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Improved Water Grate and Steam Generator.

Water grates are not, by any means, a novel idea. It was seen long ago that if water could be introduced into the hollow bars used in grates, that it would not only prove a protection to the bars from the effects of heat, but would also render the grate a more or less effective heating appendage.

The invention delineated in the accompanying engraving, it is claimed, is much more effective than those which have preceded it, and testimonials from those who have employed the device in connection with the boilers of stationary engines and locomotives, certify to its durability, and also to large saving of fuel through its use.

It is claimed—and these claims are sustained by the testimonials referred to—that the economy of fuel secured is more than 15 per cent where the grate alone is used, and from 25 to 30 per cent when both the grate and generators are used together.

Fig. 1 is a perspective view of a boiler with the improvement attached, in which A is the grate and B the steam generators. A top view of the grate is shown in Fig. 2, portions being broken away to show the tubular form of the grate.

Water enters the grate through the pipes, C, Figs. 1 and 2, the direction of the flow being indicated by arrows, and finally emerges in the form of steam through the pipe, D, Fig. 1, which conveys it to the steam space of the boiler.

The generators, B, Fig. 1, are corrugated cast-iron boxes, having connection at the bottom with one end of the outside grate bars, and being connected at the top with the steam space of the boiler through the pipes, E. The generators have also rectangular openings, as shown, through which the heated gases of combustion pass, so that both sides become effective heating surfaces.

Blow-off cocks, F, are supplied to both the grate and the generators, by which the sediment may be removed as often as necessary.

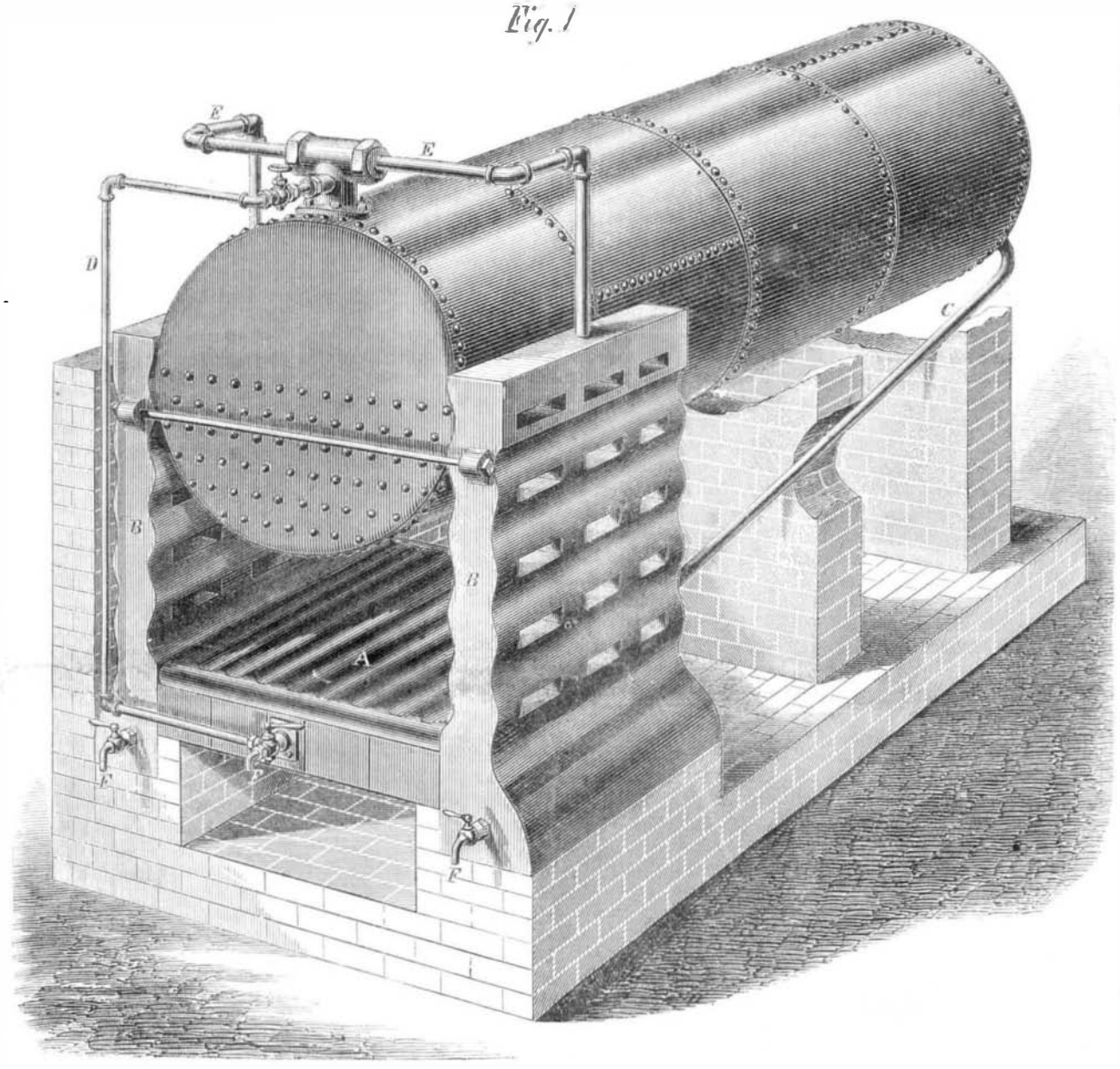
It is said that by making sections of the pipes, D and E, of glass, the circulation is shown to be perfect.

