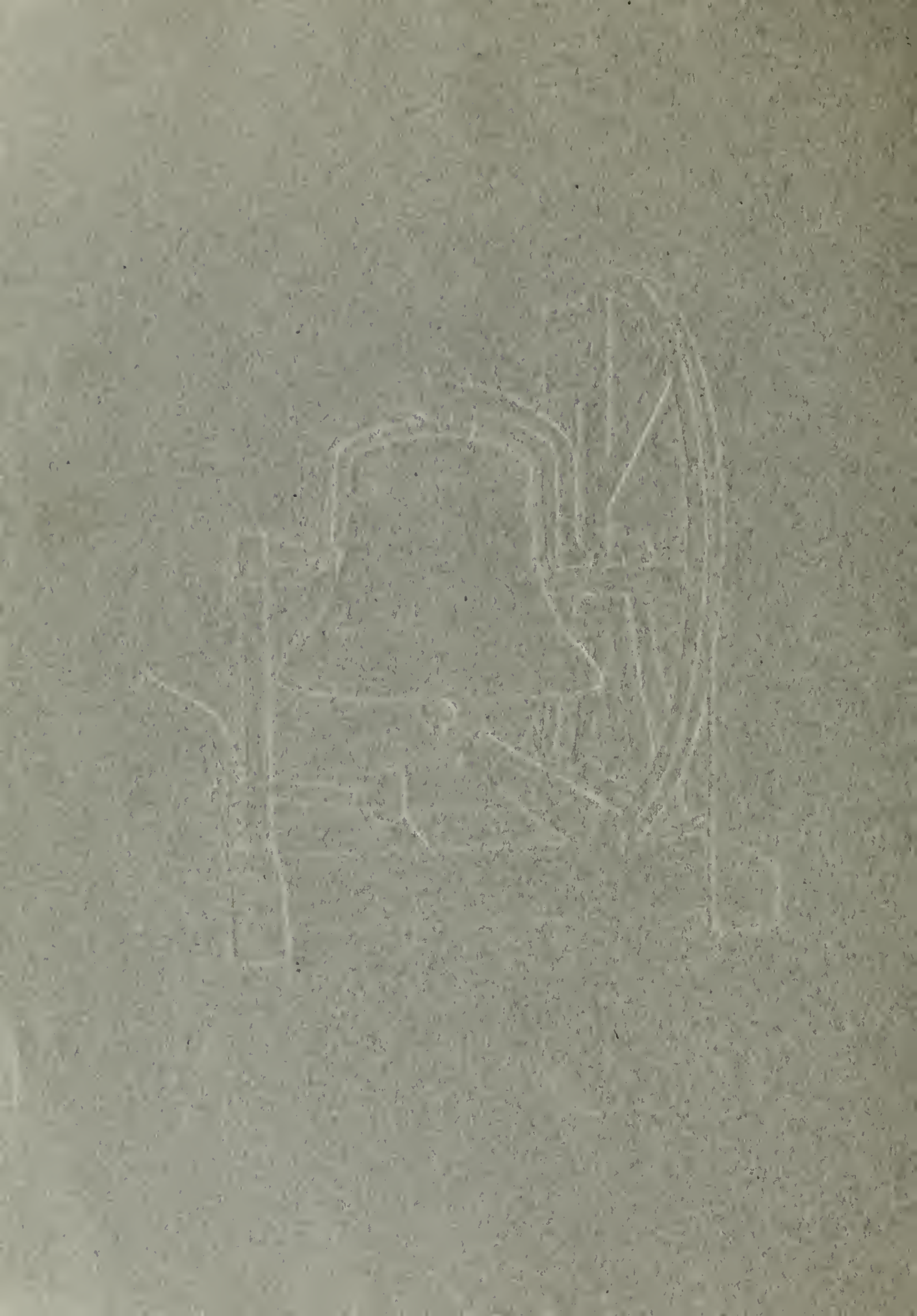
MENEELY & COMPANY

Book on Bells

WATERVLIET, WEST TROY
NEW YORK, U.S.A.



CHURCH BELLS, PEALS AND CHURCH BELL CHIMES

ALSO BELLS FOR ALL KNOWN USES, WHICH ARE COMPOSED OF THE HIGHEST GRADE OF GENUINE COPPER AND TIN BELL-METAL.

MENEELY & COMPANY
WATERVLIET
WEST TROY, N.Y., U.S.A.

THE FOUNDRY OF 1826

From an old woodcut

In 1826 my grandfather, Andrew Meneely, began the manufacture of mathematical and surveyors' instruments and bells in modest buildings which were located on a portion of the site now occupied by our foundry. As the years passed, more and more attention was given to the founding of bells, and the manufacture of other articles was finally abandoned.

Many of his instruments made more than three-quarters of a century ago are still in use and, with the thousands of bells of his manufacture that are sounding out from church towers, bear witness to his earnest and successful efforts for quality in his products.

My father, Edwin A. Meneely, became a partner in 1850, and the following year, after the death of my grandfather, formed a partnership with his brother, George R. Meneely, as Andrew Meneely's Sons, — in 1863 as E. A. & G. R. Meneely, and in 1874 as Meneely & Co.

In 1874 I began my apprenticeship My instructors were the best in their respective lines. Mr. George R. Meneely retired in 1876, and my father admitted me to partnership in 1880. After his death in 1886 I assumed the oversight of the business in all its branches. In January, 1908, a corporation was formed and I now have a most efficient corps of officers and assistants, one of them my eldest son (a Meneely of the fourth generation of bell-founders).

Those who have preceded me have left a most honorable record as business men, and the high reputation of their products is sufficient evidence of their success as manufacturers.

Between 1890 and 1895 I made the important discovery that the tone elements of bells could be accurately and absolutely determined with the aid of specially designed instruments, and that such bells, when intended for musical sets (chimes or peals), could be musically harmonized in themselves and with each other by mechanical processes and methods of testing, thus obtaining results never attained before. What has been accomplished in this class of work has been most highly complimented and particularly by many theoretical and practical musicians and tuners of national reputation.

While this is the oldest bell-foundry in the country, I believe that it is the newest and most modern in its practices, mechanical equipment, and scientific and special appliances necessary for the best workmanship and the definite determination of exact musical results. For myself and my associates in the business I can pledge that the highest grade of bells and fixtures (and this grade only and without equivocation of any sort or kind) will be shipped from this foundry.

ANDREW H. MENEELY.

THE FOUNDRY, ON THE ORIGINAL SITE, AS IT APPEARS NOW

THE OLD MENEELY FOUNDRY

ESTABLISHED A. D. 1826 BY ANDREW MENEELY

ANDREW MENEELY & SON, 1850 — ANDREW MENEELY'S SONS, 1851
E. A. & G. R. MENEELY, 1863 — MENEELY & CO., 1874

WATERVLIET, WEST TROY, N.Y., U.S.A.

IN presenting this edition of our catalogue we would state that the distinguishing characteristic of the Bells manufactured at our establishment consists of an unequaled combination of musical qualities, purity and beauty of tone and power. Our patterns are designed from exact mathematical formulæ, and the superiority of our bells is due, in a very considerable degree, to the perfection of the shape. Being cast with the aid of improved mechanical appliances, we are enabled to secure the desired tones with uniformity and success, and to supply bells we consider to be, in all respects, unrivaled.

Genuine bell-metal is a mixture of copper and tin of such proportionate parts as to most perfectly assimilate, the superiority of which as a sonorous metal has been demonstrated by centuries of use as well as by the results of comparative tests instituted under government direction. All the bells we furnish are manufactured from our special mixture of most carefully selected copper and best imported tin, and the materials we use will always be found to be exactly as specified in the guaranties we issue from time to time; we are perfectly willing to furnish, at any time, an affidavit covering all we claim in the said guaranties. We do not pretend to be able to compete in price with bells manufactured from any of the poorer, cheaper and brittle brands of copper, all of which will allow of the use of but a small percentage of tin (the more expensive of the two metals); neither can such bells compete with ours in the qualities that distinguish the best bells from those that are inferior.

Next in importance to the quality of the bell is the adaptation and security of the apparatus with which it is mounted, the construction of which should contemplate not only the mere idea of making the bell to sound, but also of effectively bringing out its *whole* sound with the least required labor in ringing; of rotating it with facility upon its vertical axis so that at pleasure a new part may be subjected to the blow of the clapper, and thus the liability of fracture, through long-continued ringing in one position, be

avoided; and finally, of persistently withstanding the strain caused by the momentum of the bell as well as the liability of becoming disordered through long use. These characteristics are pre-eminently combined in our MOUNTINGS; while we may say, particularly, concerning our ROTARY YOKE, that it is, in ALL respects, THE MOST DESIRABLE AND PERFECT ROTARY YOKE IN THE WORLD.

We have thousands of testimonial letters which cannot be published for lack of space and which would make the catalogue too bulky for practical use, and we are constantly receiving additional evidences of appreciation regarding the quality and character of our work. As a further evidence of the superiority of our bells we may be pardoned for the just pride we have in the knowledge that so many pleased purchasers are constantly recommending our work to others, thus demonstrating what can only be predicated of a superior article, that one makes sale for another.

Our bells are ringing from thousands of towers from the Atlantic to the Pacific, while their sale extends through the Dominion of Canada, Newfoundland, Alaska, the West Indies, South America and other remote parts of the world.

In the completeness of its facilities and equipment of appliances for turning out the finest bells at lowest possible cost, our establishment stands without an equal, as our plant is both the oldest and newest in outfit, with an accumulated experience and practical knowledge of Fine Bell, Peal and Chime manufacture unequaled by any others in America. Our Peal and Chime work is by far the most perfect and satisfactory in every particular.

Giving to our business most careful supervision, and personally testing each and every bell before making shipment, we can positively assure those desiring bells that the high standard of our work will be maintained, and, with this understanding, we respectfully solicit a continuance of public patronage.

All communications should be very carefully addressed to us, as follows:—

MENEELY & COMPANY
NOS. 1531-1541 BROADWAY
WATERVLIET, WEST TROY, N.Y.

CHURCH BELLS

FIG. 1

THE manufacture of Church Bells, as distinguished from bells used for other purposes, constitutes by far the greatest part of our business, and the manufacture of BELLS for whatever purpose utilized is OUR EXCLUSIVE business.

Bells classified as Church Bells are also used by Universities, Colleges, Schools, Chapels, Mills, Town and City Halls, Courthouses, Factories, etc.

Church Bell Mountings consist of Yoke, Wheel, Stands, Frame and Toller as here illustrated. These are not a part of bell weight. They are a separate charge at prices given below which must be added to the bell price. An Improved Stop is included in all such mountings for bells of 700 lbs. and heavier, without extra charge; also Steel Roll [illegible] lbs. and larger

BELL			MOUNTINGS		
Weight	Medium Tone	Diameter	Size of Frame Outside	Diameter of Wheel	Price of Mountings
400 lbs.	E♭	27 in.	3 ft. 6 in. by 3 ft. 5 in.	4 ft.	$30
450 "	D	28 "	3 ft. 6 in. by 3 ft. 5 in.	4 ft.	30
500 "	D♭	29 "	3 ft. 6 in. by 3 ft. 9 in.	4 ft. 4 in.	32
550 "	C	30 "	3 ft. 6 in. by 3 ft. 9 in.	4 ft. 4 in.	35
600 "	C	31 "	3 ft. 6 in. by 3 ft. 9 in.	4 ft. 4 in.	35
650 "	B	32 "	3 ft. 6 in. by 3 ft. 9 in.	4 ft. 4 in.	35
700 "	B	33 "	4 ft. 5 in. by 4 ft. 1 in.	5 ft. 6 in.	40
750 "	B♭	33 "	4 ft. 5 in. by 4 ft. 1 in.	5 ft. 6 in.	40
800 "	B♭	34 "	4 ft. 5 in. by 4 ft. 1 in.	5 ft. 6 in.	40
900 "	A	36 "	4 ft. 5 in. by 4 ft. 5 in.	5 ft. 6 in.	45
1000 "	A♭	37 "	4 ft. 5 in. by 4 ft. 5 in.	5 ft. 6 in.	45
1100 "	A♭	38 "	4 ft. 5 in. by 4 ft. 5 in.	5 ft. 6 in.	45
1200 "	G	39 "	4 ft. 10 in. by 4 ft. 9 in.	6 ft. 3 in.	55
1300 "	G	40 "	4 ft. 10 in. by 4 ft. 9 in.	6 ft. 3 in.	55
1400 "	G♭	41 "	5 ft. 3 in. by 5 ft. 0 in.	6 ft. 3 in.	70
1500 "	F♯	42 "	5 ft. 3 in. by 5 ft. 0 in.	6 ft. 3 in.	70
1600 "	F♯	43 "	5 ft. 3 in. by 5 ft. 0 in.	6 ft. 3 in.	70
1700 "	F♯	44 "	5 ft. 8 in. by 5 ft. 5 in.	7 ft.	80
1800 "	F	45 "	5 ft. 8 in. by 5 ft. 5 in.	7 ft.	80
2000 "	F	46 "	5 ft. 8 in. by 5 ft. 5 in.	7 ft.	90
2100 "	E	47 "	5 ft. 8 in. by 5 ft. 5 in.	7 ft.	90
2300 "	E	49 "	5 ft. 8 in. by 5 ft. 7 in.	7 ft.	100
2500 "	E♭	50 "	5 ft. 8 in. by 5 ft. 7 in.	7 ft.	120
2800 "	E♭	52 "	6 ft. 6 in. by 6 ft. 3 in.	7 ft. 6 in.	120
3000 "	D	53 "	6 ft. 6 in. by 6 ft. 3 in.	7 ft. 6 in.	130
3200 "	D	54 "	6 ft. 6 in. by 6 ft. 3 in.	7 ft. 6 in.	130
3500 "	C♯	56 "	6 ft. 6 in. by 6 ft. 3 in.	7 ft. 6 in.	140
4000 "	C♯	59 "	6 ft. 6 in. by 6 ft. 3 in.	8 ft.	150
4500 "	C	62 "	6 ft. 9 in. by 6 ft. 6 in.	8 ft.	160
5000 "	C	64 "	7 ft. 8 in. by 7 ft. 4 in.	8 ft.	180
6000 "	B	67 "	7 ft. 8 in. by 7 ft. 4 in.	9 ft.	200
6800 "	B♭	70 "	8 ft. 0 in. by 7 ft. 8 in.	9 ft.	230
7500 "	A	72 "	8 ft. 0 in. by 7 ft. 8 in.	10 ft.	260

If a Tower Clock is to be installed with bell or contemplated a little later on, then this fact should be stated when ordering bell, that we may properly arrange certain parts of the mountings to best accommodate the Clock Hammer, which we do without extra cost. The Clock Hammer is always a part of the Tower-Clock outfit. Every curve in the shape of a bell in connection with the proportions of thickness, height, etc., as to diameter has an influence on the tone-pitch and musical richness and is further influenced by the metallic composition; and we may say without fear of contradiction that much of the existing objection to church bells is due largely to the simple fact that many bell purchasers simply buy a "bell," regardless of REAL MUSICAL MERITS, at the lowest price named them, instead of buying one of the richest possible musical qualities, and which, of course, cannot be furnished at cut-rate price. The tones named on preceding page are termed "medium" because they are the mean between the highest and lowest which that weight is capable of producing, and hence a bell may have a slightly lower or higher tone than listed without detriment to its musical qualities or carrying power.

