometric maximum, according to Hoffmeyer, forces the depressions of the atmosphere to take a certain direction and influences their velocity of movement in a high degree. Therefore it is absolutely necessary to be acquainted with these atmospheric maxima which prevail upon the ocean, and they can naturally be observed only upon the ocean itself—*i. e.*, upon those islands mentioned; therefore observations made there, in connection with those made on the coast, will be perfectly sufficient for all practical purposes. Mr. Hoffmeyer hopes, proceeding upon this basis, to perfectly transform our meteorological service, and to enable our scientists not only to predict the weather for a day or two, but for a longer period of time. The importance of such predictions for the transatlantic navigation is evident. The synoptic maps will enable the ships leaving the ports to enter regions which are subjected to great atmospheric changes, and to choose those ways which, during a certain time of the year, are the least exposed to danger; they will give important information about the condition of the monsoons near the Azores, which are much more irregular than they are generally supposed to be; and they will be valuable for the owners of vessels in making it possible for them to account for possible delays of their ships.

Mr. Hoffmeyer's labors have been communicated to the meteorological institutions of Europe, and necessary steps will probably be taken to make a practical use of the suggestions of this gentleman, as the resolutions, taken April 3, 1880, at an assembly of the presidents of the German meteorological stations at Hamburg, highly recommend the suggestions made by Mr. Hoffmeyer.

Paper Pulp from Wood.

The following interesting description of the process of making wood pulp is from an account of the opening of the Thorold Pulp Paper Company's establishment published by the Thorold *Post*, Canada:

"The wood, four feet in length and of any thickness, is brought in at the basement, placed in the barking-jack (one stick at a time), where two men, with draw knives, rapidly peel off the bark. It is then conveyed by the elevator to the first floor, sawed in two foot lengths with cross-cut saws, passed on to the rip saw, where it is slabbed (that is, a small portion of wood on opposite sides taken off), to permit it resting firmly in the grinding engine. It is then passed to the boring machine (an upright one and a half inch auger, with foot attachment driven by power), where the knots are bored out. The wood is then placed in racks of the same size as the receptacle in grinding engine and carried out to be ground. The grinding engines are upright, and receive at a filling one-twentieth of a cord of wood. The wood is placed in a receptacle, and by a simple, variable, automatic feed process is pressed flatwise between two outward revolving rolls, composed of solid emery, which are flooded with a spray of water, carrying off the fibrilized pulp in a stream through revolving screens to the tank or stuff-chest in the basement. It is then pumped up into a vat that forms part of the wet machine. In this vat is constantly revolving a large cylinder faced with fine brass wire cloth, which picks up the particles of pulp out of the water and places them on the felt (an endless piece of woolen goods which makes between rolls, for different purposes, a continual circuit of the wet machine). On the cylinder is turning a heavy roll, called the concha; between the two, where they meet, the cylinder leaves the pulp, with most of the water pressed from it. The pulp now makes its appearance on the felt above the concha roll in a beautiful sheet, thirty-eight inches in width, and is carried along in a steady flow a distance of about eight feet, where it passes between (the water here again being pressed from it) but set beyond two heavy rollers, the upper iron, the lower wood; it adheres to the upper roll, which is constantly turning, wrapping it up, and when a sufficient thickness is attained, is cut off by a knife being pressed to the roll, attached to the machine for that purpose. It now leaves the roll in a thick, white sheet, 36 x 38 inches, which is received by the boy in attendance on a table conveniently attached to the machine, and folded into sheets 14 x 26 inches. It is then placed on scales until the weight is one hundred pounds, when it is placed in the press and firmly tied into square compact bundles. It is now ready for shipment to the paper mill to be made into printing and tea paper. The wood paper pulp has been placed in the market and found a ready sale. Last week a contract to the amount of $1,000 was made with one of our large paper mills."

Loss of Water Pressure in Hose Pipes.

