Correspondence.

How to Hinder Railway Robberies.

To the Editor of the SCIENTIFIC AMERICAN:

I wish to call attention to two plans to frustrate such designs.

First, by fixing a pipe to the steam dome to convey steam near the lamps on the train and then by jets or small pipes pointing downward into the lamp chimney all lights on the train could be instantly extinguished by a move of the engineer, and robbers could not see trainmen or passengers to hold them up or shoot them, while they would be fully exposed as they would advance.

My next device would be to carry all valuables in metal cans instead of paper packages, of any weight experience would approve of. When a safe was blown open, these packages would be too heavy to carry and difficult to open, and could not be destroyed. Large gas pipes, with heads screwed in, one head riveted in and the other locked securely. Such packages would be difficult to carry off or open or dynamite.

I hope you will give your readers these ideas for the protection of trains and the inconvenience of robbers.

BENJAMIN WALTON.

Compton, Cal., October 2, 1895.

Photography Out West.

To the Editor of the SCIENTIFIC AMERICAN:

I was much interested in reading in a late number of your paper Mr. Buckwalter's article on photography in the Rockies. I can quite confirm what he says about the danger of overexposure. When I began the art here as a novice, the smallest stop in my lens was about f 32. With this stop and an exposure made by lifting off cap quickly and as quickly replacing it, the negatives obtained, when the landscape or object was in bright sunshine, were almost invariably spoiled by overexposure. I finally made a smaller stop and then got good pictures. I find ordinarily that f 64 is as large a stop as can be used safely with a cap exposure for a brightly illuminated landscape. With the shutter (S. and P.) working at $\frac{1}{40}$ sec. f 16 to f 11 give fully exposed negatives. I use Cramer's Banner plates, which are very rapid, though not so much so as his Crown brand. I have seen films of another make rated at sensitometer 27, which were underexposed under the same conditions.

Perhaps the ordinary tourist would succeed best here by bringing a slower plate than he generally works with. There is not the same latitude in exposure, required at lower levels for different times of the day, needed here. The sun generally rises and sets almost at maximum brightness. I have got overexposed negatives half an hour after sunrise on a zero morning with f 32 and quick cap exposure. I have not found isochromatic plates of any advantage here so far, and yellow screens with ordinary plates are useless, except for clouds, as they intensify the lights, while destroying detail in the shadows. There is one thing has puzzled me. These overexposures spoken of were helpless ones; not to be saved by any amount of bromide of potash in the developer nor by dilution of it. But now and then under just the same (apparent) conditions—bright sunshine, f 32 stop, the same exposure and developer—a good negative was obtained. I suppose either the actinic power of the light must have been less, though the eye could not appreciate it, or else the plates varied, which seems unlikely.

W. DEARDEN.

Trinidad, Col.

The Father of Ocean Steam Navigation.

To the Editor of the SCIENTIFIC AMERICAN:

I was much interested in the article on "The Earliest Transatlantic Steamships," given in your issue of September 21. I was especially impressed by it, as I am visiting in the family of Dr. Junius B. Smith, the originator of ocean steam navigation, and have seen papers and documents by means of which I may possibly be able to give you a few additional items of interest upon the subject, and at the same time do justice to the memory of a profound and practical thinker, whose foresight and perseverance helped the world to so wonderful an advance.

Junius B. Smith was born in Connecticut and was graduated from Yale in 1802. He went early to London and transacted business between that city and New York for over forty years. He crossed the ocean several times, and on one occasion had a voyage of sixty days. This led him to reflect upon the importance of deep sea navigation, and in 1833 he began to advocate the use of steam in crossing the ocean among business men and bankers. His project was received at first with indifference and even scorn. Dr. Dionysius Lardner, who was lecturing at the time upon scientific subjects, spoke publicly of the "chimera" of hoping to cross the Atlantic in a steamship without a coaling station midway. Even the Duke of Wellington, to whom he applied, answered that he "would give no countenance to any schemes which have for their object a change in the established system of the country"! After great effort he succeeded in organizing the "British and American Steam Navigation Company," and secured a list of directors. The books were opened in 1836. The contract for building the ship was given to Messrs. Curling & Young, Blackwall, England, and the contract for the engine was made with Messrs. Claude, Girdwood & Company, of Glasgow. The latter failed after finishing about two-thirds of the work, which delayed the enterprise a year. In the meantime, in order to prove the feasibility of his project and to anticipate the sailing of the Great Western, built by a rival firm who had adopted Dr. Smith's idea, the Sirius, a small steam channel packet, was chartered and made the trip to New York just ahead of the Great Western.