Our "Rotary Yoke" is made of the best machinery cast iron, and adjusted to bell with greatest care to make the oscillation of the bell conform properly to its weight. The smaller the bell the more rapidly it moves and the oftener it strikes. The rotary feature of the yoke is that it so holds and sustains the bell as to permit turning the bell around vertically at any time it is desired so to do, to cause the clapper to strike in a new place, thus diminishing the liability of cracking the bell.

The Frame, composed of the four base timbers, in the case of large bells, may be readily unjointed if necessary to get them into tower and there easily readjusted, and upon this frame are bolted the cast-iron Stands. The Wooden Wheels are composed of hardwood frame, rims of white pine, of the best mechanical design, and will last from thirty to eighty years with reasonable care; the large ones are so made that they may be taken apart (halved) to get into tower and there again joined in perfect order. The Tolling Hammer is of cast iron and works in an adjustable clevis, as shown in the illustration. Steel springs are in all bells of 100 lbs. and heavier, to prevent clapper rattling against bell.

Bell purchasers should bear in mind that no bell will do itself justice unless it is properly mounted. The principal reason for going to the expense and trouble of obtaining the sound from a bell by swinging it against its clapper instead of the much easier method of swinging the clapper against *it*, is that the motion of the bell imparts a pleasing wave to the tone which does not exist when it is struck in a stationary position, and hence, while the ringing of a bell has a cheerful sound, its tolling is mournful and monotonous. It will be seen, therefore, that unless a bell be mounted so that it may be swung properly and effectively, the full advantage to be derived from ringing it will not be realized, while the sound produced *may* prove even more undesirable than that of tolling.

SCHOOL AND CHAPEL BELLS

BELLS thus classified range in weight from 100 to 375 lbs., though the above title does not indicate the many uses for which these sizes are purchased — Schools, Chapels, Colleges, Academies, Mills and Factories, Plantations, Steamboats and many others. They are all mounted with "Rotary Yoke," to facilitate turning around vertically, exactly the same as Church Bells.

The Mountings consist of the Rotary Yoke, Iron Wheel, Iron Stands, Wood Frame and Rope Pulley (commonly called "Sheave") attached to side of Frame as here shown. Steel Clapper Springs are in all these size bells.

FIG. 2

BELL		MOUNTINGS	
Weight	Diameter	Size of Frame Outside	Price of Mountings
100 lbs.	17 in.	29 x 32 in.	$14
125 "	18½ "	30 x 32 "	14
150 "	19½ "	30 x 32 "	16
175 "	20½ "	32 x 37 "	18
200 "	21½ "	32 x 37 "	20
225 "	22 "	32 x 37 "	22
250 "	23 "	36 x 38 "	24
300 "	24½ "	37 x 40 "	26
350 "	26 "	37 x 40 "	28

Bells of 100 up to 375 lbs. are very penetrating in sound, and are heard to a distance apparently out of all proportion to their size or weight, ranging from one to four miles, according to atmospheric conditions. Absolutely the same high-grade metals are used, and same composition as larger bells, and fully guaranteed to be made with the same care and fidelity.

IMPORTANT NOTICE

In the foregoing tables of weights, tones, sizes, etc., the weight designates the pattern; the actual weight of the bell when cast is generally from one to two per cent more in the small to medium sizes. In the larger sizes the actual weight is from two to four per cent more than pattern weight.

The note named for the respective sizes is the medium between the highest and lowest practicable for that weight in SINGLE bells and by concert pitch.

The diameter named is a part of an inch more than the pattern size; the bell, therefore, is actually somewhat less when cast.

Please read carefully the directions for ringing bells and placing them in tower and the suggestions regarding arrangement of bell rooms, windows or openings to let sound out, etc.

BELLS FOR FIRE-ALARM AND TOWER CLOCKS

Fire-alarm Bells of small to medium sizes are well operated by hand power as thus hung. The overhead timber A is provided in building the tower — not a part of our outfit. It should range from 6 to 8 inches in thickness for bells from 200 and up to 1,500 lbs.

It is a very effective hand-power Fire Alarm Striker, permitting a rapid succession of strokes.

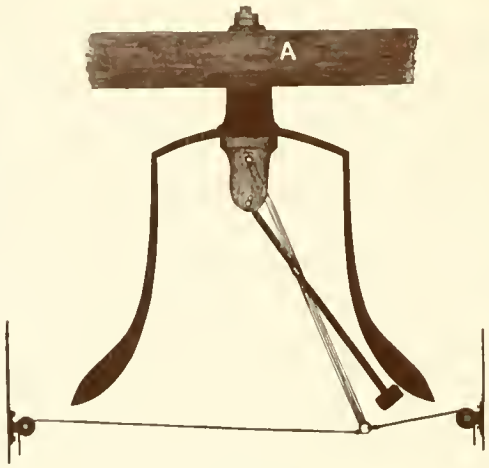


FIG. 6

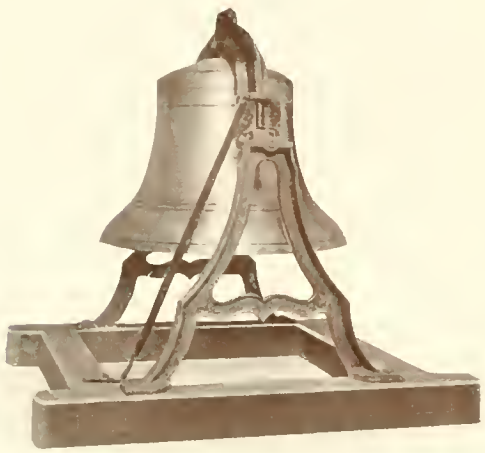


FIG. 12

In this style of mounting a Fire-alarm or Clock Bell the regular Church Bell Mountings are used excepting the Wheel and Toller, the bell being held rigid by the iron brace.

This is a most serviceable and reliable method where no overhead beam has been provided, as it provides striking surface correctly for one or more different hammers.

In this style the bell is suspended from an overhead beam in same manner as in Fig. 6, but the hand-power rope is attached direct to bottom end of Clapper, for which the "eye-hole" is provided, the rope being led to and over a pulley at ONE side of belfry. Any of these styles of hanging bell allows the use of Electric System Striker or a Tower Clock Striker or both at any time and without further expense.

FIG. 16

HINTS ON FIRE-ALARM AND CLOCK BELLS

BELLS used with electric fire-alarm system are struck on the outside by hammer forming a part of the electric fire-alarm striker machine, the bell being in most cases suspended as shown in our Fig. 16 illustration on preceding page. Due care should be exercised in setting such machines that the hammer shall strike the bell at its thickest part. A glance at Fig. 6 shows the section of a bell, the hammer indicating the thickest part; a higher or lower stroke on the bell is improper use and is outside the line of safety.

Tower-clock Hammers are also a part of the clock outfit and should be set so as to strike the bell at its thickest part the same as fire-alarm hammers. The timber to which bell is suspended is part of the tower, and should be selected and placed when the tower is being built; it ought to be of such size and so set in place that it will safely carry the proposed bell and afford the best arrangement for the operation of the Fire-alarm or Tower-clock Hammer. The beam set DIAGONALLY, ends in opposite corners, is undoubtedly the best way to place it. For bells not exceeding 1,000 lbs., such timber need not be heavier than 6″ x 8″; from 1,200 to 2,000 lbs. it should be about 8″ x 8″; for bells of 2,200 up to 3,500 lbs. it should be about 10″ x 10″; and for larger bells not exceeding 5,000 lbs. it should be about 10″ x 12″. We have specified the above timber sizes for the respective weight bells so there will be sufficient strength not only to support the bell but also withstand the strain of the striking hammer of the Fire-alarm Striker which delivers a very powerful blow.

Where no overhead beam has been built in the tower we recommend our Fig. 1 mountings complete, especially if the bell is to be used for such purposes as calling meetings, ringing for special occasions and other signals. Or Fig. 12 can be used and a Toller added to call meetings, ring signals, etc., and this method provides the bell hung rigidly to allow the Striker being set at any suitable point in the belfry. In numerous places the best results are obtained by having SEVERAL bells, each a different size and located at such places as will provide the most effectively heard alarm. In others one large bell is used in the tower of the Town or City Hall, it doing both fire-alarm and clock duty. Each community must decide as to which will likely serve their purpose best.

It may be said frankly that in general MUCH MORE IS OFTEN EXPECTED from a fire-alarm bell than any bell can do, as many inquiries come to us asking price on a bell that will be heard in any kind of weather, at all hours and wake every sleeping fireman under the most adverse conditions, and if it fails to do that the bell is blamed and called a failure. No foundry can honestly claim to supply a bell to do all that, since it is IMPOSSIBLE, as any kind or amount of metal, however manipulated, cannot be made to meet such requirements. Neither can two bells of the same size and of same weight be made to have different tones, for to secure different tones they must be different in size and weight. It is also true that a 1,000-lb. bell will be heard almost as far as one of 1,500 lbs., and a 2,000-lb. bell will sound almost if not quite as far as one of 4,000 lbs. The various noises of a locality as well as the acoustic conditions have something to do with these things, and so the selection of the best possible fire-alarm bell size for any locality is to some extent guesswork until the bell is received, put up and tried, and so the best possible selection is, take the largest that can be reasonably afforded.

LIGHTHOUSE AND FOG-SIGNAL BELLS

BELLS FOR LIGHTSHIPS, WARSHIPS, CRUISERS, STEAMBOATS, BUOYS, ETC.

Bells of this class we make to order and with or without embellishments, relief designs of historical or allegorical character. To enable us to make price intelligently a correctly drawn and clearly specified design of the desired embellishments should be submitted to us. A carefully drawn design is also required showing how the bell is to be hung in place and what kind of TOP the bell shall have to fit the Hanger.

SOME OF THE KINDS OF VESSELS WE HAVE SUPPLIED WITH BELLS

The photograph of the above plate is copyrighted by G. N. Harden, Rockland, Me.

The above plate is from photo. used by permission of Fore River Shipbuilding Co.

OUR IMPROVED STOP

IN many localities different churches arrange for having their bells rung to sound two strokes in rotation after "setting the bell," *i.e.*, bringing it full mouth up. To thus control it and prevent its being turned entirely over, we furnish with all our Church Bells of 700 lbs. and over a "Stop" attached to rim of wheel and a corresponding one to the frame below, which come in contact when the bell is about mouth up, and the man ringing it can thus easily hold it securely in position and on releasing his hold allow it to swing back, and his next pull brings it up again against the "Stop," thus producing two strokes of the bell without its turning completely over. A little careful practice of this will soon yield excellent proficiency.

INSCRIPTIONS

Any suitably worded inscription, of reasonable length, will be placed upon bells without extra charge, as a compliment; also a neat cross when desired. Emblems or Relievo Designs are an extra charge according to the work of designing patterns of the same.

TOLLING HAMMERS

With bells of 400 lbs. and heavier for churches we include in the mountings a Toller, shown in Fig. 1, page 5. This is very desirable to use for tolling at funerals and to strike the Angelus, or for other signals. The sound emitted is, of course, not so loud as when swinging the bell, nor can it be. This Toller is adjusted in a cast-iron clevis and any side blow may break it off; hence its rope should be carefully secured by hanging it on a hook on the wall, that it may NOT BE PULLED at any time while the bell is being swung, for swinging the bell against it will most likely break it off, and this cannot happen by regular, proper usage.

CLAPPER SPRINGS

These springs are in all bells mounted in either Fig. 1 or Fig. 2 style and are held in place by a bolt or bolts passing up through the top of the bell. The spring arms are always held in the path in which the clapper swings, allowing it to strike one blow and then holding it away so that the tone vibration is uninterrupted and avoiding clattering of the clapper upon the bell. The spring ends are sheathed with leather to obviate the noise of the contact of the clapper against the spring, and these leather pieces should be replaced by new ones when necessary.

OUR NEW ROTARY YOKE

THIS Yoke is of entirely different construction from the old non-rotary fixture in use many years ago, while in respect to strength, efficiency of operation and adaptation to the end in view, it has advantages possessed by none other. By means of this yoke the bell may be readily turned around vertically, without unhanging it, to cause the clapper to strike in a new place, thus preventing its being broken by long-continued striking at one spot.

The yoke has a heavy flange fitting firmly to a corresponding shoulder on the crown of the bell. Inside the bell is a clapper clevis or head through which, and the steel springs, we pass two to four bolts up through the bell and yoke. As the yoke is always at right angles to the swing of the bell it is obvious that the clapper and springs, being held by the bolts in the yoke, cannot become displaced, but are always in proper position no matter how far one turns the bell. The bell thus supported CANNOT work loose, neither is there any danger of its falling if a bolt should break. To rotate the bell it is only necessary to loosen the nuts on the several bolts enough to release the bell from contact with the yoke; then, taking hold of bell at the edge, it may be turned to any desired position; then screw the nuts up tight and the bell is ready for use, with the clapper striking in a new place.

Here we may state that there have been many and various designs in the manner of hanging bells. From as early as 600 A.D. up to about fifty years ago these designs varied from "Loops" and unwieldy lugs through the stages of "Canons" or "Horns" and some artistic, others hideous caricatures of dragons, etc. Between 1850 and 1860 English as well as German founders designed bells with FLAT CROWNS having from six to eight or more bolt holes through them. In our own foundry from 1826 to 1866 variously shaped "Loops" or "Horns" were used, but the bells could not be rotated. Then we introduced the round, tapering shank, a great improvement over the old way, but after mature use of that style it was found faulty, presenting several difficulties, chief of which was that eventually the bell would be found loose in the yoke, and the same result obtains in all others' yokes copied after that design after ten to twenty years' service. We then determined to design a "ROTARY YOKE" that would safely hold a bell indefinitely without working loose, that would hold the springs in proper position when once inserted and would not be detrimental to the tone quality and resonance. Our PRESENT YOKE has effectually accomplished all these things and has been tested and tried in all sizes and not failed us. We therefore claim that our yoke is the best mechanically designed "ROTARY YOKE" on the market.

STEEL ROLLER BEARINGS

Steel Roller Bearings are now used on all Bells from 1200 pounds upward. Kindly see description below.

FIG. B

In Fig. B is illustrated the inner box holding the steel shaft rollers as used in the mountings of all our church bells from 1,800 lbs. up to the heaviest sizes made. This box with rollers is set within a close-fitting case firmly bolted to the top of the stand. The illustrations are so clear that further detailed explanation seems unnecessary. Their mechanical design and adjustment at once show their superior merits, among which we may allude to the fact that the number of rollers is such that they will each make a complete turn at every half-swing of the bell, which is not the case on any other make of bell roller bearings in use. The rollers thus constantly remain round, not worn off on one section to wedge the yoke journal tightly into place as in numerous others we have seen. If by any accident or long-continued use it may become necessary to take part or all of them out, or remove the entire box and bearings, they can readily be changed or new ones inserted at a trifling expense. From every point of view, therefore, it is self-evident that the BEST Roller Bearing Bell Mountings are used and supplied by

THE OLD MENEELY FOUNDRY

HOISTING AND MOUNTING BELLS

IT is best to construct the tower so the bell can be hoisted up to belfry on the inside. If necessary to hoist outside then the illustration here given will be of service in doing the work. Project a stick of timber in the manner shown, fasten securely in place and attach suitable tackle on the outer end. The hoisting line may be drawn upon inside or outside the tower, according to conditions, by any number of men, by means of a mechanical hoisting apparatus or a reliable horse or team.

