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CHURCH OF ST. PETER'S, BOURNEMOUTH, ENGLAND.

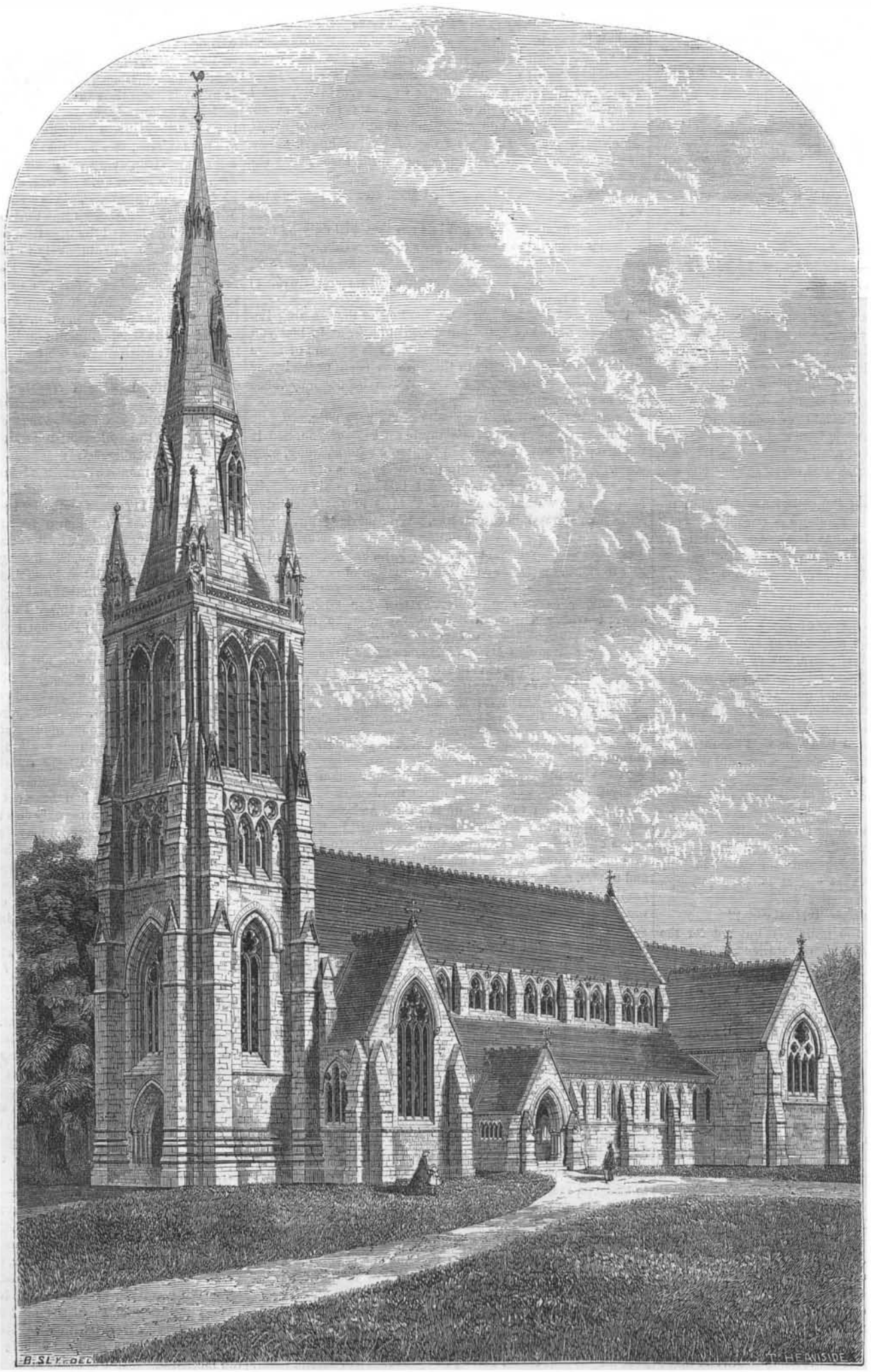
The general design of this church, as shown in our engraving, while it may compare favorably with church architecture generally, is remarkable for the fact that it was not designed at once, but at different periods, one part being, so to speak, patched on to another, until the building has attained its present proportions. The successful accomplishment of this difficult task furnishes a useful study for young architects.