In regard to the claim for the Savannah, that she was the first steam vessel to cross the Atlantic, Dr. Smith wrote that he had visited and examined her, that she "was completely ship-rigged and made no pretensions to having navigated the ocean by steam, having sailed most or all of the way and carrying her steam engine with her, as any other ship might do."

An editorial in the New York Evening Herald, dated October 18, 1838, and which is now before me, expressly gives Dr. Smith the credit of making "the first effort to turn the attention of England to Atlantic steam navigation," and the next day's issue of same paper publishes the correspondence between Dr. Smith and a company whom he wished to influence upon the subject. Another long and detailed article in the Journal of Commerce, dated February 12, 1853, just after the death of Dr. Smith, speaks of him as "the father of ocean steam navigation."

There seems, therefore, to be no doubt that Junius B. Smith was the first to entertain and carry out the plan of applying steam to regular ocean navigation, and that but for the delay caused by the failure of the firm employed to build his engine his would have been the first steamer between England and United States.

I may add that Dr. Smith's company afterward built and sent out the steamships British Queen and President.

JULIA L. BISHOPRICK.

Burlington, N. J.

Firing of Boilers with Mixed Coal.

To the Editor of the SCIENTIFIC AMERICAN:

By an article in your issue of September 21 (current volume) an attempt is made to show how a revolution can and ought to be made in the firing of steam boilers. The results recorded therein are certainly most remarkable, if we consider only the resulting figures; but if we stop to analyze them, they are shown to be very misleading.

That it is possible to utilize more heat from the combustion of certain combinations of different fuels, under certain conditions, than from other combinations, or from some one kind, is an axiom.

When it is found that some combinations of coal give better results than other combinations, or any one kind, there is surely some reason for it. No more heat can be evolved by the combustion of one pound soft coal culm mixed with four pounds of hard coal screenings than can be evolved by the combustion of five pounds of run-of-mine soft coal, provided combustion is perfect in both cases.

In firing steam boilers, two conditions must be fulfilled to insure maximum efficiency. First, the coal must be burned; second, the heat evolved must be absorbed by the water in the boiler.

That the coal shall be burned means that the combustion shall be perfect. When a chimney discharges smoke, it is evident that the combustion is not perfect. If the combustion is not perfect, it is proof positive that insufficient air has been admitted to the furnace or combustion chamber, or if sufficient air has been admitted, the temperature at which it mingled with the fuel, whether in a solid or gaseous state, was not high enough for oxidation. In very few cases is too much air admitted to the furnace of a steam boiler.

In the usual process of burning coal in the furnace of a steam boiler, a distillation and combustion is produced in which, at almost all times, some part is below the oxidizing temperature. The fresh fuel is usually delivered to that part of the furnace to which no air can penetrate without first passing through the highly heated portion in which the oxygen is consumed. The result is that the heat from this combustion distills off or sets free the volatile portion of the fresh fuel, and there being no oxygen with which it can combine, it passes off unoxidized. In order to produce perfect combustion, the volatile portion of the coal that is set free by the first application of heat must be brought into that part of the furnace which is at or above the oxidizing temperature, and simultaneously mingled with sufficient air to cause complete oxidation.

With a furnace so constructed that these results could be effected, the problem of getting the heat into the water in the boiler would be much simplified, since the efficiency of the heating surfaces would not be impaired by the presence of soot.

Thus we see that neither condition of maximum efficiency was in any way approximately fulfilled in the case described by the writer of the article above referred to. He stated that the chimney had, before the use of mixed coal began, discharged large volumes of smoke. This condition alone is enough to destroy the efficiency of the boiler. He also states that previous to the time of using mixed coal, they had insufficient boiler capacity and that the result he gives can only be obtained with plenty of boiler capacity. It is evident from this that they have increased their boiler capacity since using the mixed coal. It is equally evident that in the first case they did not burn the coal. In a case of this kind the remedy is to so construct and manipulate the furnace that the combustible will all be burned. Then the difference in cost between the different fuels will be simply in the cost per pound of combustible.