The recent engine test in New York city was interesting in many ways, but in none more so than as exhibiting the loss of power by friction in hose. Two hundred feet of Maltese cross rubber hose were laid from the engines, and at the base of the playpipe a gauge was inserted in the line. The steamers were working at from 100 to 120 pounds steam pressure. The following table exhibits the average general pressures taken every three minutes simultaneously:

Engines.	Steam Pressure.	Water Pressure at Engine.	Water Pressure at Pipe.	Loss by Friction in Hose.
Clapp and Jones	110·83	173·55	93·03	80 50
Ahrens	130 33	166·70	88 38	78·32
Amoskeag	101·64	143·14	74·54	68·60

From this it will be seen that the loss of power by friction in 200 feet of hose was very nearly 50 per cent. Had there been 1,000 feet of hose, the loss would have been very much greater, of course. The size of the hose used was 2½ inches. Had it been 4-inch hose, as the *Journal* has advocated for fire service, the friction loss would have been far less. In his little book entitled "Fire Streams," Chief Leshure, of Springfield, Mass., gives numerous valuable tables illustrating the friction loss in hose. He says: "It may be stated as near enough for most practical purposes, that when delivering the same number of gallons per minute, the friction loss in two pipes (or hose) of equal lengths, the diameter of one of which is twice that of the other, the loss in the larger will be one thirtieth of that in the smaller, or the loss in the smaller will be thirty times that in the larger." A better argument for increasing the size of hose for fire service could not be put forth. The weight of the hose need not be materially increased, for the present hose is made unnecessarily heavy to withstand fictitious pressures: that is to say, hose is now made and warranted to withstand anywhere from three to six hundred pounds pressure. When in actual service the pressures seldom exceed those given above. In a 4-inch hose it would be almost impossible to get 200 pounds pressure on the hose at any point in the line, and the hose could be made correspondingly lighter. As a matter of fact, 4-inch cotton hose is now made in large quantities for mining purposes that weighs but 70 pounds to the section, while much 2½ inch fire hose weighs fully as much or more —*Fireman's Journal.*

ENGINEERING INVENTIONS.

An improved rotary engine has been patented by Mr. John H. Newell, of Scottville, Ill. The invention consists in mechanism for operating the valve, and the combination therewith of a variable cut-off.

An improved stock car has been patented by Messrs. James V. Brown and Benjamin R. Neal, of De Soto, Ill. The object of this invention is to construct a car for transporting cattle and other live stock, so that the car can readily be divided into two or more stalls, and the food and water be conveniently transported and fed to the animals.

Mr. Daniel Kunkel, Sr., of Oregon, Mo., has patented an improved car coupling, so constructed that the cars will be coupled automatically as they are run together, also permitting their convenient uncoupling.

Chemistry of Plants.

Dr. S. Ringer, who has for some time past been experimenting upon the physiological action of *Narcissus, Galanthus, Hæmanthus*—genera belonging to the natural order *Amaryllidaceæ*—has recently examined the properties of an alkaloid from the common garden tulip—a liliaceous plant, and communicated his results to the *Practitioner*. It has been found by him that nitrate of tulipine differs almost entirely from the alkaloids derived from the amaryllids, it being a muscle poison which affects the muscles like veratria, but to a less degree. These results are interesting from a botanical as well as a physiological standpoint, as going to confirm the theory that the relationships between natural orders may, to a certain extent, be indicated by the nature of their chemical constituents. The nearer relationship of the *Liliaceæ* to the *Melanthaceæ* seems shadowed forth by the fact that a liliaceous plant has yielded an alkaloid like veratria. In the same manner the position of the Australian genus *Duboisia*, as belonging to the *Solanaceæ* rather than to the *Scrophulariaceæ*, was demonstrated by the elimination of the alkaloid duboisine, and the discovery that its physiological action was analogous to that of the solanaceous alkaloids.

Impromptu Ingenuity.

Some years ago, a Spanish steamer, while crossing the Bay of Biscay in a severe storm, gave such indications, by an unusual noise at the stern, that there was something wrong with the screw propeller or its shaft outside of the ship—that is, in the open space between the stern and rudder posts where the screw revolves. There was no dry dock in any of the ports on the coast where the ship could go to be examined; and on arrival at Vigo it appeared as if there was no alternative but to remove the cargo from the stern, and by placing it forward thus lift the screw propeller and shaft to the surface of the water. The alternative, simple as it was, meant a serious delay and great expense. Before commencing to remove the cargo, another consultation was held. It was then decided to put the stern of the ship over a bed of light colored sand; and as the water was very clear, there might be a possibility of ascertaining the extent or cause of the mishap. For two days after the vessel was so placed, the wind caused a ripple on the water, which effectually prevented anything being seen. It was then suggested by some one on board to try the use of oil on the surface of the water round the stern of the ship. The effect was most satisfactory. The water was becalmed as if by magic, and it was then seen that the wedge or key which keeps the propeller in its place on the shaft had come partly out, and thus left the screw loose on the shaft, which caused the noise. By continuing the use of oil for a few hours the wedge was ultimately driven into its place and secured. Many days of detention and the use of costly appliances and labor were thus saved.