When raised to sufficient height it is drawn in by a direct line or a light tackle. The frame, wheel, etc., should be taken up first, the frame set in place, if practicable, on a firm, level bearing. While the bell with yoke attached is held suspended, the wheel should be attached and, if it has roller bearings, they should be properly placed on the yoke journals, then the whole let down carefully on the stands, the wheel on the side OPPOSITE to the toller. If hoisted in from outside, a second lift is necessary inside and then adjusted and let down as above described.

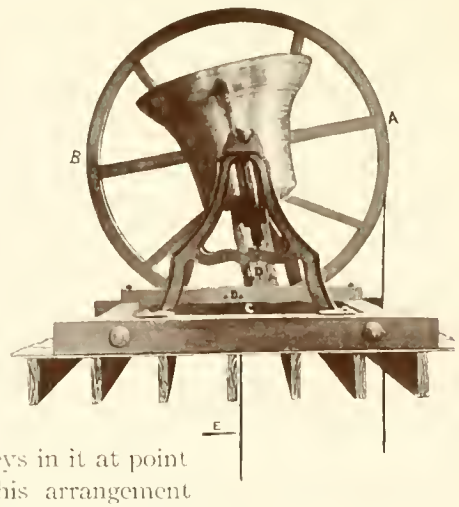
The several parts of the outfit are carefully marked by us before shipment, so that, if the Card of Directions attached to the frame be carefully carried out, any intelligent mechanic will be able to properly place and adjust everything complete in the belfry. When inserting the clapper, thoroughly oil the pin-bolt, that clapper may swing easily and open the split key after insertion. After all is in place, the stands should be braced either from sides of belfry or wall, not too tightly, but just enough to prevent them from spreading OUTWARD and breaking off by any accidental side strain. The mountings should be examined occasionally and any of the nuts found loose should be screwed tight. The bearings should have just a few drops of oil at certain intervals, not so much as to gum things up, but purely for lubrication; ten to fifteen drops every sixty days is sufficient.

The wheels, frames and stands of bells not exceeding 1,600 lbs. will almost invariably go through the openings admitting the bell; in larger sizes, if necessary, these parts are so made that they may be taken apart to pass them into belfry and are then easily reassembled.

SPECIAL CAUTION

We add this caution again, repeating that on page 12, viz.: To attach a hook to the wall facing the sexton when swinging the bell, and on this hook hang the Tolling Hammer ROPE and permit NO ONE to pull that rope while the bell is being swung. If this caution is neglected and a pull on the Toller Rope be made then the Toller Clevis will be broken off. Such breakages we cannot be expected to make good without charge.

BELFRY, ADJUSTMENT OF ROPE, ETC.



PERHAPS the most important items for success in using a bell are position of belfry, adjustment of ringing rope and "knack" of swinging it correctly. The best position of belfry, except in large cities, is just above the top of church roof; a lower position is more or less detrimental.

The windows should be sufficiently open to let the sound out freely, their base down to belfry floor or nearly so, and a roof or boarded ceiling above the bell; the floor covered with either tin or copper, with suitable pitch to drain water rapidly.

For bells up to 650 lbs. the rope may be attached to wheel at top between the two upright spokes, passed down on EITHER side and through the block with two pulleys in it at point marked C, the rope being indicated by the letter E, as this arrangement will not dislocate the rope if the bell should be turned over during the ringing. For bells of heavier weight the rope should be fastened at EITHER A or B, carried on over and down on the other side of wheel, thence straight down to the ringer, through the several floors, in which case no pulley block or sheaves are necessary, but a piece of board $1\frac{1}{2}''$ thick and about 6" wide by 8" long should have a hole $1\frac{1}{4}''$ diameter bored through it, the edge around the hole smoothed neatly and such a piece fastened on the several floors to pass the rope through to prevent chafing. In this method the rope is carried down as shown in illustration, it being fastened to the wheel at A, just below the central crossbar. If fastened at B, the rope would go down on the other side from that shown here; either side may be used. Care should be exercised that the bell be not swung so hard as to cause an undue "bump" when the "Stops" marked D D come in contact, which would cause unnecessary jarring. The bell may be held MOUTH UP between strokes by easily holding firmly against the stops as shown in illustration.

The proper ringing of a bell is more a matter of "knack" than strength and is readily acquired by some careful practice. A few energetic pulls at the start bring the bell up in the position shown and it can then easily be held as long as desired; then allow it to swing back to its next highest point, when another firm pull quickly made sends it forward to and again engages the Stops. When that knack is acquired the ringing of the bell will be a pleasure and easily done.

The ringing rope need not be heavier than necessary strength and flexibility require, as more than that will encumber the free swing of the bell. No man can pull down with greater force than his own weight permits; hence a rope sustaining double his weight is ample for any weight bell, but in ringing a bell of considerable weight a light rope would be difficult to grasp firmly in the hands. We therefore give size of rope suitable for the various size bells, viz.:

For bells of less than 500 lbs., $\frac{1}{2}''$ diameter.
For bells of 500 to 800 lbs., $\frac{5}{8}''$ diameter.
For bells of 900 to 1,500 lbs., $\frac{3}{4}''$ diameter.
For bells of 1,600 to 3,500 lbs., $\frac{7}{8}''$ diameter.
For bells of larger size a rope of 1" diameter.

COPY OF OUR WARRANT

Printed on and forming a part of our Invoice, properly dated and signed, as given with all our bells of 100 lbs. and over.

We hereby WARRANT the above-named bell to be free from original defects, perfect in quality and workmanship, composed exclusively of 77 parts purest ingot copper and 23 parts best imported block tin; of full, good, clear tone, and against fracture from proper usage for FIFTEEN (15) years from date of shipment. Should it thus crack within that time and prompt notice be given us thereof, we hereby obligate ourselves to promptly furnish a new one of same weight, quality and workmanship in FREE exchange for cracked one — on cars at Troy or Watervliet, N.Y.

OLD COPPER AND TIN BELLS

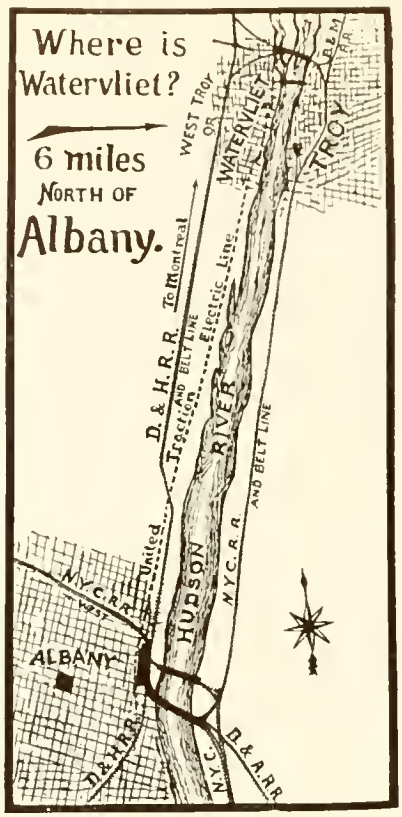
Of memorial character or cherished for various reasons, we accept at highest value on account of new ones, and when so ordered we will incorporate them in the composition of the new bells, subject to the addition of such new metals as will in our best judgment produce a strictly first-class result. We constantly have use for a limited quantity of old bells in the manufacture of certain parts of our bell-mountings, chime fixtures and other appurtenances requiring a soft bronze composition, and will pay a fair price for such as may be offered to us, the quality being suitable for our purposes.

OUR SHIPPING FACILITIES

Our city is on the west side of the Hudson River, at the head of navigation, connected with the city of Troy by two great bridges and two steam ferries. Troy is the converging point of several great railroad systems and of the Erie, Champlain and new barge canals, thus affording superior shipping facilities to ALL POINTS. The respective freight stations are well within a mile of our foundry, the shipping bills all bear the printed heading " TROY " and as a result, in so far as it affects us, our product has been termed " Meneely Bells " and " Troy Bells " by the Press and Public from 1826 to the present time. We invariably secure the closest freight rate on every shipment and send shipping bill promptly to our customer. To avoid errors in shipping, the purchaser should state in the proper space in the order blank the correct name of the station and the transportation line on which located, to which we shall make shipment.

VISITORS ARE ALWAYS WELCOME

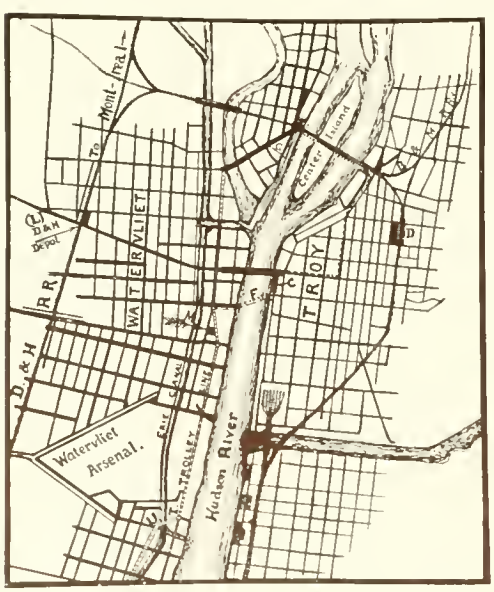
WE are frequently asked "Where is Watervliet?" and to adequately answer the question we here present a map, a little study of which will make its geographical position clear. For many years it was known as "WEST TROY," but a few years ago the corporate name was changed to that of "WATERVLIET," thus making it conform to that of the great gun shops of the U. S. Government, known as the "Watervliet Arsenal," here located. We are approximately about six miles north of Albany.



All B. & M. trains and some D. & H. and some N. Y. Central trains arrive at and depart from Troy Union Station. Several D. & H. trains also stop from the north and south, at their Watervliet station, but as it is in the outskirts of our city, some 11 blocks from us and without direct trolley cars to our place, it is more convenient to take D. & H. trains that arrive at Troy Union Station. From there walk three blocks westward to Third Street and there board any trolley car carrying sign reading "Albany, Troy, Watervliet," and in a few minutes arrive at our door, fare five cents.

The N. Y. Central, Boston & Albany, D. & H., and West Shore Railroad trains all arrive at Union Station, Albany. The same trolley cars above referred to pass directly in front of the station at Albany and come direct to our door, time about 22 minutes, and the fare from Albany is ten cents. From the dock of the People's Line and Hudson River Day Line boats it is only half a block to the same trolley cars above named. The dock of the Citizens' Line boats at Troy is directly across the river from 16th St., Watervliet; between these two points plies the Troy-West Troy Ferry, indicated by the letter F, and from their landing to our office is one block.

A large portion of our city's layout is shown in this map especially drawn for us, including a portion of Troy. Our plant is indicated by the arrow and letter M. D is the Troy Union Station, L is the D. & H. R.R. Station. The dotted line indicates the trolley cars route; passing our door they go north and south. The car bearing a BLUE sign goes north to 19th St. and crosses over to Troy via Congress St. Bridge, on to Third St., and then north to Bridge and River Sts., crossing westward to Watervliet and thence south. The car bearing RED sign goes north to 25th St., and there crosses to Troy to Bridge and River Sts., thence south via Third St., and crosses westward to Watervliet via Congress St. Bridge and then south, these cars thus making a LOOP between Watervliet and Troy.



With these maps and explanations, visitors will have no difficulty in readily finding our place, and we extend a cordial invitation to prospective bell purchasers to visit our foundry, and we shall be glad to show them through the Oldest Established yet the NEWEST and most PERFECTLY EQUIPPED Bell Foundry in America.

THE DISTANCE BELLS CAN BE HEARD

HOW far can the bell be heard? This question has been asked us thousands of times by purchasers respecting the bell under consideration, and similar question is asked by every purchaser regarding Peals and Chimes. Regretfully we must say that NO ONE can guarantee how far any given weight of bell or bells can be heard, as so many seemingly little things vitally affect the desired result. The position of the belfry in its relation to the roof of the edifice, the surrounding buildings and condition of the country, the inside arrangement of the belfry, its windows, floor, etc., all and each affect the result. At times the atmospheric conditions are such as to prevent SOUND WAVES rapidly spreading to any considerable distance. Bell-sounds are concussions disturbing air-waves and are more or less musical in accordance with the form, empirical proportions and composition of metals employed in the manufacture of the bell. A multitude of experiments have been made since bells have come into use, many of them under government direction, the bells being made of many different shapes and proportions and many different metallic compositions, to secure a distinct superiority of RESONANT as well as MUSICAL qualities, but nothing has yet been discovered that will satisfactorily compare with bells made of Copper and Tin of such respective parts as will form the most thorough amalgam, and of shape and proportionate thickness as embodied in the bells we manufacture. It is essential, therefore, to secure, above all, the best bell that can be had, then to properly prepare the tower and belfry, ring the bell correctly, and the result will undoubtedly be all that can be desired.

In general a bell will be heard farther lengthwise of a valley than over the hills. On level plains or nearly so, bell tones carry well, and still better out on or across water. In cities, the noises of steam and trolley cars, manufacturing establishments, carts and trucks rattling over paved streets, the hum of the busy throngs passing to and fro, are so great that it is quite impossible to hear bells to any great distance, nor is that essential, as the people in cities do not want NOISY BELLS. Rich, musical bells are pleasing and delightful everywhere, and the result obtained from them as compared with the harsh, clangy quality tones of the noisy class, makes them well worth the difference in first cost. We therefore invite the most thorough investigation of the musical, smooth, velvet-like tone quality of our bells, confidently believing that they will be found the most satisfying in everything that makes a bell or bells a lasting delight.

Albany is six miles south of us and Cohoes three miles north, with Troy just across the Hudson River on the east. There are bells in Albany and Cohoes that weigh over 4,000 lbs. each, some as heavy as 7,000 lbs., but they are NEVER HEARD HERE, because there are so many noises to overcome that no bell is equal to the emergency. These bells, if placed in a country church tower of moderate height, where there are no noisy conditions, would frequently be heard to a distance of EIGHT or even TEN miles. The large bell of 22,000 lbs. which hung for many years in the tower of the New York City Hall, was heard, before it became fractured, on numerous occasions up the Hudson River about thirteen miles, in the night when the city was comparatively quiet, and we may add, when those who heard it were far enough away from the city noises. Water is a good conductor of sound and aided materially in making the bell heard that distance.

Many persons suppose that a bell of say 2,000 lbs. will be heard twice the distance of the 1,000 lbs. bell, but this is a serious mistake, because the larger bell does not possess anything like twice the resonant surface of the smaller one. What is gained and admired in the larger bell is its deep, majestic, dignified, mellow tone, impossible to secure in the smaller one, as the size of the bell absolutely governs the musical pitch, the shape, proportion of its various thicknesses, etc., in combination with the metals used controlling the quality of sound.

A bell of 100 or 200 lbs., in an open belfry on a schoolhouse or factory in the country, is frequently heard at a long distance, out of all proportion, apparently, to one of 1,000 lbs. in a church tower near by; and instances of this kind frequently cause no little comment in the way of comparison. The reason for this is that the small bell has a sharp, shrill, penetrating sound that must,

of necessity, be heard a GREAT DEAL farther, in proportion to its weight, than the low, mellow, "churchgoing" sound of the church bell. The same principle applies to the whistle of a locomotive, and it is heard a long distance simply because its tone is shrill and penetrating.