It is claimed that besides the durability and economy above mentioned as being secured by this construction, the following advantages are also attained, viz., increased heating surface; impossibility of cracking by expansion, as the grate and generators are only attached to the boiler by the pipes: the grate being fed from the bottom of the boiler, receives water constantly, as fast as the external heat converts the water into steam: also the grate is always kept so cool that no clinkers can adhere to its surface.

The grate is cast by a peculiar method which secures uniformity of thickness. The generators are also cast in single piece, and their use obviates the necessity of fire-bricks.

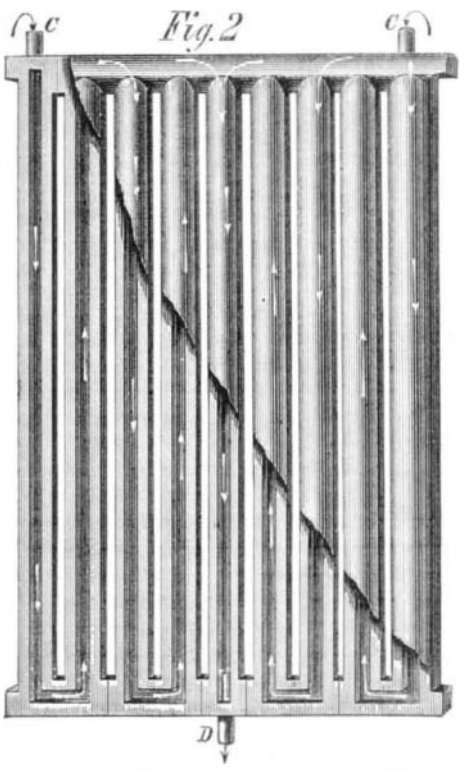
The patent on the water grate bears date Nov. 19, 1867, and that on the steam generator is dated March 24, 1868. Portions or the whole of these patents will be sold. For further information address R. L. Walker & Co., Globe Village, Mass.

Fig. 1



WALKER & CO.'S WATER GRATE AND STEAM GENERATOR.

Fig. 2



THE BALTIMORE OYSTER INDUSTRY.—In no country in the world is the oyster so popular an article of food as in ours; and our large inland states and territories are populated with men of like passions with ourselves of the seaboard States. What wonder, then, that the packing of this most nutritious of shell fish is a large and important industry, indeed one of the largest, in Baltimore? The oyster beds are chiefly in the Chesapeake river and its tributaries, and the annual crop is about 25,000,000 bushels, taken from beds covering 3,000 acres. The capital employed in the canning and preserving trade is estimated at $10,000,000; and the oysters dredged, canned, and packed, are sufficient in quantity to feed 20,000 persons.

How Eyes are Made.