First of all, a south aisle was added to a poor modern chapel of ease, then a north aisle, then a clerestory, so that the old chapel gradually disappeared. After this, in the year 1863, a very costly chancel with aisles was built. This is groined in stone, and has a sumptuous painted and sculptured reredos, the walls on each side of it being lined with charmingly designed groups of angels painted on tile. On each side of the eastern bay of the chancel are double screens of marble and alabaster, which form two ranges of sedilia. The two aisles on each side of the choir seats are occupied by lofty metal screens. In the wall on the north side of the chancel is a sculpture of the Crucifixion, while opposite to it is a sculpture of the Annunciation, and over the vestry door another, of the Charge to St. Peter. The vestry, on the east side of the north transept, is three stories in hight, with a newel staircase. Below is the heating chamber, on the church level the clergy vestry, and above this the choir vestry. Almost all the windows throughout this part of the church are of stained glass.

Latterly it has been found that the church was not large enough, and an addition of a somewhat novel kind is now proposed by the architect; namely, a western transept, beyond which is a steeple. The steeple is already built up to the top of the tower, and the western transept will, it is expected, soon be built, so as to connect the steeple with the church. The tower is 25x25 feet, and 103 feet high to the top of the parapet. The hight of tower and spire will be 188 feet. The lower stage is groined in stone, and the belfry is being provided with a heavy peal of bells.

A large churchyard cross, with sculptures on the base, and a lych gate, of stone and oak, are also being erected in the beautiful churchyard.

The extreme length of the church, when completed, will be 180 feet. The whole of the work, with the exception of a portion of the south aisle wall, has been done from the designs of Mr. G. E. Street, A.R.A.



ST PETER'S CHURCH, BOURNEMOUTH, ENGLAND.

Steam Pressure Gages.

At the meeting of the Institution of Mechanical Engineers, held at Birmingham, on the 26th October, there was read a paper "On Steam Pressure Gages," by Mr. Ernest Spon, of London, communicated through Mr. Charles Cochrane. Of this paper we subjoin an abstract:—The reliable construction of steam pressure gages is of much importance in connection with the safe working of steam boilers, a great number of the spring pressure gages in ordinary use having been found inaccurate, either from defects in original construction or in consequence of their becoming unreliable when in constant use. In the Bourdon gage, which is the spring pressure gage that has been the most extensively used for a great number of years, the indication of the pressure is obtained by the employment of an elastic metallic tube, bent to a curved form, which, when subjected to internal pressure, becomes less curved; and the resulting movement of the free end of the tube communicates motion to an index upon a dial, through the intervention of a lever or a toothed sector and pinion. The elastic tube, however, is liable to become permanently strained by continued use, or by accidental exposure to an excess of pressure; and the indications of the gage are then no longer correct.

In the Schaeffer gage, the pressure is measured by the deflection of a circular corrugated steel plate, fixed round the circumference and bulged in the center by the pressure, the extent of the bulging being magnified upon a dial by means of a toothed sector and pinion. This gage, though it has been considered one of the best in use, has a disadvantage in the very small range of deflection of the plate under the pressure, requiring the motion to be very largely magnified upon the dial, whereby any errors are also proportionately magnified. The plate is also liable to be permanently strained by an excess of pressure, and is, moreover, liable to crack when continually worked. The metal of this plate being very thin, as is also the case with the elastic tube of the previous gage, its elasticity is liable to be diminished when any oxidation takes place, and error in the indications is then the consequence. The pressure is also measured by the bulging of a circular steel plate in Wallis' gage, but the deflection is increased by the plate being cut into five segments by radial slits; and a thin brass diaphragm, or a sheet of vulcanized india rubber, is used to cover the slits on the side exposed to the pressure. The brass diaphragm, however, is found too rigid to admit of the requisite sensitiveness in the gage; while the india rubber is liable to get forced into the slits by the pressure, thereby obstructing the action of the gage. A solid piston, working in a cylinder, is supported against the steam pressure by a steel