In general, if the efficiency of a steam boiler regarding the cost of evaporating a pound of water is not what it should be, the first thing to do is to find if the cheapest kind of fuel that can be obtained, in proper quantities, and that is applicable to the conditions, is being used. If this is found to be the case, the next thing is to ascertain if it is all being burned. If this is found to be the case, then there is but one more thing, and that is, does the heat of combustion get into the water in the boiler, or does it go somewhere else, up the chimney or out through the brick work, or somewhere where it is not useful. When these three conditions are being fulfilled in the highest degree, then the highest efficiency has been reached. If they have not been fulfilled in the highest degree, then the efficiency is below the maximum.

Thus we see in the case cited in the article above referred to a gain was made at all three points: First, the hard coal screenings were cheaper per pound of combustible, which means more heat units for a given amount of money; second, by the change, owing no doubt to the changed conditions of boiler capacity, etc., combustion was made more perfect, which meant more heat units evolved; and third, the heat of combustion was more perfectly taken up by the water in the boiler, owing to the improved condition of the heating surfaces. Under these conditions, the result obtained is not at all remarkable. If combustion had been perfect in the first case, the result would have shown only the saving due to the difference in the cost of combustible per pound.

There is another and very good reason why this method will not revolutionize the firing of steam boilers. The quantity of hard coal screenings is limited. At no point other than shipping and receiving points of hard coal can they be obtained in any quantity that would supply even the smallest steam plant. At the largest shipping and receiving points they are to be had only in very limited quantities.

Duluth, Minn., is the receiving point of practically all the hard coal used in the Northwest. An attempt was made at one time to burn hard coal screenings in one of the plants of the Twin City Rapid Transit Company of Minneapolis and St. Paul, obtaining the supply from Duluth. The apparent result showed great economy, owing to the low prices of hard coal screenings. It was soon found, however, that the entire supply of this port was insufficient for one 3,000 horse power plant, and the scheme had to be abandoned.

Now, why will a person attempt to startle the world by making a statement that a result had been obtained which ought to revolutionize the great industry of firing steam boilers, when on its very face the statement shows that the conditions were not properly dealt with?

If all questions of fuel economy were taken up as they should be and figured out on some such line as herein set forth, there would be fewer wild statements about phenomenal results being obtained.

The question of fuel economy is one that is well worth the serious consideration of any one interested, and is one not to be dealt with lightly, or in an unscientific manner.

W. COOPER.

797 State Street, Schenectady, N. Y., October 8, 1895.

The Echo Organ at Westminster Abbey.

This organ, presented by Mr. A. D. Clarke, has now been fixed in the triforium above Tennyson's monument, and is almost completed. The new instrument is electrically connected with the main organ, and the same engine supplies wind to both. The electric wires by which the connection is made are carried from the organ to the echo instrument incased in a small leaden pipe, while a larger pipe taken up through the roof gives the connection between the bellows and the echo pipes. A new keyboard has been added to the already complicated main organ (making five manuals in all), and there are electrical contrivances in great variety, by means of which couplings and stops are put into or out of action. Despite the distance separating the two instruments, the effect of touching the keys on the new manual is instantaneous, and the echo organ is as sensitive in responding as is the main instrument.

Patent—Infringement—Suit.