"What do we think of this fellow?" asks the oculist of his client. "Study his features, his look, and say frankly what you think." "He looks well enough," answers the other, laboring usually under some little emotion. "Well, Jean, reveal your secret to this gentleman." Whereupon Jean introduces a knitting needle under his eyelid, removes his eye, places it in the hand of the astonished spectator as unconcernedly as though it were a shirt stud. How is it possible to resist such a demonstration? These gentlemen charge from forty to fifty francs for an eye. The manufacturer of the Rue du Temple has an entirely different way of doing business. He is generally a man pretty well informed; simple, polite, a little of an artist, a little of a workman, and a little of a tradesman. He scarcely employs either apprentice or assistant, except when he receives a good order from some naturalist for animals' eyes for his collection. All day long, seated at a table at one end of his workroom, he works by the light of a spirit lamp. Before him are arranged, in either cakes or sticks, the materials used by him in his profession. He takes a little enamel, melts it, and, by the aid of a blowpipe, blows it until it becomes a small ball at the end of the instrument. This ball is destined to represent the white of the eye. He next takes some more enamel, which is colored this time, and lets a drop of it fall upon the summit of the *cornea*.

Gently heating it at the flame, it spreads out in a round spot, and eventually becomes flat, and resembles the iris. A darker drop of enamel placed in the same manner in the center of the iris imitates the pupil. The ball is now detached from the blow-pipe, cut to an oval shape, and smoothed at the edges, so that on introducing it beneath the eyelid it may not wound any of the smaller nerves. These eyes cost no more than from twenty to twenty-five francs, which one can quite comprehend, as there is neither heavy rent to pay, nor the wages of a liveried cyclops.

The manufacture of artificial eyes is both difficult and tedious. It suits alike both men and women, and many of the latter succeed well in it; it is, moreover, one of the best remunerated of art industries. Most of the work-people are paid by piece-work; that is, so much per eye, varying from ten to fifteen francs, and a clever workman will turn out his eye per diem. Others receive from the large manufacturers a share of the proceeds arising from the sales of eyes manufactured by them, and have to take back any eyes not approved of by the customers. These they put on one side to serve for their stock in trade when they commence business on their own account.

One of these collections furnishes a somewhat curious sight. Reposing upon wadding at the bottom of a drawer are several scores of eyes, ranged side by side, and exhibiting a singular variety of expression. Some are small, others large; some black, others blue, hazel brown, light brown, bluish, and greenish gray: nearly all are brilliant; all have a fixed stare—all are, in fact, looking you through. On one side are laughing children's eyes, next to them the liquid-looking eyes of young girls, the languid eyes of middle-aged women, eyes with an amiable or sinister expression, severe official eyes; then come the old men's eyes, slightly filmy; and in a corner are the worn-out eyes—eyes that have been already used, and have been returned by the customers as

models to make other eyes by. The enamel eye, after being exposed to the action of the atmosphere for some months, loses alike its color and its luster, and becomes opaque-looking; a thick, dingy coating of solidified humors spreads over its polished surface, and it has a glassy look, like the eye of a dead person. "Touch them, you will do no harm," says the oculist to visitors, just as though it was a collection of coins or minerals they were inspecting.

ENAMELING WOOD WORK.

[From The Building News.]