A few years ago an iron bridge of considerable length, the weight being about two hundred tons, was constructed in England, and erected in a remote part of Germany. By some mishap, the bridge, when finished, was found to be some distance "out" to one side, an error which the proprietors insisted should be rectified. To take down and reerect the bridge would be simply ruin to the contractor. But necessity is the mother of invention, and so it proved in this case. It was summer time, and the contractor proceeded to find the amount of expansion which was caused by the heat of the sun over the whole length of the bridge. He next ascertained what contraction took place in the night by cooling. Armed with these data he thought it might be possible to bring the bridge to its proper position in a few days. The bridge, of course, in its ordinary condition, expanded from the center, pushing its two ends outward, or farther apart, and again contracting toward the center. Taking advantage of these conditions, one end was made fast in the morning, and the bridge was forced to expand from that immovable point, instead of from the middle, as formerly. When the iron composing the bridge had expanded to its full extent in the direction intended, that end was released, and the opposite end made fast. The bridge then contracted toward its true position. Thus, whatever was gained by the day's expansion was secured by the subsequent contraction when the metal cooled at night, and the process being renewed day by day, the work was successfully accomplished.

An ingenious application of expansion and contraction in metals was made use of in France, and has frequently been taken advantage of since. The walls of a large building in Paris were observed to be giving way by bulging outwards, and the problem was to bring them back to their vertical position. For this purpose a number of bars of iron having screws and nuts on each end were let through the opposite walls and across the intervening space between them. The nuts and screwed portion of the bars were outside. The bars were now heated by a number of lamps suspended below them until they had expanded as much as possible, and the nuts screwed up against the outsides of the two opposite walls. The lamps were next removed, when the heated bars, in cooling, gradually contracted in their length, bringing the walls very gently, but with irresistible force, into their normal position.

It is well known that in working iron, such as welding two pieces together, and even in its manufacture, hollow places or flaws occur, with merely an outside skin over the defective parts, which any test but a destructive one would fail to discover. Nor would it be difficult to point out numerous examples of disaster thus occurring. To test the homogeneity of the metal, a bar of iron is placed on the equatorial line. A compass with a very sensitive needle is passed along in front of the bar, the needle of course pointing at a right angle to it. If the bar is perfectly solid through its whole length, the needle will remain steady. If, however, there should be a flaw or hollow place in the bar, the needle will be deflected as it passes from the solid to the hollow place, *backward* toward the solid iron; passing on over the hollow place, the needle will come within the range of the solid iron at the other end of the flaw, and will again be deflected *forward*. If the bar be cut through anywhere between these two points of deflection, a flaw will invariably be found. Many thousands of pieces of iron—some prepared for the purpose of testing this method of trial, others in the ordinary course of business—have been operated upon with the same unvarying result.

A striking instance of ingenuity in taking advantage of the resources of nature in an emergency, is found in Sir Samuel Baker's account of his travels in Abyssinia. His stock of soap had become exhausted; and as he possessed abundance of various kinds of fat, including that of elephants, hippopotami, lions, and rhinoceros, he determined to convert a quantity of this grease into soap. For this purpose he required both potash and lime; and how were these to be obtained? The negleek tree, he found, was exceptionally rich in potash; he therefore burned a large quantity, and made a strong lye with the ashes, which he concentrated by boiling. There was no limestone; but the river produced a plentiful supply of oyster shells, which, if burned, produce excellent lime. What was next wanted was a kiln in which to burn the shells, and this he constructed out of one of those great ant hills, which rise to ten feet high, common to those valleys, and which possess a very hard external crust. Two natives hollowed out one of those hills; a proper draught hole was made below from the outside; it was loaded with wood, and filled with some six bushels of oyster shells, which were again covered with fuel; and after burning twenty-four hours a supply of excellent lime was obtained. Then commenced his soap boiling, which was effected in a large copper pot of Egyptian manufacture. The ingredients of potash, lime, and fat were then carefully mixed; and after boiling ten hours, and having been constantly stirred, he obtained excellent soap, of which he had in all about forty pounds weight.