When hung stationary and struck as for Fire Alarm or Tower Clock, or tolled as for funerals, or chimed as in playing tunes, bells will not and cannot be heard as far as when swung, as the swinging motion, throwing the mouth WELL UP, not only thrusts the sound OUT as it were, but imparts to it a richness that is not obtained by striking, tolling or in chiming.

FIRST IMPRESSIONS LAST LONGEST

N view of the above trite saying, let us advise that you do not let eagerness to hear the bell run away with good judgment, but see to it first that the bell chamber is properly prepared. The belfry windows should be as close to floor as possible, say within 12 inches, and be well open to let the sound out freely, and above the top of windows should be a sort of ceiling. If there be an opening up into the spire, or two feet or more of room space below the base of the windows, either or both would be a "pocket" that would retain most of the sound of the bell or bells. Give the bells fair play at the start. On rare occasions some one will write in effect that the bell seems to lack power, and in describing the tower inform us that the belfry floor is several feet below the base of the windows, louvers in the windows very close together and so nearly vertical that they are practically closed. Sometimes nothing over the bell to prevent the sound being lost in the spire. Under such conditions it is not to be wondered at that the respective bells are not heard any farther away. After making the corrections we suggest in such cases, the bells prove entirely satisfactory.

Edmund Beckett Denison, M.A., Q.C., of London, England, who has made bells a study for forty years, and was entrusted by the government with the direction of the casting of the Westminster and other large bells, writes as follows in one of his works on bells and tower clocks:

"Few persons appear to know how much the sound of bells is muffled and lost by boxing them up in small bell-chambers, putting them below the windows, making the windows themselves too small, and filling them up with close louvers.

"The bottom-edge of one louver-board need never be as low as the top of the one below it, as rain does not usually go horizontally, and no louvers will keep out snow, and it is of no consequence if a little rain and snow do come in, as the wood and iron work are painted, and wet does the bells no harm. It is a good plan to cover the bell-chamber floor with zinc, laid so as to send off any water in a spout.

"It is a remarkable fact, by no means yet explained, that a wind hardly strong enough to move a leaf, allows sound to be heard three or four times farther in the direction of the wind than against it, although the velocity of sound is enormously greater than of wind in the most violent storm."

In another work on bells, towers, etc., Mr. Denison says:

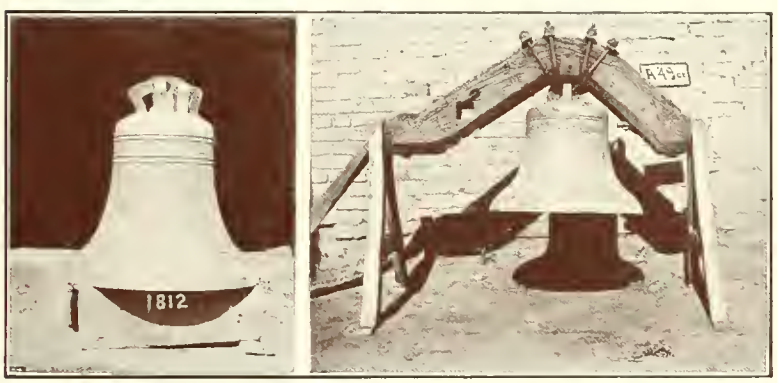
"Nine out of ten modern towers are built as if it was the bell founder's business not only to cast the bells, but hang them, make the towers large enough to hold them, and to invent some way or other of making the sound find its way out of the windows, wherever they are and however small they may be.

"Mr. Ruskin also abuses close louvers on architectural grounds, and notices the grand effect of the large, wide ones in many foreign churches. Ours are generally made as if the builder supposed that the bells would catch cold and lose their voices if they got wet; whereas bell metal is perfectly indifferent to it. A small bell *in an open bell-gable* will often be heard farther than one of ten times its weight shut up in a tower, under the disadvantages of confined space, bad position, small windows, close louvers and the bell chamber not ceiled above the windows."

RING THE BELL CORRECTLY

A GREAT deal is to be gained by ringing a bell properly, throwing the mouth well up, and not lazily jingling it. Sextons will require several weeks' practice before being able to ring a bell properly and bring out its full tone. It is not physical strength that is required so much as getting "the knack" of catching the rope just right, particularly on the second "DOWN PULL." Small bells are easily swung well up. Those of 700 to 2,000 lbs. can readily be brought MOUTH UP by steadily pulling down on the rope until the "STOPS" engage, and held there as long as desired. For any larger bell several vigorous DOWN PULLS may be necessary, if the bell cannot be drawn up as above described, until the "STOPS" meet, this being done as follows: Begin by pulling down on the rope as far as possible, allow a back-swing and at the highest point of the rope make a second vigorous down-pull and repeat this operation until the "STOPS" meet, when the bell can be held in that position as long as desired. When the bell swings BACK from contact of the stops, allow the rope to easily GLIDE through the hands; do not follow it hand over hand, but let it slide without friction on the hands, keeping the arms extended diagonally upward at about 60 degrees angle, and when the rope has been drawn up as far as the bell carries it, at that instant quickly close the hands tightly, grip the rope firmly and make the next down-pull, but make it with no greater force than to just make the "STOPS" meet with a fair touch to avoid unnecessary jarring or too great a BUMP. By carefully practising this method the "knack" of ringing a bell correctly will soon be acquired and the ringing of the bell be found a pleasurable exercise rather than a laborious task, and what is of greater importance, the rich, full, majestic tone will be a pleasure and satisfaction to all who hear it.

How the bell shown in the right of the illustration below was rung we cannot say, for it is one made by this foundry in 1849, and somehow reached California, where a local craftsman fitted the peculiarly grown wooden Yoke to it, together with the journal irons. It was received by us as shown to be recast into a larger bell.



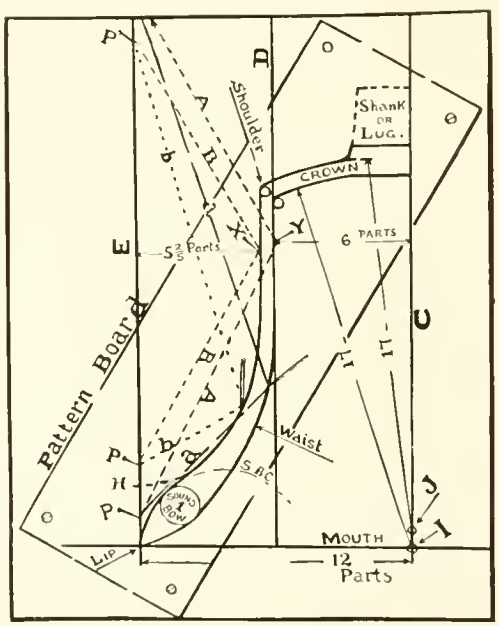
The other bell shown is a Paul Revere make of 1812, and is peculiar in that it is some taller than the proportionate rule demands according to the diameter, hence appears to be one of experimental nature.

HOW BELLS ARE DESIGNED AND CAST

WITHOUT exception, every purchaser of a bell or bells is deeply interested in the process of manufacture, and, with few exceptions, the same is true of those who are not prospective purchasers. We propose, therefore, at this part of this book, to take the public into our confidence as far as the peculiarities and intricacies of the work permit, by describing in general how a bell is designed and made, from the first step to the finished bell as it stands in the tower ready to ring. We may say first that no founder is prepared exactly to state HIS OWN PERSONAL method of designing a bell pattern, nor is it essential that he should, since any rule that yields a definite result is sufficient for illustration. It is a curious fact, however, that NO TWO MAKES OF BELLS IN THIS COUNTRY ARE EXACTLY ALIKE in their shape, proportions, thicknesses, tone results, etc., and THEREIN is found the reason for the superior merits of THE REALLY BEST BELLS.

It is not our purpose at this point to discuss the merits of various makes, but to simply give an intelligent example of the process of the work. The method here described in this draft of the pattern is almost identically the same as first published by Sir Edmund Becket-Denison in England over half a century ago, when the more or less acrimonious controversy was raging concerning the now famous "Westminster" (or) Cambridge Clock Chimes.

THE PATTERN DRAFT



On the drafting table is screwed a suitable "Pattern Board," on which the design is then laid off in the following manner, reference being made to the illustration herewith as this description is followed. The vertical line C is first drawn and then the Mouth line at true right angle to C. Whatever the diameter of the bell shall be, it is divided into 24 equal parts, and thenceforth the entire layout is based on these "parts," except the thickness of metal at the "Sound Bow," "Waist," "Crown," and "Shoulder," which will be made clear as we proceed. Six parts are now marked off on the Mouth line from line C, and the line D is drawn. Six parts further and the line E is drawn, making the line E 12 parts from C.

Next are marked off 14 parts upward on line D, and there a PIN is set at Y. Then 14 parts are measured off diagonally upward and downward to line E, intersecting it as shown, following the broken lines A A, and a Pin set at each intersection. A strong, fine string is secured to the upper pin on line E, passed over to Pin at Y, then down to the lower intersection on line E at P and fastened taut. A pencil is then set at Y, taking that pin out, and by keeping the line taut and moving the pencil DOWNWARD the inner shape of the bell section is drawn, indicated by the heavy line a a, to the point called LIP. Next a similar pin is set at X, which is half a part down and 3-5 part OUTWARD from Y, and from that point are measured off 11 parts over to E, intersecting that line as shown (see lines B B), the string fastened as before, the pencil inserted at X, withdrawing the pin there, and by following the taut string downward the OUTER shape of the bell is drawn from X down to the top of the Sound-Bow circle, the line b b ending at H. A pair of dividers is now used, and setting the points 4 parts apart, one point at the point of the LIP and the other 1-3 part below the MOUTH LINE, the portion of a circle is drawn as shown by S B C. This may leave a very small space at top of the Sound-Bow circle which can be filled in by hand or by any other convenient process.

The circle marked "Sound Bow" is an imaginary one indicating merely the thickest part of the bell, which should be 1-11 of the entire diameter at the MOUTH LINE. That part marked "Waist" should be HALF the thickness of the Sound Bow, and the part at Y should be 1-3 the thickness of the Sound Bow. From the point marked I to the inner crown curve should be 17 parts; from I to J the same as the thickness at Y, and then 17 parts from J to the top or OUTER Crown

Curve. The inner crown curve is drawn over to meet the line D. The outer crown curve line should be carried well beyond the line D to intersect with a line drawn straight up from X. Where these crown curve lines intersect with the vertical lines at D and beyond there should be a very small circle drawn on the inner side to round off the intersections, which would otherwise meet very sharply. The draft is now complete except for the SHANK, or any other suitable design there for hanging the bell, or it may have an OPENING THROUGH THE TOP OF BELL for such a mechanical method of hanging the bell as the designer may see fit to use, as such an opening in no way affects the sound or tone of the bell.

Two suitable boards are now provided, one of them cut to conform to the draft of the INNER shape of the bell, the other to the OUTER shape, and when completed are called "Sweeps" or "Patterns," and when ready for use appear as shown. The iron molding forms are then provided to conform to these "Sweeps," one called the "Cope," the other the "Core." The OUTER form of the bell is "Swept up" IN the Cope, and the INNER form is swept up ON the Core. These iron forms are liberally perforated to make the clay loam adhere more firmly and to provide vents to allow the gases to burn off which are generated during the "Pouring" of the molten metal into the molds. On the Core form is first wrapped a layer of straw rope, which, during the pouring, is completely charred to ashes, thus allowing the cooling mass to contract without an undue strain of the metal and insuring a sound casting. All our molds are operated above ground except the Copes for bells of 3,000 lbs. or larger, these being set somewhat down in a shallow pit for the more convenient working of the Sweeps.

When the mold for the outer shape is about finished and still soft, the lettering of the Inscription desired is impressed into its surface, reading from right to left, this work being shown in the illustration below as is done for all SINGLE bells. Such inscriptions should be condensed into as few words as possible, because much lettering is liable to interfere with the tone vibrations of the bell. In attuned work, such as PEALS and CHIMES, the lettering is INVARIABLY CHASED on the surface of the bell after it has been fully tuned, and so in this class of work the lettering does not appear in raised characters.

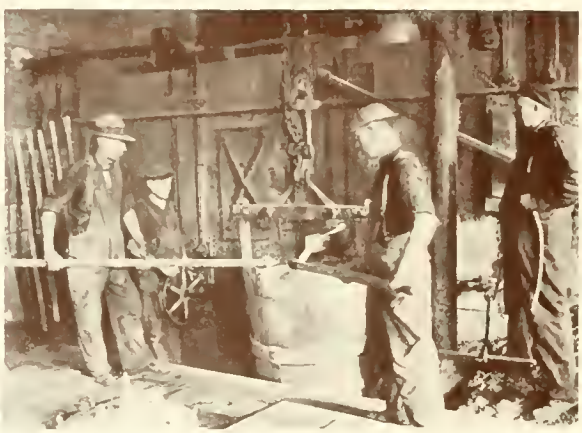
The next view is a peep in the foundry, showing a number of molds "closed," set around in a circle ready for the casting; they are so placed to accommodate the swing of the great crane as it carries the "Ladle" containing the molten metal which is then "poured" into these molds. We sometimes have as

metal to flow out and into the Ladle, several men standing by with fresh plugs on the end of suitable sticks, and when sufficient is drawn off the "Tap" is plugged up with one of these fresh plugs. From this Ladle is "poured" a number of bells as the quantity of metal drawn provides for, when the Ladle is returned, the furnace again is tapped, and this operation is repeated until all the molds have been filled. What metal remains after filling the last mold is poured into ingot molds and is used in the next lot of metal melted.

The furnace we use is that known technically as a "HOT-AIR FURNACE," which means that the metal is melted by "HOT AIR." It is oblong in form, having

many as TWENTY closed molds thus set, all to be "poured" from one "HEAT," which means ONE HEATING OF THE FURNACE, and which may thus contain from five to eight tons of metal, and always the self-same percentage of composition.

When the metal is melted it is drawn from the furnace into a "Ladle" at the "TAP." We have several such Ladles in use; the smallest, which is of the simple type, will contain 2,500 lbs., while the large, latest-style one will contain full 8,000 lbs. of molten metal. The "Tapping" of the metal from the furnace is done as shown in the view next given. The clay plug is driven in, allowing the



two compartments and chimney. The Fire compartment is at farthest end from the chimney or Stack; there is a wall between this section and the metal section, reaching almost to the interior top of the furnace, the top of the metal section being convex downward. Through the aperture above the wall the heat enters the metal section, strikes the convexed roof and is deflected upon the metal.

This is the cleanest method of melting and assures the most perfect amalgam of the two metals used, copper being first melted and the block tin afterwards, the latter being put in at the last in a manner that is specially provided for in the construction of our furnace. The view here given shows the manner of casting or "pouring" a bell. The molds remain closed for a day or more, according to sizes, to allow a gradual cooling of the bells.

When the molds are opened, the top one, or "Cope," is lifted off, then the bell is lifted off the "CORE," the view here given showing the position of the Cope and Core, the bell having been re-

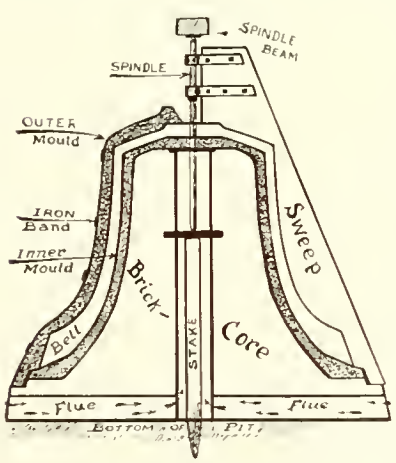
moved, and leaving the broken, charred residue of the loam mold visible, which we thus show to make clear that no matter how many bells are to be made, every one must go through the same process and that no mold can be used for another bell of like size. A new loam mold is absolutely necessary for each and every bell.