We have very considerable doubts as to whether polished paint may be considered in good taste when used for the interiors of drawing rooms, or, in fact, of any room. There is a want of repose, and a garishness about gloss colors, which are scarcely compatible with that quietness and repose so necessary to the perfect satisfaction of the educated eye. Polished glass is beautiful, and never out of place; the same may be said of marble, of gems, and of all steel work or instruments. With all these, polish is the one thing needful to develope their beauty and finish, and, in fact, is a necessity of the material. This is so self-evident that we never for a moment doubt its propriety or imagine it would be better otherwise. Fitness, beauty, and utility are a consequence of the polish in all these cases, and therefor proper and right from every point of view; but the same reasoning will not apply to polished paint, that is to say, plain tints of colors. Of course, imitations of woods and marbles may be polished with propriety and without offense to good taste, simply because we expect to see them so, and they would not be finished if left unvarnished and unpolished. But it is otherwise with plain colors, which, when glossy, have too much the look of the japanner's shop or the tea tray business. These remarks apply principally to that so-called enamel work which is produced by merely painting the work and finishing it with varnish, when, as a matter of course, it very soon becomes discolored; and even when first done it is a mistake in name and execution, and a gross offense against good taste. The best enamel work—of which there is but little done in consequence of its great cost—is free, in some measure, from the objections urged against the common work. Its manipulation requires so much patience and care that it is a very difficult matter to find men who have the qualifications requisite for preparing such fine work, and therefore it is very rare to see a really good job. In getting up enamel work, much care is requisite in the selection and use of the material required. The filling-up color, which forms the body of the enamel, is of the greatest importance to the ultimate success of the work. Of this material there are several kinds manufactured—black, brown, and yellow, for coach painters, japanners, and others; but for use in interior decoration we prefer to use the white lead filling, as we can, by adding the necessary staining colors (which do not affect the properties of the enamel), form a solid body of color of the same tint, or nearly so, as that with which the work is required to be finished, and thus do away with the objections which may be urged against the black or dark-colored filling. For it will be evident to the plainest comprehension that if work which has to be finished white, or with very light tints of color, be filled up with dark-colored filling, that the number of coats of paint which will be required to obscure or kill the dark color will be so many that there will be danger of the work becoming rough and uneven in parts—at all events there can be no question that work which is left with a smooth, even surface, produced by rubbing alone, must be much finer in texture than any that can possibly be left by the brush. The white lead should be ground stiff in turpentine, and about one fourth part of the ordinary white lead, ground in oil, added to it, in order to prevent the enamel cracking, which it has a tendency to do, except there be some little oil mixed with it. A sufficient quantity of polishing copal or best carriage varnish should now be added to bind it so that it will rub down easily, which fact cannot be properly ascertained except by actual trial, inasmuch as the drying properties of varnishes vary, and other causes influence the matter. If there be too much varnish in the stuff the work will be exceedingly difficult to cut down, and if too little, it is apt to break up in rubbing, so that it is always the safest plan to try the enamel color before commencing anything important. The color, being properly mixed, should be laid on the work in the ordinary manner, using it rather freely. It may be as well to state here that no filling should be put upon new work without the same having had two or three coats of ordinary oil paint, nor on old work without its having one coat. This gives a key for the filling to bind to. Successive coats of the filling should now be laid on the work until there is a sufficient thickness to cut down to a level surface, filling up the whole of the indentations and undulations of the panel. One day should intervene between each coat, in order to allow it to harden in some degree. When a sufficient number of coats is put on (which number will, of course, depend upon the state of the work to be filled up), it should stand for a fortnight or three weeks, until it is thoroughly hard; it will then be ready for cutting down, which is to be done with felt, ground pumice-stone, and water. The felt used should be such as the marble masons use for polishing marble, which varies in thickness from one eighth to half an inch, and about three inches square. This should be fastened by the aid of patent knotting or other resinous gum, to square pieces of wood of the same size, but one inch thick, so as to give a good hold for the hand in using. These pieces of wood, covered with felt, may be made of any size or shape, to fit molded surfaces or other inequalities. The pumice-stone to be used should be of different degrees of fineness, and should be carefully selected, so as to be sure that it is free from any foreign substance. It is sold ready ground, but in situations where it cannot be conveniently got, it may be prepared from the lump, by grinding or crushing with a stone and muller, and then passed through fine sieves or muslin; by using these of different degrees of texture the ground pumice may be produced of different degrees of fineness. Except great care be exercised in this matter, it will be found that particles of grit will be mixed with it, which in using, get on to the work, and make deep scratches, thus causing endless trouble and annoyance, besides spoiling the work. The greatest care is also required in keeping the felt clean and free from grit. Many workmen are careless in this matter, and when working set down the felt on the step-ladder or floor, and thus particles of sand or grit get upon it, and so mischief is done.