National Value of Cheap Patents.

At the December 6th meeting of the Society of Engineers, London, Mr. Joseph Bernays, President, in the chair, a paper was read by Mr. Frank W. Grierson on "The National Value of Cheap Patents." The author pointed out that inventors, like all other men, did not work for the mere sake of working, but for their own advantage. In obtaining an advantage for themselves, however, they conferred upon the whole nation a much greater advantage. The advantage an inventor sought was secured to him by a patent; patents should, therefore, be granted at as low a cost as possible. A patentee was desirous of providing improved processes and means of doing what had not before been possible; or of doing something in a quicker and more economical manner than had before been possible. Inventions were very seldom "happy thoughts;" they were nearly always the result of much consideration and many experiments, neither of which would be undertaken for the mere love of the work, but which were undertaken in the hope of reward in the form of a successful patent. The patentee had an obvious incentive for getting his invention known and adopted; if it was not an improvement it would certainly not be adopted, but if it was, it would be adopted only in consequence of his persistent efforts, and by its adoption a step in advance had been made.

After referring to the evil of "orphan" inventions, the author gave the details of the stamp duties on British and American patents, from which it appears that the stamp duties on a patent in that country, lasting only 14 years, are 175*l*., while those on an American patent, lasting 17 years, are only 7*l*. A table was then given of the patents applied for and granted in the United States and in Great Britain during the last ten years, from which it was shown that the 50*l*. stamp duty at the end of the third year kills about 70 per cent of the patents granted, and that the 100*l*. duty destroys very nearly 20 per cent more, leaving only 10 or 11 per cent to complete the full term. The effect of these crushing duties is that while on December 31, 1879, there were in Great Britain only 15,755 patents in force, in the United States there were more than 200,000, not including designs. The United States thus have thirteen times as many patents in force at the same time, and therefore make thirteen efforts to advance for each one that the English make. During the last ten years 22,868 British patents have been crushed by the heavy stamp duties. An American patent, once granted, lasts the full term without further payment. The result of this is seen in an enormous import of American goods of varied description, and in the continued flow of skilled artisans to America. Mr. Grierson then gave the following comparative table of average results for the last ten years:

	British Isles.	United States.
Receipts	158,280*l*.	143.049*l*.
Expenditure	48,063*l*.	125,254*l*.
Profit	110,217*l*.	17,795*l*.
Stamp duties on one patent	175*l*.	7*l*.
Maximum duration of patent	14 years.	17 years.
Average " " "	5 "	7 "
Number of patents applied for	4,496	19,770
" " " granted	2,980	13,335
" " applications refused or abandoned	1,516	6,415
" " grants paid 50*l*. duty	820	
" " " " 100*l*. duty	253	
" " " killed by 50*l*. duty	1,851	
" " " " " 100*l*. duty	436	
Percentage of applications granted	66·28	67·55
" " " refused or abandoned	33·72	32·45
" " grants paid 50*l*. duty	30·70	
" " " " 100*l*. duty	11·18	
" " " killed by 50*l*. duty	69·30	
" " " " " 100*l*. duty	19·52	
" " " lasting full term	11·18	100·00
Population	34,500,000	50,900,000
Number of persons to one patent granted	11,577	3,811
Ratio of amount of duties on one patent	25	1
" " number of patents granted	1	3
" " " " " in force	1	8
Average cost to inventor for one patent, including patent agent's charges	190*l*.	19*l*.
Technical examination of applications	None.	Careful.
Inventions invalidly repatented	Frequently.	Rarely.