The bell is now cleared of all adhering mold and sent to the polishing table, where it is finished to its natural, gleaming, gold-like color, and is then fitted out with its MOUNTINGS, thoroughly tried out to meet the most exacting criticism, and then shipped to the purchaser; when placed in the belfry ready for use it appears as shown in Fig. 1 on page 5 of this book.

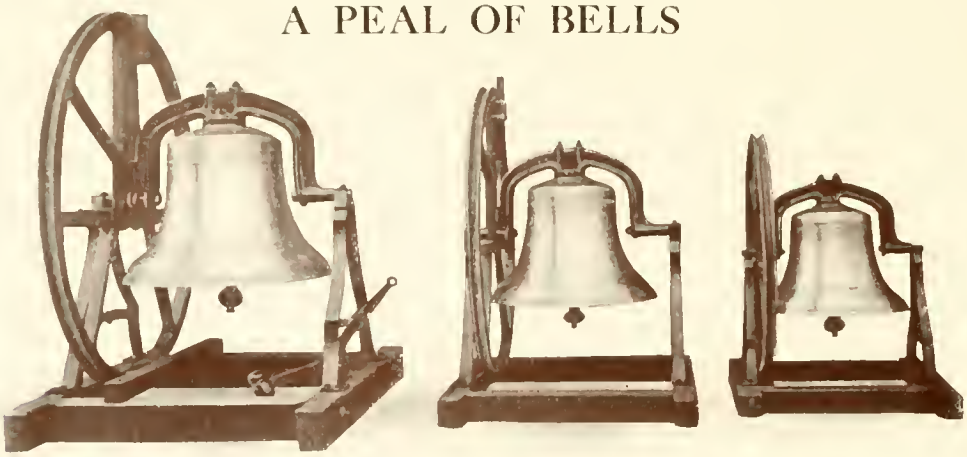
THE EUROPEAN METHOD OF CASTING BELLS

By aid of the cut given herewith we will briefly explain their process. After designing the draft, ONE SWEEP Board is made to conform to the inner shape of the proposed bell. It is adjusted to a Spindle. A Pit is dug just so deep as to bring the top of the Spindle above ground. A Brick core is built hollow, with several flues under it from circumference to center. At about two-thirds of its finished height a flat, iron plate is set, resting on a suitable stake previously driven down, and the ends built into the brick core. The center of this plate is countersunk for the point of the Spindle to rest in and revolve. Above the Pit is a Beam hinged at one end to a suitable support, a countersunk plate on the under side to tally with that on the plate set inside the core and between which the Sweep revolves, the other end locked to a support to keep it rigid.

The brick core is roughly finished outside to suitable form and on it is then "swept up" a loam mold to conform to the inner shape of the bell. The mold is allowed to dry, by which time the sweep has been further cut to conform to the outer shape of the bell and replaced, the mold is greased and on it is now swept up a CLAY BELL, on the outer surface of which is then placed *in wax characters* such inscription, lettering or ornamentation as desired. When all is hard and dry, the sweep is once more cut down to conform to the outer shape of the outer mold; the Sweep in the cut shown appears as cut for the outer shape of the bell. The Clay Bell is now given a coat of grease and the outer loam mold is then swept up over the bell and having several iron bands around it partially embedded in the mold. When dried, a fire is built under this completed mold, melting away the grease and wax, the outer mold is lifted off, the *clay bell broken out and removed*, the mold replaced, all well packed down in the Pit. A Gate or Runway is then provided from the top of the mold to the TAP of the furnace, the "pouring" being done by allowing the metal to flow direct into the mold.

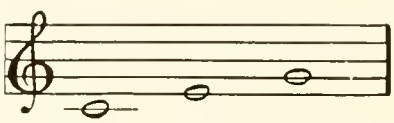


A PEAL OF BELLS

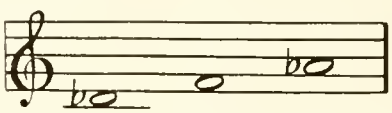


AS understood in this country a Peal of Bells consists of two or more bells harmonically in tune with each other. Generally, three bells are used, occasionally four or five. When composed of three they are almost invariably the first, third and fifth of the octave of a given key, the largest or first always considered as the key-note. Such a set is called a "Major Triad." Occasionally a "Minor Triad" is desired, and in some places a combination of both. We here present the music score of a number of different Peals of Bells, here given in accordance with "Concert Pitch Standard"; due allowance must be made for other standards of musical pitch.

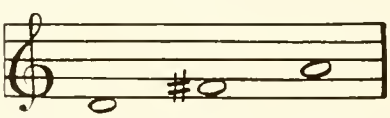
The first here shown is a set of three bells in the key of C, weight of bells about 7,800 lbs., and with mountings complete close to 12,000 lbs.



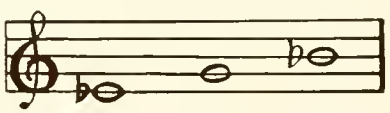
The second is a set of three bells in the key of D flat, weight of bells from 6,500 to 6,700 lbs., and with mountings complete about 10,000 lbs.



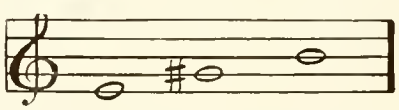
The third is a set of three bells in the key of D, weight of bells 5,500 to 5,700 lbs., and with mountings complete about 8,500 lbs.



The fourth is a set of three bells in the key of E flat, weight of bells about 4,600 to 4,700 lbs., and with mountings complete about 7,000 lbs.

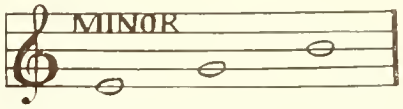


The fifth is a set of three bells in the key of E, weight of bells about 3,900 lbs., and with mountings complete about 5,800 lbs.

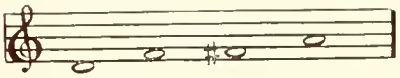


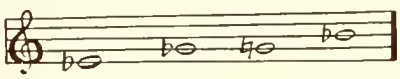
The sixth is a set of three bells in the key of F, weight of bells about 3,350 lbs., with mountings complete about 5,000 lbs.

These are all "Major Triads," and of this class of Peals we can supply several sets of lesser weight and higher key, as also heavier than first set named and of lower key, as may be desired, and for which special proposition will be made upon request.

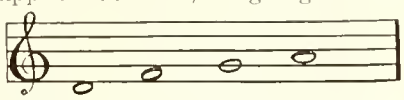


Two MINOR scores are here submitted; the first is in the key of D, which in Concert Pitch weigh about 5,800 lbs., with complete mountings about 8,700 lbs. If desired in International Pitch the bells will weigh about 6,750 lbs., and with complete mountings about 10,000 lbs. The second is in key of E, which in Concert Pitch weigh about 1,200 lbs., and with complete mountings about 6,300 lbs. If desired in International Pitch they will weigh about 5,000 lbs., and with mountings complete about 7,500 lbs. A combination of Major and Minor chords is represented in the two scores at the left, the first in the key of D, Concert Pitch, weight of bells about 7,400 lbs., and with mountings complete about 11,500 lbs. In International Pitch the weight would be about 8,600 lbs., and with mountings complete about 13,000 lbs.

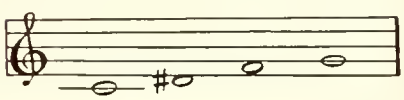




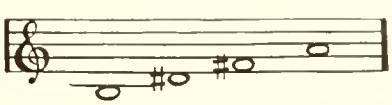
The next is in key of E flat, Concert Pitch, and the weight of bells about 6,300 lbs., with mountings complete 9,500 lbs. In International Pitch they would be about 7,400 lbs., and with mountings complete about 11,500 lbs. The church at the right is St. Joseph's Church, St. Joseph, Minn., in the tower of which is a set of four bells we supplied in 1903, weighing almost 8,300 lbs., with mountings complete about 12,500 lbs., and their tones are thus:



The church shown in the center is St. Nicholas Church, Evanston, Ill., in the tower of which is a set of four bells which we supplied in 1906, their total weight being 10,300 lbs., and with complete mountings about 16,000 lbs. Their tones are these:



St. Alphonsus Church, at Southport St. and Wellington Ave., Chicago, Ill., is shown in the lower left-hand corner, in the tower of which is as fine a set of four bells as we have ever supplied, the weight of the bells alone being about 12,000 lbs., and with their mountings complete about 18,000 lbs. Their tones are as shown by the following score:



GERM. EV. LUTH. CHURCH
Cumberland, Md.
Three Bells, 2,600 lbs.

IN presenting these views of churches, cathedrals and other edifices, we would state that it was impossible to secure photographs of ALL that have Peals or Chimes of our bells in use, nor would the space available permit the insertion of all if we could have secured them, and, for the same reason, we cannot list all Peals and Chimes furnished by this foundry. Our endeavor is to supply such references as will afford every prospective purchaser ample opportunity to secure satisfactory information regarding our work and the reliability of our dealings.

We urge every one contemplating such a purchase to investigate, and if possible to personally go to the nearest church having our bells and inspect them, especially such as we have supplied within recent years, as these exemplify our latest style of fittings and special scientific TUNING WORK.

Of the many single Bells, Peals and Chimes supplied by this foundry many years ago, it is but reasonable to expect that the growth of churches, the ravages of time, fire and accident have caused a number of them to be replaced by new ones in recent years.

The following list of churches have respectively Peals of two to four bells from our foundry. The total weight of the bells alone is given, without mountings.

Brownsville, Tex.	St. Mary's Church	2700 lbs.
New York City	St. Mary's of Assumption	2400 "
New York City	Church of O. L. of Sorrows	2850 "
New York City	St. Ann's Church	3000 "
St. Jacques le Mineur, P.Q.	Roman Catholic Church	3300 "
Prince Albert, Sask.	Sacred Heart Cathedral	3100 "
Norwalk, Ohio	St. Mary's Church	3220 "
St. Clements, Ont.	Catholic Church	2130 "
Brooklyn, N.Y.	Church of Annunciation	2136 "
St. Melanie, P.Q.	Catholic Church	2300 "
Omaha, Neb.	St. Philomena Church	3300 "
Manitowoc, Wis.	German Lutheran Church	1660 "
Hull, P.Q.	Catholic Church	2900 "
Sheboygan, Wis.	Evangelical Lutheran Church	2900 "
Corpus Christi, Tex.	St. Patrick's Church	2900 "
Detroit, Mich.	St. Paul's Lutheran Church	2900 "
Marquette, Mich.	St. Peter's Cathedral	2900 "
New York City	Swedish Lutheran Church	2900 "
Sebastopol, Ont.	Trinity Lutheran Church	2758 "
Zanesville, Ohio	German Lutheran Church	2950 "
St. Martine, P.Q.	Catholic Church	2327 "
Bloomsburg, Pa.	St. Paul's Church	2750 "
Little Chute, Wis.	St. John's Church	3320 "
Hudson, N.Y.	Christ Episcopal Church	2744 "
Edmunston, N.B.	Immaculate Conception Church	2300 "
Tomah, Wis.	St. Paul's Lutheran Church	2500 "
Detroit, Mich.	St. James' Lutheran Church	2300 "
Escanaba, Mich.	St. Patrick's Church	3000 "
Detroit, Mich.	Christ Lutheran Church	2100 "
Laurium, Mich.	St. Paulus Lutheran Church	2300 "
Philadelphia, Pa.	St. John Cantius Church	3250 "
Camden, N.Y.	St. John's R.C. Church	2000 "
St. Agatha, Ont.	St. Agatha's R.C. Church	2400 "
New Hamburg, Ont.	Catholic Church	2400 "

ST. ANN'S CHURCH
Turners Falls, Mass.
Three Bells, 3,350 lbs.

There are many more churches having peals of our bells, the weight of the set of bells aggregating from 1,500 lbs. up to 2,300 lbs., respectively, these being the least weights that will yield good results when distributed properly into three bells. It is always best to tell us the total desired weight and let us apportion it in the best manner to secure the best results. We desire it particularly understood that we give to each and every order, whether great or small, our best care and most skilful services.

All churches shown and listed on this page have Peals, the largest bell alone weighing between 2,100 and 2,200 pounds. Those shown on the right reading downward are:

St. Louis R.C. Church, Buffalo, N.Y.
St. Mary's R.C. Church, Columbus, O.
St. Peter's R.C. Church, Allegheny, Pa.

Those shown on the left are:

St. Peter's Church, Jersey City, N.J.
St. Joseph's Church, Topeka, Kans.

St. John's R.C. Church
Amherstburg, Ont.

Trinity Episcopal Church
Washington, Pa.

Sacred Heart Church
St. Mary's, Pa.

Immaculate Conception Church
Formosa, Ont.

German Evangelical Luth. Church
East Saginaw, Mich.

St. John's Lutheran Church
Hagerstown, Md.

St. Joseph's R.C. Church
Galion, Ohio.

St. Mary's R.C. Church
Erie, Pa.

St. Benedict's R.C. Church
Blue Island, Ill.

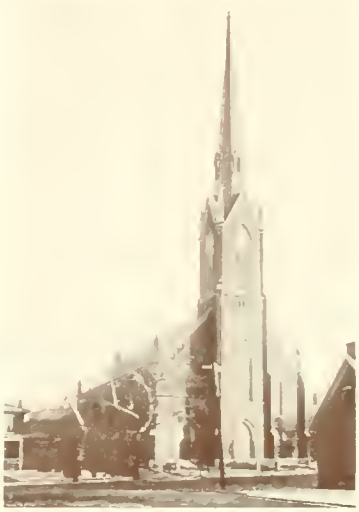
Friedens Evangelical Church
Prairie du Sac, Wis.

Immaculate Conception Church
Lansing, Iowa

St. Paul's Ev. Luth. Church
Ft. Atkinson, Wis.

St. John's Ev. Luth. Church
Jefferson, Wis.

Holy Ghost Lutheran Church
Milwaukee, Wis.



1. Grace Lutheran Church
Milwaukee, Wis.
Three Bells. 2100 lbs. Tenor

2. St. Luke's Church
Rochester, N.Y.
Four Bells. 2100 lbs. Tenor

3. St. John's R.C. Church
Erie, Pa.
Three Bells. 2500 lbs. Tenor

4. St. Mary's R.C. Church
Annapolis, Md.
Three Bells. 2100 lbs. Tenor

5. San Fernando Cathedral
San Antonio, Tex.
Four Bells. 3574 lbs. Tenor

6. St. Mary's R.C. Church
Memphis, Tenn.
Three Bells. 2100 lbs. Tenor

7. Holy Cross R. C. Church
Columbus, Ohio
Three Bells. 2300 lbs. Tenor

CHURCHES HAVING PEALS, LARGEST BELL 2,500 POUNDS

Oswego, N.Y., St. Paul's Episcopal Church
Reading, Pa., St. Paul's Church
Paincourtville, La., Church of Assumption
Mentz, Texas, St. Roche's Church
Philadelphia, Pa., Holy Cross Lutheran Church
Newark, N.J., St Peter's Church
Ft. Wayne, Ind., German Lutheran Church
Dayton, Ohio, Holy Rosary Church
Hanover, N.H., Dartmouth Chapel
Chicopee, Mass., St. Stanislaus Church
Milwaukee, Wis., St. Lucas Lutheran Church

THE FOLLOWING CHURCHES HAVE PEALS AS NOTED

French Catholic Church, St. Rose du Lac, Man. Four Bells, largest 3,090 lbs., key of D.