In cutting down, it is best to use a piece of soft lump pumice stone to take off the rough parts. The felt and ground pumice should now be used with water, the work should be wet with a sponge, and the felt soaked in water, and then into the powdered pumice, and the work rubbed with it, keeping it moderately wet, and rubbing with a circular motion, and not straight up and down and across, with a light touch, using only just as much pressure as will cause the pumice to bite, which will be very clearly felt while the hand is in motion. Much care and patience is required to do this properly, for if the pressure be too great it forces the pumice into the body of the filling color, and scratches it instead of cutting or grinding it fairly down. No hurry will avail in doing this work, it must have its time; hurry only defeats the end in view, and often causes much unnecessary labor. A scratch, caused by want of care and too much haste, will often throw the work back for days, and involve the cost and labor of refilling. We find in practice that the purpose is best answered by using the pumice stone, the coarser kind first, then the medium, and finishing with the finest last. It will be found advantageous to let a day elapse between the rubbing, for when the surface is cut down the filling will in all cases be softer underneath, and if it be allowed to stand for a day, the newly exposed surface gets harder, and of course rubs down better in consequence. The pumice stone should be well washed off the work occasionally, in order that we may see what progress is being made, and if it require more rubbing or not. If, while in progress, it be found not to be sufficiently filled up, it may have one or more coats of filling after it has been roughly cut down, and before much labor has been spent upon it.

When sufficiently rubbed down with the pumice stone—that is to say, when it has been cut down to a fine, level, and uniform surface, the work should stand for a day or two to harden. It will now depend entirely upon the work, as to whether it must be polished upon the filling, or whether it will have to be varnished and polished. If the filling be of the right color, and has rubbed down of one uniform tint, we prefer it to be finished in this state, because, in the first place, it will have a surface and texture which cannot be got by any other means. Finished in this state there is an absence of that glare-polish—if we may use the term—which is inseparable from varnish polish. It has all the uniformity of surface and evidence of finish, without that appearance of varnish which is so objectionable, and therefore we prefer it to any varnish polish. After it has stood a day or two, the work, if it be intended to be left in the state we have been speaking about, must be polished in this wise: Take a clean felt and rotten stone, either in oil or water, and with this rub the work as before, until the polish begins to appear; then take a boss (*i. e.* a ball of cotton wool inclosed in fine silk), put the rotten stone upon this and keep rubbing with the circular motion until the polish is uniform and equal all over. The rottenstone must now be carefully cleaned off; if it be in oil, clean off with fine flour; if in water, with sponge and wash leather and water, taking care not to scratch. A clean damp chamois or wash leather will now be required, which must be held in the left hand, leaving the right perfectly clear. Now use the ball of the right hand, press gently upon the panel, and draw it forwards or towards you. If this be done properly, it will bring up a clear polish upon the work. The hand should be kept slightly damp by drawing it across the leather almost every time the hand is drawn forward. If this be done effectually, a rustling sound will be produced while the hand is in motion; if this be so, the polish will be sure to follow. The polish thus produced on the filling alone will be of the kind we have spoken of above, and will not be at all objectionable to even the most fastidious taste; but if the work has to be finished with a brilliant luster and to a high degree of polish, it will, after being cut down with the pumice and felt, have to be coated with two or more coats of the best polishing copal varnish, having a quantity of the best flake white from the tube; this should be mixed with the varnish in sufficient quantity to form a creamy mixture, with which the work must be coated—one, two, or three coats, as may be desirable. This should stand for three or four weeks, until it becomes hard, for the harder it is, the better it will polish. It must then be cut down with felt and the finest ground pumice stone in water, and polished with the rotten stone, as before described. By this means a bright and brilliant polish may be obtained, of a very enduring nature. The same process will of course answer for all varnished imitations of woods and marbles, and all work which will admit of the application of oil varnishes.

IN Philadelphia there is a small blacksmith's shop, the bellows of which is operated by dogs. The bellows is connected with a wooden wheel box, which is kept revolving by the motion of the dog, something after the manner of a treadmill.

Birmingham Bell-Making.

In medieval times it was accounted a less difficult matter to cast a church bell than to convey it any long distance from the foundery to the steeple; and it was a common practice to cast these cumbrous articles in the immediate neighborhood of the church or cathedral in which they were intended to be hung. So late, indeed, as the year 1762, the great clock bell at Canterbury was re-cast in the cathedral yard. The early bell-founders were consequently an itinerant fraternity, roving through the length and breadth of the country, but seldom failing to pitch their tent in or near some cathedral town. That they were well skilled in their craft the Sunday chimes in many an antique temple bear ample witness, and a leading bell-founder of the present day does them the justice to remark: "One law of nature, indeed, they were acquainted with, which modern bell-founders in too many cases ignore—that a given weight of bell metal can only sound a very narrow range of notes with good effect, and that if bells are cast thinner to produce deeper notes, the quality of tone must suffer."