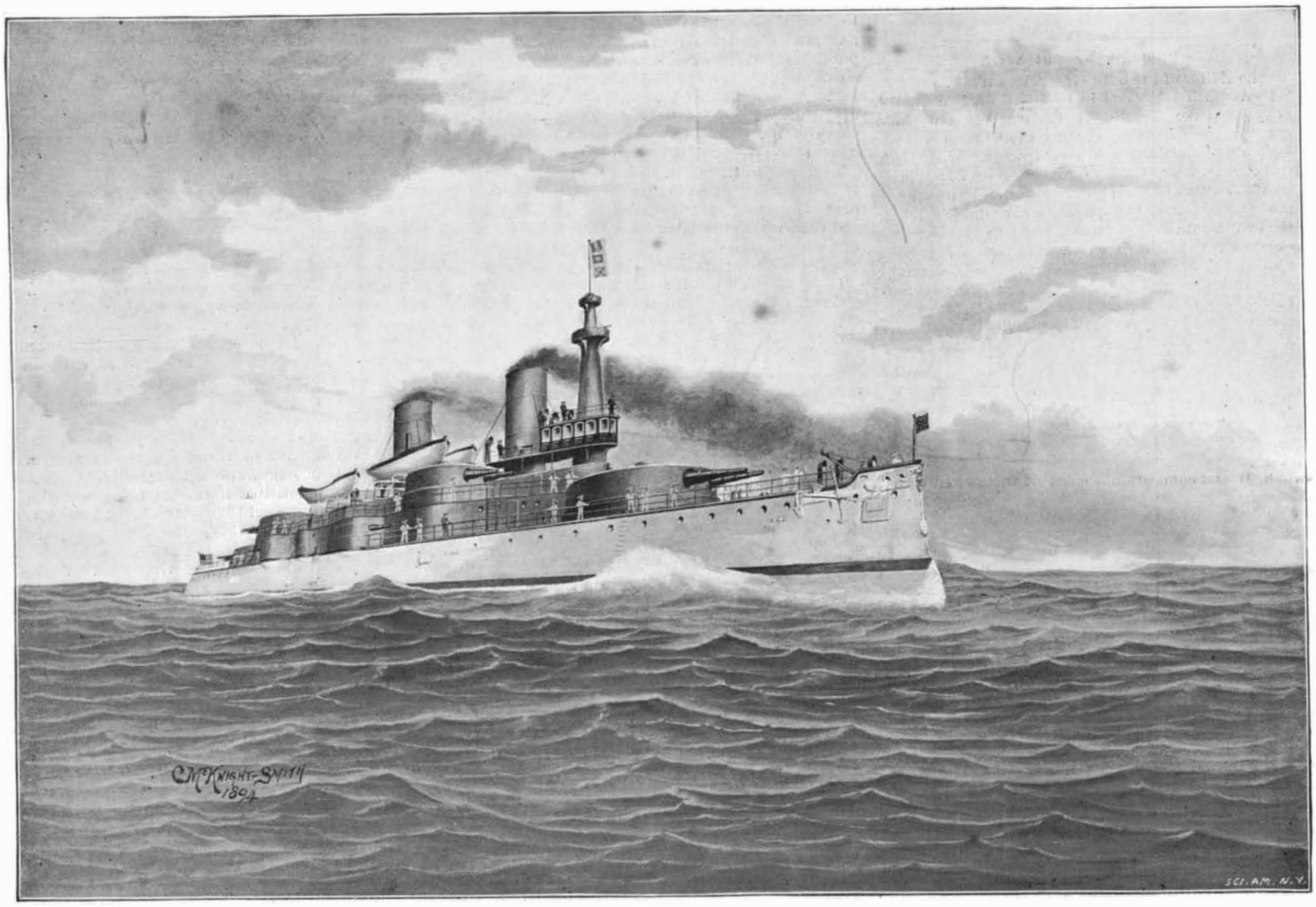
The case of Hall, receiver, vs. Traders' National Bank, recently decided by Judge Colt, of the United States Circuit Court at Boston, was a suit for the infringement of a patent which came up on a motion to dismiss the suit on the ground that by reason of the death of the defendant the suit had abated and cannot be revived. The judge said: "When a person wrongfully appropriates a patented invention, it is an invasion of the patentee's right of property, and the gains or profits derived from such piracy belong to the patentee. Because the machine in which the wrongdoer may have embodied his piracy may not belong to the patentee does not affect the real character of the act. I can see no difference in principle between a suit by the owner of a patent against an infringer to recover the profits he has made and a suit by the owner of land or of a mine against a wrongdoer to recover the value of timber or ore taken. I cannot assent to the proposition that the profits actually made by an infringer, for which recovery is sought by a bill in equity, are the same as damages in an action of libel, slander, diversion of a watercourse, trespass in breaking up meadow or pasture land, and similar actions of tort. The former are the actual direct pecuniary benefits, capable of definite measurement, acquired by the wrongdoer; the latter are primarily the loss suffered by the injured party, where the wrongdoer realizes no pecuniary benefits, or only such as are indirect, indefinite, or rest in speculation, compromise or arbitrary adjustment. I am of opinion that the cause of action survives and the motion must be dismissed."—Bradstreet's.

Echo in Large Halls.

The British Architect says that the acoustics of the banqueting hall in the Glasgow Municipal Building are defective, so that, as it is reported, "the most practiced speaker cannot make himself heard over more than one-half its area." At the request of the city authorities, the city engineer held a consultation with a member of the Glasgow Institute of Architects, to determine what should be done to remedy the trouble.