St. Joseph's Church, Macon, Ga. Three Bells, largest 3,050 lbs., key of D.

Sacred Heart Church, Polonia, Wis. Largest bell 3,057 lbs., key of D.

St. Casimir Church, Amsterdam, N.Y. Largest bell 3,047 lbs., key of D.

The church here shown is St. Joseph's Rochester, N.Y.; the largest bell weighs 2,824 lbs. Peal is in key of E flat.

Cathedral of Immaculate Conception, Kingston, Ontario; the largest bell is 3,100 lbs. Peal in key of D.

Cathedral of Sts. Peter and Paul, Philadelphia, Pa.; the largest bell is 3,012 lbs., key of D.

Zabriskie Memorial Church, Bristol, R.I. Has Peal of Three Bells, largest 3,000 lbs., in key of E flat.

St. Adalbert's Church, Detroit, Mich. Peal of Three Bells, largest 3,100 lbs., key of D.

Gethsemane Episcopal Church, Minneapolis, Minn. Largest bell 3,128 lbs., key of D.

In the upper row, left to right, are shown St. Joseph's R.C. Church, San Antonio, Texas, which has a Peal of Four Bells, 3000 lbs. Tenor.

St. Michael's R.C. Cathedral, Toronto, Ontario; Two Bells, Tenor 3047 lbs.

Trinity Ev. Luth Church, Columbus, Ohio; a Peal of Four Bells, Tenor 3070 lbs.

The church shown at left centre is St. Paul's Ev. Luth. Church, Columbus, Ohio; Peal of Four Bells,Tenor 2850 lbs.

Those shown at bottom, left to right, are: Holy Name R.C. Church, Steubenville, Ohio; Peal of Three Bells, 3000 lbs. Tenor.

St. Stanislaus R.C. Church, Bay City, Mich.; Peal of Four Bells, Tenor nearly 6500 lbs.

We also have Peals of Bells in other churches as follows:

Immaculate Heart Church, Pittsburgh, Pa., Four Bells, 3500 lbs. Tenor; German Evangelical Protestant Church, Albany, N.Y., Three Bells, Tenor 3300 lbs.; and in St. Martin's Roman Catholic Church, Cleveland, Ohio, Four Bells, Tenor 3600 lbs.

St. Louis' Cathedral, New Orleans, La., shown on the left, has a Peal of Four Bells, 4100 lbs. Tenor.

On the right, St. Paul's R.C. Cathedral, Pittsburgh, Pa. Has Peal of Three Bells, Tenor 4100 lbs.

St. Mary's R.C. Church, Lancaster, Ohio, shown in centre, has Peal of Three Bells, 4100 lbs. Tenor.

Church of M. H. Redeemer, New York City, has Peal of Two Bells, Tenor 5300 lbs.

Emanuel R.C. Church at Dayton, Ohio, Four Bells, Tenor 5300 lbs., and

St. Stanislaus R.C. Church, Buffalo, N.Y., a Peal of Four Bells, Tenor 5333 lbs.

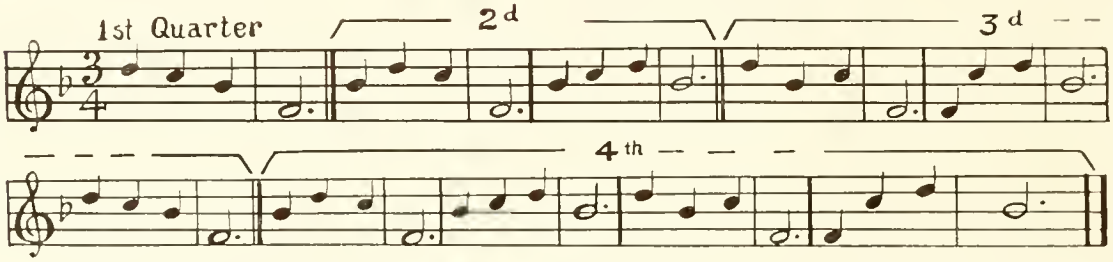
We also have Peal of Three Bells, close to 4500 lbs. Tenor, in St. Francis Assisium Church, Chicago, Ill., Sacred Heart Church, Syracuse, N.Y., and St. Joseph's R.C. Church, at Burlington, Vt.

At the left is shown St. John Kanty Church and School, Chicago, Ill., which has Peal of Four Bells, Tenor 5800 lbs.

On the right is shown St. Patrick's Cathedral, Rochester, N.Y., which has Two Bells, the largest of 6100 lbs. weight.

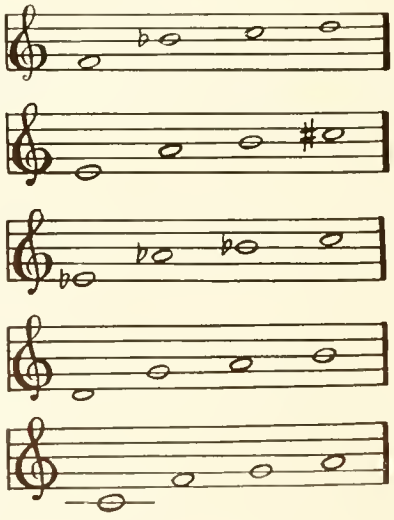
WESTMINSTER OR CAMBRIDGE CHIMES

THE first Westminster Chime was composed of FIVE Bells. The four quarter bells represent the same tone intervals as those in the tower of St. Mary's Church, Cambridge, England, and known as the "Cambridge Chimes." When the Clock and Chimes were placed in the tower of the Parliament Building at Westminster, London, those intervals were used for the Quarter Bells and a Great Bell added, it having the note of the octave below the next largest Quarter bell, upon which the hours were struck. That great bell soon cracked and was recast, and this second great bell, known then as Big Ben, cracked after a few years' use. It has never been recast and its use was discontinued. The clock hammers were then readjusted so the hours would be struck on the largest QUARTER bell. That soon demonstrated that the extra great or HOUR bell is not a necessity, as few persons have ever noticed that Big Ben is not in use, and since then "Westminster" or "Cambridge" Clock Chimes have been composed of only the four quarter bell intervals, shown in the following score, the key-note being the next largest bell.



The first four notes shown are struck at a quarter past the hour; the eight notes marked "2d" at the half-hour; the next twelve notes at third quarter and the next sixteen notes a little before the hour, these ending on the KEY-NOTE, and after a due pause the hour is struck on the largest of the four bells. We here show five scales of Westminster Chimes and give the total weight of the four bells based on Standard International Pitch, as follows:

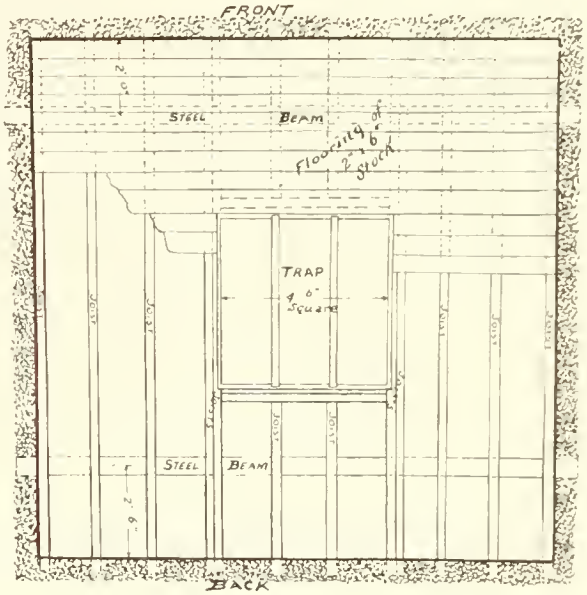
Set in F for largest bell, about 4,200 lbs.
Set in E for largest bell, about 5,100 lbs.
Set in E flat for largest bell, about 6,000 lbs.
Set in D for largest bell, about 7,000 lbs.
Set in C for largest bell, about 10,200 lbs.

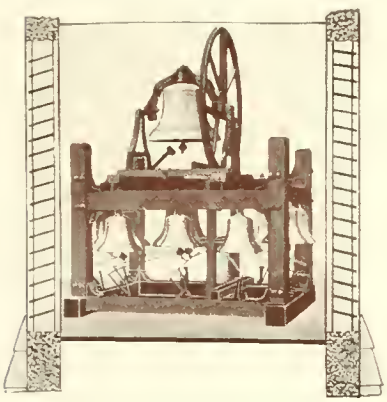


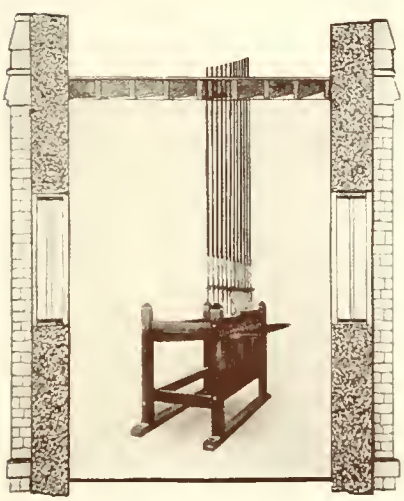
These are EXAMPLES. We can furnish lighter weight sets in higher keys as also heavier sets in lower keys. For purely clock use the bells are generally suspended in a substantial frame as above shown, but if desired they can be furnished with full mountings as in Fig. 1, page 5, so they may be rung as a Peal or any of the bells as a SINGLE bell, without adversely affecting the operation of the clock. We thoroughly attune these bells in the same careful manner as Peal and Chime bells elsewhere referred to and described in this book.

PREPARATION OF TOWER FOR CHIMES

WE are often asked, "What space is required for chimes?" There are no arbitrary dimensions beyond that of enough space to contain them in proper order and some to spare. For the lightest weight set of chimes the bell-room should be not less than about 10 ft. square by about 12 ft. high from floor to ceiling. The majority of bell-rooms we have inspected are from 12 to 15 ft. square and about 14 to 16 ft. high from floor to overhead ceiling, roof or boarding. We have put chimes in some that are 20 to 24 ft. square, but they are only about 10 to 12 ft. high. A bell-room that is approximately 13 to 15 ft. square by 14 to 18 ft. clear height inside is suitable for chimes of medium to heavy weight respectively, the largest bell weighing from 3,000 lbs. up to say 4,500 lbs., and we may add that we do not regard a heavier chime as good for TUNE PLAYING.





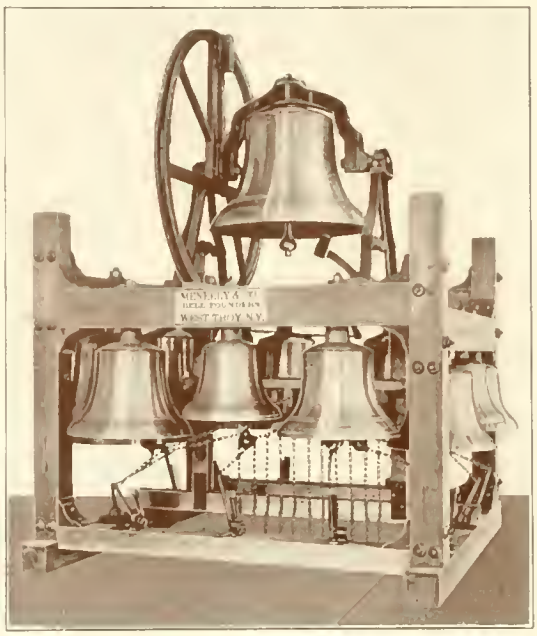


Most towers are substantially built, but few have a properly prepared bell-room FLOOR. The plan here shown indicates the BEST arrangement, and the dimensions given are based on a room that is 14 ft. square. For larger or smaller towers these measurements, etc., should be correspondingly more or less. The plan is so clear that we do not think further explanation necessary. The floor should be strong enough to safely sustain THREE TIMES the complete weight of the bells and fittings, be so made that it will drain off water promptly, and covered with either tin well painted or copper. The size of the Trap shown in the plan will admit a bell as large as 3,000 lbs.; for any larger bell the trap should be made to correspond. The surface of the bell-room floor should be close to the base of windows, certainly not over 15″ below, and the overhead ceiling or roof should be close to top of windows or not more than about 24″ above, and this is meant for ANY and EVERY belfry. If the bell-room be large in area and not over say 10 ft. high inside, then the openings around should be fully half the inside WIDTH of room and could be all of three-fourths and entirely open. Additional information we will gladly supply based on expert examination of the tower and its needs wherever a chime of bells be under consideration with us.

The illustration here given shows the general way of installing our chimes and the proper location of Chiming Console; its distance from the bells may be whatever the tower conditions make necessary, but within 50 ft. of the bells is best if at all practicable to there locate it. If the belfry windows are 12 ft. or more in height and of good width, they need not be entirely open; the arrangement of louvers shown in illustration is generally sufficient, especially if the bell-room be well above surrounding buildings and apex of church roof.

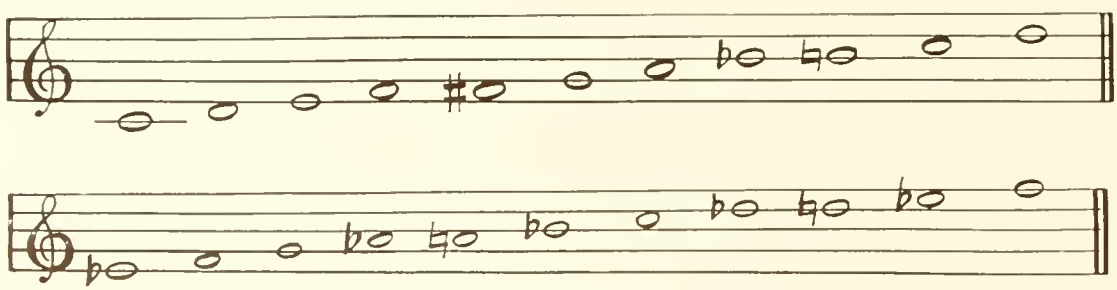
CHURCH-BELL CHIMES

AS generally understood in this country, a CHIME consists of at least EIGHT bells corresponding to the eight notes of a given octave, but as such a set would be very limited in tune-playing capacity, one or more bells are added, which greatly multiplies the number of tunes that may then be correctly played. Many tunes are composed in what is called in bell parlance the "key of the fourth," because the 4th bell is the key-note, and such tunes require the insertion of a "diminished 7th," which we call the "flat 7th," to make the intervals in that key correct. Many tunes also have one note above the octave or "treble." The addition, therefore, of the "flat 7th" and the one above the "treble" to the eight bells of the octave makes the number of bells in the set amount to TEN, and this we consider as the least number of necessary bells to form a good chime. A number of tunes also have what is known in music as an "accidental," commonly called the "augmented 4th"; we call it the "sharp 4th," and the insertion of such a bell makes the set comprise ELEVEN BELLS, and, if the bell-room space, strength of tower and purchaser's means permit it, we strongly urge such a set of bells as the best chime within moderate limits. We exemplify such chimes in the two scores here shown, the first being in the key of C, as heavy a set as we recommend for the best service and most satisfactory results.