The commencement of bell founding as a staple of Birmingham industry appears to have dated from the middle of the last century. It is at least recorded in the local annals that "a foundery opposite the Swan at Good Knaves' End" supplied a peal of bells to Harborne and two other neighboring churches, about the year 1760. "Chimes" were cast at another foundery twenty years later, but from that time down to a very recent period the production of church bells became an obsolete industry in the "hardware village." Within the last half dozen years, however, Messrs. Blews and Sons have successfully revived the trade, and Birmingham bells promise to become as famous in the future as they have been in the past—thanks to the liberal and progressive enterprise of this well known firm.

Let us now describe the process of casting a peal of bells, as recently witnessed at the establishment referred to. The peal comprised six large bells for a church in New South Wales, which were cast in the same pit with three other bells for Mexico, the weight of the entire casting being about three and a half tuns. Bell metal is compounded of three parts of copper to one of tin, this proportion giving the greatest density of metal. Mr. Blews is, however, of opinion that the true chemical combination would be six atoms of copper to one in tin, or in weight three and one fourth to one. A less quantity of metal than is due to the caliber of the bell, though giving the same note, produces a meager, harsh sound; consequently, the superior dignity of tone in some old bells is ascribed to a greater weight of metal being allowed for the same note than would accord with modern ideas of economic production. Four tuns of bell metal is seething at a white heat in the furnace when the process of casting commences. At a given signal, an aperture at the end of the furnace, which had been stopped with fire clay, is opened by a workman armed with a long tamping bar, and the white fluid flows along channels of sand to the pit containing the molds.

There are two ways, Mr. Blew tells us, of making bell molds. The core in both cases is made of a brickwork or cast-iron cone, covered with molding clay, "swept" into the shape of the interior of the bell by a wooden "crook" fixed to a spindle set up in the middle of the core. The advantage of an iron core is that it can be lifted into a furnace to dry, instead of being dried by the application of internal heat, as is necessary in the case of the brickwork core.

The old method is to make a clay bell on the core by means of another crook, and when this is dry, to make the outside mold on the top of it. This mold has hair and hay bands, or (in large castings) bands of iron intersected to make it hold together, and lift off when dry. The clay bell is then knocked to pieces, the mold dropped down again over the core, and weighted with earth in the pit in which the bell is cast. The metal is then poured in at one hole at the top, another aperture being left for the escape of air. In the newer process no clay bell is made. The mold is an iron case lined with clay, and swept out internally to the outside shape of the bell. The "wires," or ornamental rings round the bell, are made in both cases by the second sweep, the letters and devices being stamped in the soft clay. These iron copes can be bolted down to a plate under the core, and need not, therefore, be sunk so deep in the ground, if sufficient care be taken to get an adequate "head" of metal above the bell, which is a very essential consideration. The process of casting in the case under review occupied about ten minutes, but a couple of days at the least would be required for cooling. The tenor bell of the peal for New South Wales had a happily chosen legend: "We sing the Lord's song in a strange land."

Church, school, plantation, factory, and ship bells, still closely adhere to the medieval type, and they vary in weight from fifty-six pounds upward. Other descriptions of bells are made very largely in Birmingham, by a goodly number of bell founders. Railway and dinner bells, from four to seven inches wide at the mouth, with wooden handles attached, musical hand bells for village ringing clubs, cattle, horse and sheep bells, with the ordinary house bells, are among the principal varieties, and the number produced is simply prodigious.

Some curiosities in bells are reported by the manufacturers, of which a few may be briefly noticed. Tiny house bells, ¾ in. to 1½ in., are largely made for the African market, where they are used for purposes of barter. Sleigh, dray, and caparison bells—which are small circular articles, with an iron ball cast inside—are extensively produced for Canada and the East India market. An order was not long since executed for 10,000 green, bronzed, and lacquered house bells, which now adorn the iron palace of a West African prince.