Mr. Grierson went on to observe that this table showed that in the United States three patents were granted for one there, after allowing for the difference in population, and that the stamp duties on one patent there would pay those on twenty-five patents in the United States. We might, therefore, fairly say that the British inventor was handicapped 25 to 1 in favor of the American inventor. It was to be carefully remembered that in handicapping the inventor they handicapped the nation. The author drew attention to Mr. John Standfield's proposal for reduced stamp duties, which was as follows: On application (to cover cost of provisional protection), 2*l*.; on filing complete specification (to cover cost of printing, etc.), 3*l*.; total, 5*l*.; there should also be an annual tax of 1*l*. Provisional protection to be granted for one year, and the duration of patents to be twenty-one years. After remarking on the advantage of official technical examination of applications, the author pointed out that it was impossible to calculate the enormous indirect loss the nation suffered from the present exorbitant patent stamp duties, which drove abroad and stifled a large proportion of that inventive faculty upon which alone they were dependent for holding their place among the nations, and which might, if not so hampered, save a considerable number of lives now annually lost in preventable accidents, and might give employment to many who are now unable to obtain work, and who in consequence have to be supported in idleness.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—Southern District of New York.

MATTHEWS *vs.* SCHONEBERGER *et al.*—PATENT BOTTLE STOPPER.

Blatchford, J.:

1. Every claim of a patent has reference to the descriptive part of the specification, and must be construed as if the words "substantially as specified" formed part of said claim.

2. So where the specification speaks of a part or feature of the patented device as being "an important feature of the invention," and makes it a part of the claim, the omission of such feature from defendant's device saves him from infringing the patent.

3. Where a prior device accomplished the same thing, but not so perfectly as the patented device, the claim to the latter must be limited to its precise construction whereby it accomplishes the results more perfectly, and will not include other means of doing it.

4. A function cannot be claimed. The claim must be either to the physical structure, the combination of devices, or the method of operation.

5. The Codd bottle stopper, consisting of a glass marble inside of a bottle seating against a rubber seat in the mouth of the bottle by the pressure of gases from within, is not an infringement of the Albertson patents for a gravitating stopper consisting of a stem with a rubber valve or skirt around it, which seats on the interior of the neck of the bottle.

This suit was brought on two patents. One of them is a reissue, No. 2,386, granted to the plaintiff October 30, 1866, for an improvement in bottle stoppers, the original patent having been granted to Albert Albertson, as inventor, August 26, 1862. This patent has expired.

The second patent sued on is No. 44,684, granted October 11, 1864, to J. N. McIntire, on the invention of Albert Albertson, for an improved method of stopping bottles.

Bill dismissed.

Concrete Blocks.

In reference to the art of concrete block building, Mr. Imrie Bell, of London, has been much struck by the want of attention paid to the art of producing a fair and finished surface in the exposed faces of the blocks, as exemplified in many of the large engineering works in course of construction in the metropolis and elsewhere, where the exposed faces of the concrete present a rough honeycombed appearance, with the marks of the joints of the timber planks forming the moulds in which the blocks have been formed, or the frames inside of which they have been built *in situ*, in place of showing a fair and smooth surface. The author has given this matter much consideration, and the result of his experience is that in concrete building it is perfectly easy, with a little attention, not only to produce a fair surface, but to form mouldings and panels, and even tracery and ornament, and at the same time make this face work as durable and solid as any part of the block. There are two reasons why little attention has hitherto been paid to this art—one is carelessness or indifference to appearance, the other is that most engineers who have attempted it have done so by "rendering," a most objectionable and dangerous mode of effecting the object; and which, even if successful for a time, is simply veneering, and is subject at any time to decay, the failure generally occurring after wet and frosty weather, which has naturally caused a want of confidence, and stopped a repetition.

The plan which the author has followed, and with complete success and at an inappreciable increase of cost, by which a smooth, uniform, and equal colored face can be obtained (and if wanted, the color of the blocks might be slightly varied by different colored sand), and which, both above and below low water, has stood successfully the test of eight years' exposure to frost, heat, storm, and rain. This plan is simply to have a smooth-planed board for the face of the mould painted previous to commencing the work with a mucilage of soap, and to line inside with a finer concrete or mortar as the work proceeds, so that the mixture placed close to the face boards is carried up with that contained in the body of the block, the whole forming one homogeneous mass, and insuring that the setting process of the whole mass shall progress simultaneously: and in fact this face, like the skin of cast iron, is actually the strongest portion of the block.