spring in Miller's gage, and is rendered steam tight in the cylinder by an india rubber diaphragm, which is fixed round the circumference between the flanges of the cylinder; the motion of the piston is communicated to the index by means of a short chain, coiled round the spindle of the index, and attached to the arms of a vibrating bow, which is actuated by the piston rod. The motion of the piston is limited to a very short range, owing to the risk of the india rubber diaphragm getting cut round the edge of the piston with a longer action; and the construction of the multiplying gear for the index involves objectionable complication. In Smith's gage, which has been extensively used, a steel volute spring is employed, and is acted upon direct by the steam on one side, being covered on that side by an india rubber diaphragm secured round the circumference to make a steam tight joint. This spring has a considerable range of action compared with the gages previously noticed, and being of considerable substance is not liable to be affected in strength by corrosion; the deflection of the spring moves the index by means of a rack and pinion. Three concentric spiral springs, placed one within another, with their ends covered by an india rubber diaphragm, are employed in Silvester's gage, which is similar in principle to the last one; and the motion is communicated to the index by a rack and pinion. There is, however, an objection to the employment of a rack and pinion, for actuating the index of a pressure gage, on account of the play occurring in toothed gearing; and in Foster's gage, in which the pressure is measured by the deflection of a volute spring covered by an india rubber diaphragm as before, the movement of the spring is transferred direct to the index, by means of a stud fixed to the center of the spring and working in a spiral groove in the spindle of the index. This pressure gage has been found by the writer to be superior to the other gages in use, in regard to durability, accuracy, and sensitiveness. The strength of spring employed is proportionate to the limit of pressure to be measured, the total range of deflection being the same in each case. Specimens were exhibited of the various gages described, and the action of some of them was shown by means of a force pump.

CORNELL UNIVERSITY.---A STUDENT'S LABOR FOR KNOWLEDGE.

A correspondent of the New York *Times*, recently visiting the Cornell University, describes, among other interesting particulars, a conversation held with one of the students. The interview gives a good indication of the qualities of the young man, who is a sample of a great many, in the Cornell and other institutions of learning, who are obtaining an education under what the world would call adverse circumstances. But although the labor is hard and the deprivations great, they form the furnace of trial, to refine the intellect, and produce a mental and moral state of sterling purity and value.

"I looked around for some student who could inform me as to the progress made in the specialty of Cornell—the self supporting part of the system. At last, by good chance, I came upon a room where a young fellow of twenty-three was studying Sanscrit. Having been in India for many years, I was interested in his studies, and we commenced an animated conversation upon philologic roots. We criticised Max Müller, commented on Bunsen's theory of the Pelasgic people, and heartily agreed upon the absurdity of studying Greek and Latin, which were dried sponges, out of which everything good had been taken by our ancestors. Incidentally I learned that this most accomplished gentleman was supporting himself by laboring on the farm. He generally worked three hours a day, and six hours on Saturdays, and had already got through his appointed labor for that Saturday. I asked him if the manual labor of plowing, etc., did not stupefy him, contract the brain cells, and make his apprehension duller. He replied that it did not, because he had been brought up as a farmer, and had nothing to learn when he came to the college. He was taking the agricultural course, but had become interested in philology, and one of the professors, who knew Sanscrit, had become interested in him, and had given him lessons in that perfect language, though Oriental studies are not in the curriculum.

I said: "I suppose yours is an individual case?"

STUDENT—Yes, as regards the philology, but not for the farm. There are twenty-nine of us who work on it.

CORRESPONDENT—Does it pay your expenses?

STUDENT—It pays mine; but then I worked steadily during the long three months' vacation, which ended in September. I can go easy now if I feel inclined.

CORRESPONDENT—I suppose the hardest part of the work is done by laborers employed for that purpose?

STUDENT—Not at all. There are only two teamsters hired on the farm, and all the other work is done by us. At this moment we're laying down a series of drains, and this is very heavy work indeed.

CORRESPONDENT—Did you do that this morning?

STUDENT—Yes, for six hours.

CORRESPONDENT—And did you not feel stupefied or tired out?

STUDENT—Not at all. I dislike the work, and was very glad to get back to this, but I was not tired.

CORRESPONDENT—Are there any other methods of earning one's support here, besides the farm?

STUDENT—Oh yes. If you can print, you can earn more in the press room than on the farm, and soon there will be lots of work in the machine shop. The men are going to make copies of Ollivier's geometric models.

CORRESPONDENT—What's that?

STUDENT—Why, a Frenchman of the name of Ollivier made a set of models to illustrate all the problems of geometry. A set was purchased by the State of New York, and is, I think, at Albany. They are going to make copies of these. Twenty thousand dollars were given, I believe, for the first set that he made, but our fellows here can make them for eight hundred.

CORRESPONDENT—I see. Well, but men who can't handle tools will not be able to do that sort of thing.

STUDENT—Certainly not. Skilled labor is at the same premium here that it is elsewhere.