The architect thought that it would be necessary to make important structural alterations in the room. The authorities said that they could not entertain this idea, and the city engineer tried his hand at a suggestion. He discovered that the ceiling was covered with slabs of fibrous plaster, suspended from timber framing, and that there was a hollow space under the platform. This construction, in his opinion, gave the ceiling the character of a drum, and he advised lining the back of the plaster slabs with silicate cotton. For a similar reason, he advised filling up the space under the platform. These suggestions have been carried out, and we are told that the acoustic quality of the room has been perceptibly improved. It seems strange that a room with a resonant ceiling should be acoustically bad, a vibrating ceiling hung in this way usually improving the acoustics, by its property of conducting sound, without reflecting it; but there were probably serious defects of proportion in the room, which might be sufficient to produce echo and noise which the resonant ceiling could not overcome.

Whether lining the ceiling with slag cotton would improve the matter appears to us extremely doubtful. The resonance of the ceiling would unquestionably be advantageous. Its tendency to produce an echo, which is a totally different thing, would be, so far as it existed, injurious. To line the ceiling with a mass of fibers would check such resonance as it might possess, and would not, so far as we can see, diminish in the least any disposition that it might have to produce an echo. In the same way, the hollow space under the platform would be, and was probably intended to be, acoustically valuable, through the reinforcement which the vibrating mass of air in it, or the elastic walls inclosing it, would give to the speaker's voice; and to fill it up with dead material seems to us a very strange proceeding. What city engineers may think on such subjects we cannot say; but architects should keep in mind the golden rule, that resonance, such as is to be obtained by thin, elastic linings, or even by masses of air judiciously distributed, is a thing to be sought in designing rooms for hearing music, or for public speaking; while echo, such as is produced by hard, unyielding surfaces, is to be avoided as much as possible. Every architect who has ever designed a music room for a private house knows how greatly the effect of music is improved by lining the walls of the room, and if possible, the ceiling, with thin wooden paneling; and every layman who has ever bought a piano must have noticed what depth and richness is given to the tones of one played in the dealer's wareroom, by the sympathetic vibrations with which the strings of the surrounding instruments respond to the playing. For twenty centuries, at least, architects have sought in various ways to secure similar resonance in large rooms, understanding thoroughly the advantages to be derived from it. The Gewandhaus at Leipsic, reputed to be acoustically the most perfect music hall in the world, owed its quality to the fact that it was surrounded by thin partitions, set at a little distance from the main walls of the building, which, by their own elasticity, joined to that of the mass of air between them and the walls outside, provided the resonance which experience has shown to be indispensable. In the same way, La Scala Theater, at Milan, one of the largest, and acoustically the most perfect, of all European theaters, was lined throughout with thin woodwork. The ancient Greeks, to secure resonance without the use of woodwork, placed under the seats of their theaters earthen pots, with the mouth turned toward the stage, the vibrating mass of air in these serving to reinforce the sound. On the other hand, rooms in fireproof buildings, surrounded on all sides by hard, rigid masses of masonry, are very apt to be acoustically bad. Even where the large rooms, by careful study of their proportions, are successful, the smaller rooms, which cannot be so proportioned, are in such buildings almost always intolerably noisy. So far as the Glasgow banqueting hall is concerned, it is, of course, impossible to say what may be the cause of the trouble; but we venture to predict that checking whatever resonance the ceiling and the space under the platform may possess, will do little to ameliorate it.—Amer. Architect.



THE UNITED STATES BATTLE SHIP INDIANA.

The Fireless Locomotive.

On the line of railway from the heart of the city of Marseilles to the necropolis in the quarter of St. Pierre, 1·86 miles long, 2,394 feet of which is a tunnel, fireless locomotives are employed. These consist of a cylindrical receiver charged with warm water at a maximum pressure of 227·5 pounds per square inch. At the end of a run, says the Railroad Gazette, this drops to from 43 pounds to 71 pounds. The water is then reheated to 203° C., corresponding to 227·5 pounds pressure by steam from the generators at the central station. The cylindrical warm water receiver is 10 feet by 3·8 feet, holding 550 gallons and about 21 cubic feet of steam. The steam from the generators is equally distributed throughout the warm water by means of properly arranged pipes. It is condensed after being used in the cylinders in a condenser over the receiver consisting of 1,154 tubes, representing a cooling surface of 538 square feet.

THE largest bell in Japan, that in the temple at Kioto, is twenty-four feet high and sixteen feet in diameter across the rim.