Chime of Eleven Bells, largest 2,500 lbs., as installed in 1903 in the Tower of CHRIST CHURCH, BINGHAMTON, N.Y. Bell-Room 13 ft. Square by 14 ft. High.

To have TWELVE or more bells in a set, the largest bell, commonly called the "Tenor," must of necessity be heavy enough to avoid having those above the octave so light in weight as to be without that tone-temper or musical timbre so necessary to make all the bells have a homogeneous tone-quality.



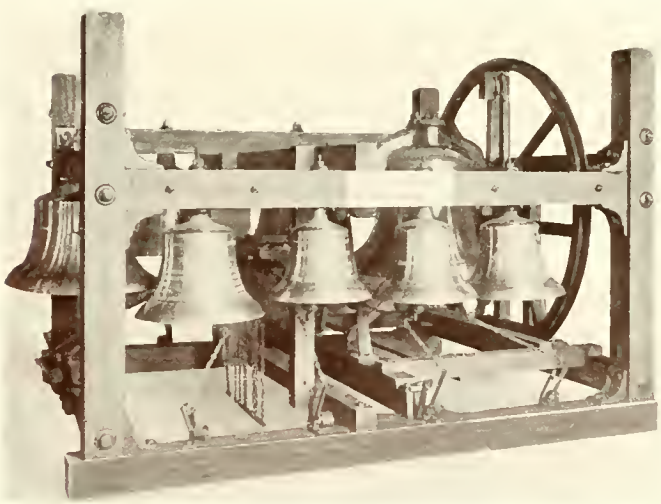
The second score represents a medium weight chime of ELEVEN bells in the key of E flat, and for this NOTE the Tenor bell should never be more than about 3,000 to 3,100 lbs. We can make a lighter weight E flat; it would be nearly a half-tone higher in pitch. These are EXAMPLES. We can furnish lighter chimes in higher keys and intermediate weight chimes, according to the key-note desired. In large cities reasonably heavy chimes are more necessary than those of lesser weight, but a very heavy chime of bells in a moderate size church tower in a small town would be out of proportion with surrounding conditions and involve an unnecessary expenditure of money.

ALL our chime bells are made from SPECIALLY DESIGNED PATTERNS drafted in accordance with most carefully calculated formulæ to produce the richest, fullest musical tone-quality; individually having certain tones that are in tune or harmony and which we can positively discern and manipulate. Bells thus made have certain inherent tone-elements previously counted on, which we smooth out by the mechanical tuning process employed ONLY in our foundry.

Every chime bell is thus a TONE-TEMPERED bell of a distinctively pure, smooth, velvet-like tone-quality, musically attuned within itself and as perfectly in tune with the others of the set as can possibly be made.

Musical Doctors, Teachers of Music in Universities and Colleges, Organ Builders and Organists, many of them having NATIONAL reputation of highest ability, have thoroughly tested our work; some have been here in the foundry and tested our process, all of which they did in the most critical manner, and have marveled at the superior results and splendid accuracy of tone and tune and have said that they would consider any alteration as likely to spoil what they regard as the best possible chime work. We do not claim that chimes made many years ago according to the then known methods were models of perfection, for they simply COULD NOT be, nor can any foundry on earth produce even an approximately accurate set of bell chimes without SOME tuning after the bells are cast. What we claim is, that NO OTHER MAKE of chimes can fairly compare with such of our chimes as have been made in accordance with our present system of tuning. We earnestly advise every one considering the purchase of chimes, if at all practicable, to personally visit different places and inspect this class of our work, or employ some competent, reliable person to do so, and compare it with that of any other; also to write to those whom we have thus served and learn from them what they can say of the quality of our work and reliability of our dealings. We urge this direct method of investigation as the best way for each prospective chimes purchaser to subserve his own best interests.

Chime of Twelve Bells, largest 4,300 lbs., as installed in the Tower of ST. PETER'S CATHEDRAL, Erie, Pa., 1903. Bell-Room 18 ft. Square by 16 ft. High.

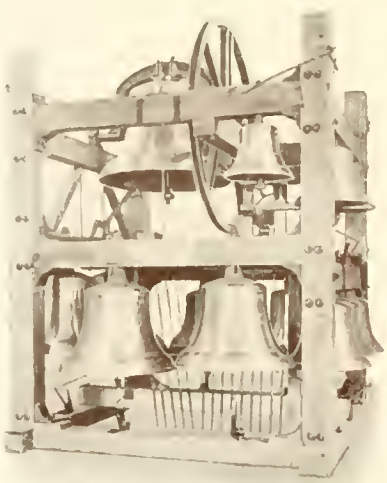


Chime of Ten Bells, largest 2,500 lbs., as installed 1901 in the Tower of ST. MATTHEWS GERM. LUTH. CHURCH, Charleston, S.C. Bell-Room 15 ft. Square by 12 ft. High.

ALL tunes cannot be played accurately on ANY chime of bells, nor is it necessary, as there are thousands of good well-known tunes that CAN be played accurately on a chime of ten to twelve bells. The chimer should provide 200 to 400 different tunes for his use with which he can so change his programs from time to time as to make every chimes concert a pleasurable event to the community. By harmoniously transposing one or two notes in a tune that cannot be played as composed, it will be found that such tunes can be played so well that no one will notice any change therein.

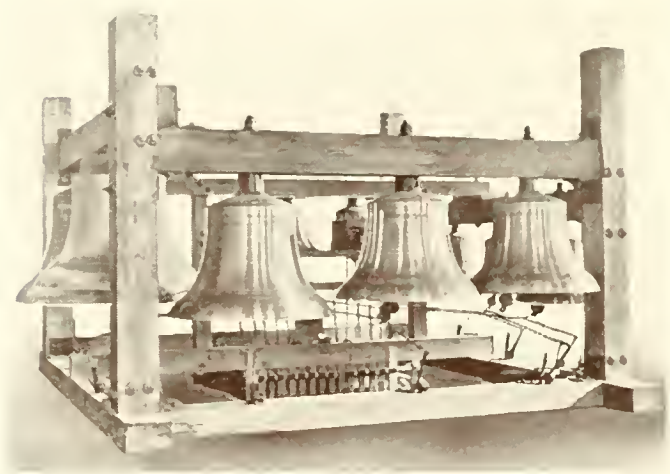
THE tunes in the various church hymnals seldom exceed the limit of Eleven bells, and as such tunes are used almost exclusively on church chimes there is no pressing need for more bells. A very small number only of the sacred solos are suitable for being played on chimes, largely because as they are composed many contain a number of "accidentals" and often a change of key, which effect cannot be produced on a chime of bells. Hence it is better to adhere to the hundreds of tunes available in the church and gospel hymnals, playing those best known to the community.

The peculiar inherent tone-elements of bells of less than 24" diameter make it very essential to avoid their use in chimes. The purpose of the heavier chimes is to obtain a richer, mellower tone-quality which is due to the larger proportions of the bells and the use of more metal properly distributed. If the range of a heavy chime be extended to more than Twelve bells, those beyond that number, no matter how good they may be individually, are of little musical value in the chime, and these upper notes will sound more or less out of balance with the large ones. For these reasons as well as others which we will frankly discuss with prospective chime purchasers who desire it, it is impracticable to make a really good sounding chime the largest bell of which is appreciably less than 1,800 lbs. In such a set the smallest bell would be something like 200 to 230 lbs., and will do very well, but would, as above stated, be somewhat out of balance in a chime of which the largest bell weighs 2,500 lbs. or more.



Chime of Fourteen Bells, largest 4,300 lbs., as installed 1903 in the Tower of ST. SIMEON'S EP. CHURCH, Philadelphia, Pa. Bell-Room 14 ft. Square by 17 ft. High.

For Universities, Colleges and Public Memorial Towers there may be good reasons for having one or two more bells in the set to permit playing a limited variety of secular songs and ballads, but such a chime needs to be of such weight as to require not less than 250 to 300 lbs. in the bell for the highest note, and in such chimes the purchasers can afford to make some allowance regarding tone-balance that they may have the necessary bells for playing the rollicking tunes desired. There are not many such tunes, however, that are desirable and, therefore, not much is lost in deciding on a chime of eleven or twelve bells of lesser weight.



Chime of Fourteen Bells, largest 4,850 lbs., as installed 1908 in the Tower of the Library Building, CORNELL UNIVERSITY, Ithaca, N.Y. Bell-Room 18 ft. Square by 12 ft. High

For each chime of bells we supply, the frame is particularly built to suit the bell-room in which it is installed, and is based on the inside size and character of the room and the style of the windows. For that reason we present illustrations of several chimes showing how they are installed, and give the size of the room. The same chiming action is in each and every set we supply, the most perfect Playing Action that has ever been devised for chimes.

In numerous instances the purchasers do not desire the largest bell to be used as a swinging bell, and so all the bells are mounted as shown in the illustration of Cornell University Chimes.

OUR CHIMES PLAYING CONSOLE

N this page we show two styles of our Chiming Console, one having turned posts, the other rich, plain posts, and purchasers of our chimes may have either style desired. We make them of Oak, highly polished, and will be furnished in either a dark antique, dark golden or green weathered finish as preferred; if no preference is expressed in ordering, we furnish the Console with turned posts and dark golden Oak finish.

The music holder, the connecting ferrules, the adjusting bars and hinges are all of brass, highly finished, and with the remaining metal parts, bolts, etc., are heavily nickel-plated.

If desired, the Console will be provided with four foot-pedals or levers, but our experience is that with very few exceptions, where they have been included, they have fallen into disuse within a very short time, and so they are only included if so requested at time of making contract for the chimes. The connections from the Console up through the several floors to the bell-room are straight-grain wooden rods, tested to stand 1,500 lbs. lift, and unless broken by side strain they will last anywhere from 50 to 100 years with proper care. Owing to the character of these connections, which must be of great strength and lasting quality, it becomes a necessity to have the Chiming Console located on some floor of the tower and as nearly in the center of the room as the connecting adjustments of playing action require, all of which is based on the size and shape of the bell-room, and illustrated on page 35 of this book. The chiming action immediately under each bell in our chimes is unique in design, combining strength, reliability of tension with resilient stroke; in effect a heavy Piano Action.

No one can strike too hard a blow, and yet as light a stroke as desired can be given, nor can the ball of the clapper rest in contact with the bell. There is nothing gained by extra exertion of power in playing nor any back-pulling of the levers necessary by the chimer. Playing a chime is healthy exercise and the correct knack of it is soon acquired by one ambitious enough to properly qualify, and while this work does NOT require a professional musician, he should be one well enough versed in music to read it readily and be able to play it correctly on some musical instrument such as Piano, Organ, Violin, 'Cello, Trombone, Cornet, etc. Such an one will, by aid of the instructions given by our chimer at time of installation of chimes, be able to properly play them almost immediately.

CHIMES FROM OUR FOUNDRY

IN these pages we present a large list of chimes supplied by this foundry, compiled from the records, the first set having been manufactured for exhibition about 1853. It is interesting that, so far as we know, all the chimes furnished, with but two or three exceptions, are still in use to the edification of all who hear them. We give these illustrations as near as space permits according to weights, beginning with the lightest weight chimes made.

Sacred Heart Church, Georgetown, B. Guiana
Ten Bells, 1800 lbs. Tenor; bought in 1905.

Church of the Good Shepherd (at right), Hartford, Conn.
Nine Bells, 1800 lbs. Tenor; bought in 1869.

Shown below, left to right:

Christ Episcopal Church
Indianapolis, Ind.
Nine Bells, bought 1860.
Tenor bell 1700 lbs.

St. Paul's Ep. Church
Petersburg, Va.
Nine Bells, bought 1860.
Tenor bell, 1700 lbs.

Trinity Reformed Church
York, Pa.
Chime of Nine Bells,
Tenor bell 1800 lbs.
Bought in 1868

The church shown at the right is First Presbyterian with DeWitt C. Hay Memorial Tower, Sackets Harbor, N.Y., in which is Chime of Ten Bells succeeding a set of nine originally placed in 1893. That first set was destroyed by fire, and the new set was placed in 1899. Tenor bell weighs 1800 lbs.

The church at left is St. Peter's R. C. Church, New Brunswick, N.J. Chime of Nine Bells, 2100 lbs. Tenor; bought in 1870.

The second church at left is Ascension Church, Troy, N.Y., having Nine Bells, the Tenor nearly 1800 lbs.; placed in tower in 1870.

The church at right is Main St. M. E. Church, South, Danville, Va. Chime of Eleven Bells, 2100 lbs. Tenor; installed in 1909.

In the lower left corner is St. Peter's Eng. Church, Cobourg, Ont. Chime of Ten Bells, installed 1904; Tenor bell 1800 lbs.

In lower right corner is Grace M. E. Church, Morningside, Sioux City, Iowa. Chime of Eleven Bells, Tenor 2100 lbs.; installed in 1908.

The church at left is Woodside Presbyterian, Troy, N.Y., having Nine Bells, 1800 lbs. Tenor; installed in 1869.

Next below is St. Patrick's Church, Utica, N.Y. The bells were purchased from time to time until ten in all had been procured by 1868. Tenor weighs somewhat less than 1800 lbs.

The next below is Park Congregational Church, Norwich, Conn. Ten Bells installed 1876; Tenor 2100 lbs.

Church shown at right above is St. John's Anglican, Lunenburg, Nova Scotia. Chime of Ten Bells, 1800 lbs. Tenor; installed 1902.

Next below is St. Paul's Anglican Church, Fort William, Ont. Chime of Ten Bells, Tenor 1800 lbs.; installed 1909.

Lower right hand is First Presbyterian Church, Pasadena, Cal. Eleven Bells, 2100 lbs. Tenor; installed 1908.

The church shown at the left is St. John's Anglican, Truro, Nova Scotia. Chime of Ten Bells, Tenor 1800 lbs.; installed in 1906.

The one at the right is M. E. Church, Plainfield, Ill. Chime of Ten Bells, Tenor 1800 lbs.; installed 1906.

The next shown below is First M. E. Church, San Diego, Cal. Chime of Eleven Bells, Tenor 2100 lbs.; installed in 1908.

That shown in lower right corner is St. James Anglican Church, Stratford, Ont. Chime of Eleven Bells, Tenor 2100 lbs.; installed 1909.

We also have chimes as noted in the following named churches.

St. Paul's Episcopal Church at Concord, N.H. Nine Bells, 1800 lbs. Tenor; installed in 1868.

St James' Episcopal Church at Derby, Conn. Nine Bells, 1800 lbs. Tenor; installed in 1867.

St. John's R. C. Church, Newark, N.J. Nine Bells, 1800 lbs. Tenor; installed in 1859.

St. John the Baptist R. C. Church at Paterson, N.J. Nine Bells, 2100 lbs. Tenor; installed in 1860.

St. Aloysius R. C. Church, Newark, N.J. Nine Bells, 2100 lbs. Tenor; installed in 1888.

St. Ann's R. C. Church, Brooklyn, N.Y. Nine Bells, Tenor 2100 lbs.; installed in 1869.

St. Peter's Presbyterian Church, Rochester, N.Y. Procured nine bells in 1860 and added three in 1869. Tenor 2100 lbs.

St. James' Episcopal Church, Oskaloosa, Iowa. Ten Bells, 2100 lbs. Tenor; installed in 1901.

St. Paul's Episcopal Church, Chester, Pa. Eleven Bells, 2100 lbs. Tenor; installed in 1909.