CORRESPONDENT—What can the men do who have only their manual strength?

STUDENT—Well, they can work on the farm or they can grade the square.

CORRESPONDENT—They can do that, but then do they?

STUDENT—As a general thing they attempt it, and finding it rather rough, give it up in despair, and go home.

CORRESPONDENT—Well, but that was hardly what Mr. Cornell designed, was it?

STUDENT—No; he expected that the college would give work to every one, that cared to take it, of a kind that he could do. I suppose that this will be done in the future by outsiders, but it can never be accomplished by the college.

CORRESPONDENT—Something in the factory way, you mean. I suppose something that will utilize the grand water power that is running to waste so picturesquely in the gorges.

STUDENT—(laughing)—I guess so. I have heard that Mr. Cornell has some such scheme in his head.

CORRESPONDENT—But even then, perhaps, the men could not earn enough to keep them. Let us calculate a little. I have been through some factories in Auburn lately, and I learned the rate of wages current there. Such work as unskilled students could do would be paid at the rate of seven, say eight, dollars a week for a day of twelve hours. Now, how many hours can you average of work throughout the year?

STUDENT—About half a day if I work steadily through the vacations.

CORRESPONDENT—Very good; then that will only be four dollars a week throughout the year for everything.

STUDENT—That would be quite sufficient. My expenses are only three dollars a week, and I earn enough over to keep me in coarse clothes.

CORRESPONDENT—I beg your pardon for the seeming impertinence of the question I am about to ask, and I beg you to believe that the spirit that dictates it is not one of mere curiosity. Are you living in this fashion from necessity, or do you perhaps wish to show that it can be done by those who have no resources?

STUDENT—I do it from necessity; I am very poor.

CORRESPONDENT—Sir, from my heart I honor you, and if the sympathy of a stranger can lighten a road so stony, pray understand that you have it in the fullest sense of the word.

We shook hands heartily, and I left him to his Sanscrit, feeling as I walked away that Cornell meant something more than showed on the surface. We Americans have been rather apt to worship the dollar, but when poverty is so honorable and so honored as it is here, our golden idol is like to tumble a peg or so in the estimation of society."

The Unity of the Race---Waiting for Light---The World Older than Chronology---Science and Religion Reconciled.

From the Brooklyn *Daily Union*, we make the ensuing extracts of a sermon preached to his people, on Sunday, Nov. 18th, by Henry Ward Beecher, from the following text:

'Acts xvii. 26, 27—"And hath made of one blood all nations of men to dwell on all the face of the earth, and hath determined the times before appointed and the bounds of their habitation; that they should seek the Lord, if haply they might feel after Him, and find Him, though He be not far from every one of us."

After showing that it was a great condescension for a Jew to say this thing, so opposite to both the Jewish and Grecian idea, he went on to speak of the light and darkness both thrown upon the relations of men by scientists. The speculation concerning the origin of the race is producing a two-fold mischievous effect. It unsettles the faith of some men, and others, seeing this, are driven away from all scientific reading. There is no doubt that the world is older, and that the race of man extends further back, than the six thousand years of chronology. But chronology is of purely human invention, and we touch no question of the Bible if we remove chronology thousands of years back. It is generally conceded by those who have the best opportunities of knowledge, that the present condition of things was developed from a lower condition. It is not a question of the Divine creative act (or need not be), but a question whether creation was unfolded by an instantaneous act or by slow evolutions. In regard to the creation of man we have

THREE THEORIES.

We have the theory of the creation of one pair, and all the rest descending from them. The second theory is that Adam and Eve were the ancestors of but one line, and that there were other lines. The third theory considers man as the natural outgrowth of the animal. This gives great offence to many on moral grounds, and to many on scientific grounds.

It is alleged that this theory cannot be sustained without leaving great gaps in the evidence. These speculations have had an effect on the public mind. Many inconsiderate and hasty persons have fallen from their faith and thrown away the Word of God. There are multitudes of men at the present time infected with the skepticism of science. These speculations lead the strong to domineer over the weak. It is said that the order of creation is that there are different planes, and the plane of one race is that of science to another. It is taught that rights belong to those who can defend them. Whatever theory may prevail of the origin of man will not prevent the fact that man has come upon the earth by a divine method, and it concerns us more to know what man is than how he came here. There will not be ultimately any incongruity between true science and true religion. For one I am a patient waiter as to how man became what he is. I am bound to receive light, let it come from what quarter it may. Let men investigate, and let men not refuse the truth when it comes, for the truth is the best for us all. I am sure in the meantime, that the race is one in such a sense that they have the same rights and the same duties, and the same heritage. All spiritual elements fit all men alike, and the questions of the future are not disturbed by ethnological conclusions. I don't care if one man came from alligators, another

FROM MONKEYS,

another from lizards, if I find that they are all susceptible of reasoning and training. The important question is settled, if we find we can work men up in the same way, now that we have them here. How absurd it is to speak of the anatomical structure as proving divisions! The substantial plan is the same; all the great functions are the same. If it were true that the African had his heart in his liver, that would be a tough argument. A surgeon or a nurse would treat all races alike. In physiology and anatomy, it is assumed that men are are; and yet men read the skeptical books that have been written, and garrulous, know-nothing talk about the difference between the flat nose and the Grecian nose. Isn't smell the same in one as in another? In some families you will find the child radiant with imagination, and the next will be cold and practical; one will be full of song, and the next will be dumb. There are no greater differences in the families of races than we find here in the family on a small scale. You can educate animals to a small degree, but there is no development in generation; but the minute you strike the human race, you find that the reason is there, and you can enlarge it in every way. Educate a savage and his children will be better than he was, and so on till you have the high state of culture. This is a striking proof of the unity of the race and the sharp line that separates man from the animal. The love of the beautiful and the perception of wit and humor belong distinctively to man. All men laugh, and nothing below men. If sobriety is a great grace, then dogs beat the soberest man on the earth. According to any scheme of development, how could this humor be found? So the moral sense is common to all. The sentiment of conscience belongs to the whole human family, for conscience is a feeling that acts according to the understanding.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of September, 1871:

During the month 873 visits of inspection were made, and 1791 boilers were examined—1624 externally, and 491 internally—while 117 were tested by hydranlic pressure. Number of defects in all discovered, 886, of which 103 were regarded as dangerous. The defects in detail are as follows:

Furnaces out of shape, 32—5 dangerous; fractures, 56—11 dangerous; burned plates, 49—5 dangerous; blistered plates, 104—3 dangerous; sediment and deposit, 150—12 dangerous; incrustation and scale, 137—13 dangerous; external corrosion, 69—10 dangerous; internal corrosion, 46—3 dangerous; internal grooving, 13—2 dangerous; water gages defective, 71—2 dangerous; blow out apparatus defective, 18—2 dangerous; safety valves overloaded, 27—5 dangerous; pressure gages defective, 103—1 dangerous, varying from — 10 to + 7; boilers without gages, 3—3 dangerous; cases of deficiency of water, 3—1 dangerous; braces and stays broken and loose, 10—2 dangerous; dangerous caulking, 1; boilers condemned, 19. Attention is particularly called to the danger arising from careless caulking of boilers. A case was found where the skin of the plate had been cut so as to produce a crack some ten inches long, after only two weeks' use. The careless handling of the caulking tool may do serious injury. Boilers fed from water tanks situated overhead are very liable to be injured from the water leaking down, causing external corrosion. Such a case was met with the past month. The iron was so thin that a chisel could be easily driven through at several points, while the boiler in the main was sound. These "little matters," if neglected, soon become serious. An engineer's eye should detect all such defects, and have them remedied. Too small boiler capacity, requiring heavy firing, is a danger to which we have often called attention. We allude to it again. An upright tubular boiler was found with the fire box burned out. The iron was only $\frac{1}{32}$ of an inch in thickness in many places, and a slight blow of the hammer penetrated it. The day before 50 pounds pressure of steam was used. Here was culpable neglect on the part of the owner or user and an engineer, in no way fitted for his responsible duties. If steam users will persist in over working boilers, and in using them when not provided with proper fittings and attachments, explosions must be expected. There were six explosions during the month, by which 21 persons were killed and 6 wounded.

COATING COPPER AND BRASS WITH ZINC BY A WET PROCESS.—M. R. Böttger (*Polytech. Notizblatt*) gives the following formula: Cover, with a concentrated solution of sal ammoniac, zinc in grains or powder, placed in a non-metallic vessel; warm to ebullition and introduce into the mixture the objects of copper or of brass which it is desired to coat, after having properly cleansed them. After a few minutes, the objects will be covered with a brilliant, firmly adhering, deposit of zinc. The granulated zinc is obtained by pouring the molten metal into a warm mortar, and triturating vigorously, with an iron pestle, until it solidifies.