1. Memorial M.E. Church, South, Durham, N.C. Ten Bells, Tenor 1800 lbs.; installed 1907.

2. First Presbyterian Church, Marion, Ind. Eleven Bells, 2100 lbs. Tenor; installed in 1910.

3. First Ev. Lutheran Church, Leechburg, Pa. Ten Bells, 2100 lbs. Tenor; installed in 1910.

4. Court St. M. E. Church, South, Lynchburg, Va. Ten Bells, 1800 lbs. Tenor; installed in 1908.

5. Trinity Episcopal Church at Vineland, N.J. Ten Bells, 2100 lbs. Tenor; installed in 1902.

Also have chime of Ten Bells in tower of St. Patrick's Church, San Francisco, Cal., Tenor 2500 lbs.; installed in 1874.

Christ Episcopal Church, Little Rock, Ark., at the left. Eleven Bells, 2100 lbs. Tenor; installed in 1903.

St. Paul's Presby. Church, Hamilton, Ont., at right. Eleven Bells, 2100 lbs. Tenor; installed 1906.

At left centre is shown Unitarian Church at Hopedale, Mass. Eleven Bells, 2100 lbs. Tenor; installed in 1910.

At right centre is shown St. Timothy's Ep. Church, Roxborough, Philadelphia, Pa. Ten Bells, 2100 lbs. Tenor; installed 1897

At right here shown is David Dudley Field Memorial Tower at Stockbridge, Mass., in which is Chime of Ten Bells, 2100 lbs. Tenor; installed in 1878.

At left is St. John's Ep. Church, Savannah, Ga. Procured Eight Bells in 1854 and were used until 1910. They were then sent to us to be recast and have three bells added, all tuned by our new process, and with all new frame, fittings and playing console were placed in Tower in 1911. Tenor bell is 2500 lbs.

The churches shown on this page, beginning at the left downward and then the right downward, are:

St. Mark's Ep. Church at Hoosick Falls, N.Y. Ten Bells, 2500 lbs. Tenor; installed in 1871.

St. Paul's Ep. Church, Buffalo, N.Y. Ten Bells, 2500 lbs. Tenor; installed in 1856.

Central M. E. Church at Winona, Minn. Eleven Bells. 2500 lbs. Tenor; installed in 1906.

First Baptist Church, Newton Centre, Mass. Ten Bells, 2500 lbs. Tenor; installed in 1898.

St. Peter's Ep. Church, Auburn, N.Y. Ten Bells, 2500 lbs. Tenor; installed in 1875.

St. Matthew's Germ. Ev. Luth. Church, Charleston, S.C. Ten Bells, 2500 lbs. Tenor; nstalled in 1901.

Trinity Ep. Church at Cleveland, Ohio, had a like Chime of Nine Bells, procured in 1854. The parish outgrew the church and erected a new edifice about fifty years later which became the Cathedral of the Diocese; the old church was dismantled and with the bells and other things disposed of

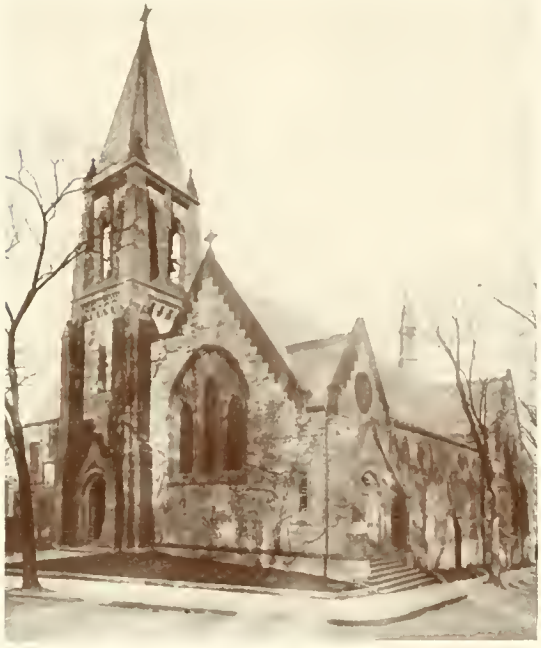
The church shown at right is St. Peter's R. C. Church, Haverstraw, N.Y. Ten Bells, 2500 lbs. Tenor; installed in 1896.

At the left is St. John's Ep Church, Waterbury, Conn. Ten Bells, 2500 lbs. Tenor; installed in 1871.

At right centre is shown Christ Church, Anglican, at Petrolia, Ont. Eleven Bells, 2500 lbs. Tenor; installed in 1909.

Below at left is shown All Saints' Ep. Church, Great Neck, N.Y. Eleven Bells, 2500 lbs. Tenor; installed in 1904.

The church shown below at right is Christ Ep. Church, Binghamton, N.Y. Eleven Bells, 2500 lbs. Tenor; installed in 1903. We have duplicates of this chime in the towers of Christ Ep. Church, Winnetka, Ill., and Memorial M. E. Church, Mishawaka, Ind., both sets installed in 1912.



Above is shown Grace Episcopal Church, New Bedford, Mass. Ten Bells, 3000 lbs. Tenor; installed in 1882.

Below is shown B. M. C. Durfee High School, Fall River, Mass., with a like chime installed 1886.

Above at right is St. James' Ep. Church, Sault Ste. Marie, Mich Chime of Eleven Bells, 3000 lbs. Tenor; installed in 1905.

That next below is Christ Ep. Cathedral, Salina, Kans. Chime of Eleven Bells, 2500 lbs. Tenor; installed in 1906.

Next below is shown Grace Ep. Church, Utica, N.Y. Ten Bells, 2500 lbs. Tenor; installed in 1870.

We also have Chime of Ten Bells in tower of Elm Park M. E. Church, Scranton, Pa., 3000 lbs. Tenor; installed in 1892.

The Church of O. L. of Perpetual Help (Mission Church), Roxbury, Boston, Mass. Chime of Twelve Bells, Tenor 4300 lbs.; installed in 1910.

A like chime is in tower of the Guardian Angels Church, Manistee, Mich., shown below; installed 1910.

At the right is Holy Trinity Church, Yarmouth, Nova Scotia. Eleven Bells, Tenor 2500 lbs.; installed in 1908.

Below it is St. Simeon's Ep. Church, Philadelphia, Pa. This church has a Chime of Fourteen Bells, Tenor 4300 lbs.; installed in 1903.

The church shown at the right is St. Paul's Episcopal Church, Dedham, Mass. Chime of Ten Bells, 3000 lbs. Tenor; installed in 1881.

A like chime of bells is in tower of Trinity Ep. Church, Bristol, R.I. It is composed of bells bought at various times until the last ones to complete the set in 1897.

At the left is shown St. Thomas' Episcopal Church, New York City, as it was before the fire which destroyed the Tower. There were Ten Bells therein, Tenor nearly 3000 lbs.; installed in 1874. The bells are in storage until the completion of the new edifice.

In centre is shown the Cathedral of the Immaculate Conception, Albany, N.Y. Chime of Ten Bells, Tenor 3000 lbs.; installed in 1862.

The church shown below is St. Michael's Episcopal, New York City. Chime of Ten Bells, Tenor 3000 lbs; installed 1891.

Grace Episcopal Church, New York City, shown above, has perhaps the widest known Chime of Ten Bells in this country. The Tenor is nearly 3000 lbs. They were installed in 1873 and are rung several times daily.

St. Andrew's Episcopal Church, shown at right, New York City. Chime of Ten Bells, Tenor 3000 lbs.; installed in 1890.

At the left is shown St. Peter's German Ev. Lutheran Church, Berlin, Ont. There were three fine bells in the tower, which was surmounted by a fine tall spire. It was struck by lightning which destroyed the spire and the tone of the bells. They were sent to the foundry, recast and nine bells added, making a chime of Twelve, Tenor 3000 lbs., and installed in 1901.

At the right above is shown St. Patrick's Cathedral, Newark, N.J., which has a Chime of Ten Bells, 3000 lbs. Tenor. Four of the bells were procured in 1862 and others added from time to time until the set of ten was completed in 1875.

From left to right below are shown in the order named, the Thomas W. Lawson Observatory Tower at Dreamwold, Egypt, Mass., in which is a Chime of Ten Bells, 3000 lbs. Tenor; installed in 1901.

St. James' Cathedral, Anglican, Toronto, Ont., having perhaps the tallest spire in Canada, in the belfry of which is a Chime of Nine Bells, the Tenor weighing nearly 5000 lbs., which were installed in 1866.

Christ Episcopal Church, Reading, Pa. Chime of Ten Bells, Tenor weighing 2500 lbs.; installed in 1874.

On this page are shown left to right downward, St. Andrew's Memorial Ep. Church, Yonkers, N.Y. Chime of Twelve Bells, 3500 lbs. Tenor; installed in 1909.

St. Mary's R. C. Church, Yonkers, N.Y. Chime of Twelve Bells, 4300 lbs. Tenor; installed in 1911.

St. Patrick's R. C. Church, Cleveland, Ohio. Eleven Bells, installed in 1899; 3550 lbs. Tenor.

St. Charles Borromeo Church, Philadelphia, Pa. Eleven Bells, 3000 lbs. Tenor; installed in 1904.

Trinity Ev. Luth. Church, Connellsville, Pa. Chime of Twelve Bells, 4300 lbs. Tenor; installed in 1911.

St. John's R. C. Church, Clinton, Mass. Chime of Eleven Bells, 4300 lbs. Tenor; installed in 1902.

Also have a Chime of Twelve Bells, 3500 lbs. Tenor, installed 1912, in University of Washington, Seattle, Wash.

The church at left is South Congregational Church, New Britain, Conn. Chime of Fourteen Bells, Tenor 4300 lbs.; installed in 1904.

At right is shown Trinity Episcopal Church, Pittsburgh, Pa. Four bells were supplied in 1864, five in 1871 and one in 1874, making ten bells in all; the Tenor weighing nearly 3600 lbs. In 1910 they were remounted in a new frame and fitted out with our latest improved Chiming Console and Playing Action.

Cornell University at Ithaca, N.Y., is shown in lower left corner. A Chime of Nine Bells was installed in the old tower in 1868, and a great clock bell of nearly 5000 lbs. added a year later.

These were all sent to us in 1907, the two largest TUNED TO PITCH, the others recast and incorporated into TWELVE ADDITIONAL bells, using the old great bell as the Tenor of the newly constructed Chime of Fourteen Bells; these with all new frame, Chiming Console and playing connections were installed in the tower shown in 1908.

In centre is shown St. Luke's Episcopal Church, Germantown, Philadelphia, Pa. Chime of Ten Bells, installed in 1892; Tenor weighs 3000 lbs.

Church shown below is St. Joseph's French Church, Toledo, Ohio. The church has Eleven Bells, 3500 lbs. Tenor. Two bells were bought in 1879 and others added from time to time until the set was completed by 1900.

At the left above is shown St. Peter's Cathedral, Erie, Pa., which has a Chime of Twelve Bells, 4300 lbs. Tenor, installed in 1903. At the right we show Christ Episcopal Church, New Haven, Conn., having a Chime of Fourteen Bells, 4300 lbs. Tenor, installed in 1905.

At the left is shown the City Hall and County Building, Albany, N.Y., which has a bell of 7100 lbs., installed in 1882.

At the right is shown St. Patrick's Church, Watervliet, N.Y., having a bell of 7250 lbs., which was installed in 1906. So far as we know, these are the largest bells in this State outside of the city of New York.

THE ORIGIN OF BELLS

WE include herein a few of the many interesting Old Missions of Southern California and some of the great churches and cathedrals of Mexico. The cathedrals of Mexico City and Monterey are said to have some of the largest bells in the Western Hemisphere, doubtless procured from Spanish founders during the past two or three centuries. We also give a description of the forms of some of the earliest known bells used to summon people to worship.

The origin of bells is probably to be dated from the time when the sonorous property of metals was first noticed. In the writings of Moses (Exodus xxviii. 33–35), "bells of gold" are mentioned as being attached to Aaron's robe, that "his sound shall be heard when he goeth in unto the holy place before the Lord." Bells are also mentioned in Zech. xiv. 20: "In that day shall there be upon the bells of the horses, HOLINESS UNTO THE LORD;" and it has been suggested that even Tubal Cain, the sixth in descent from Adam, "an instructor of every artificer in brass and iron," might have known something of the art of making them. Æschylus and Euripides inform us that the Greek warriors had small bells concealed within the hollows of their shields, and when the captains went their rounds of the camp at night each soldier was required to ring his bell in order to show that he was awake and watchful at his post. The caldrons of Dodona, which were a rude kind of brazen kettle or bell, are mentioned in history as having existed at a very early period; they having been hung upon the temple of Jupiter, at Dodona, and through the sound which they gave forth when the winds caused them to strike against each other, the most ancient of the Grecian oracles promulgated their responses. Plutarch mentions that when the city of Xanthus was besieged, some of the inhabitants tried to escape by swimming and diving through the river, but nets with small bells attached were spread across the stream under the water, by the ringing of which each capture was announced.

The Bells of San Gabriel, Cal.

Bells of San Juan Capistrano, Cal.

The Old Mission at San Diego, Cal.

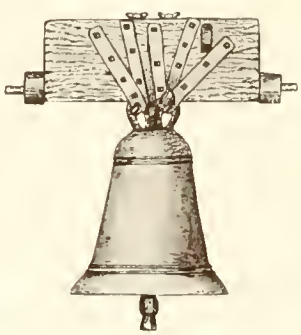
The period when large bells were first introduced in churches is uncertain, but by the seventh century they were in pretty general use, since the venerable Bede at that time mentions them as being in English churches. Their use for this purpose gradually

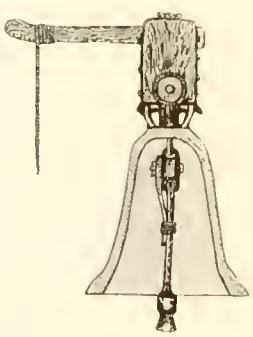
extended throughout Christian countries, giving rise to that feature of ecclesiastical architecture, the bell tower. Authorities are divided as to who was the first to thus introduce them; some claiming it to have been Paulinus, Bishop of Nola, in Campania, Italy, A.D. 400; others, Pope Sabinianus, A.D. 604.

Dr. Heinrich Otte described about 1856, in "Glockenkunde," several bells made many centuries before, undated, having the form of

an inverted goblet, the bottom more or less curved, and the two here shown, also without date upon them, the first having its loops broken off. The second begins to show the evolution of form toward the more modern, and these he called "sugarhatform." The next bell shown below is that of the Great Bell of Japan and said to rival the King of Bells at Moscow. The one beside it is an English bell of 1759.

The bell shown below this is very ancient, without date upon it, and so far as we know is still in use at Manningford-Abbots, Wilts, England. The next two at bottom of this page are of English manufacture of the date cast upon them.





The first peal of which there is any reliable account was one of five bells which was presented to King's College, Cambridge, England, by Pope Calixt III, in 1456. From that period the placing of several bells in one tower became more frequent; but it was not until the middle of the sixteenth century that peal ringing became reduced to an art.

In the history of the church of the middle ages the bell has much to do. In the liturgies of the Roman Catholic Church is given a form for its consecration, directing the priest to wash the bell with water, anoint it with oil, and mark it with the sign of the cross in the name of the Trinity. It was often christened with great pomp

and ceremony; persons of high rank being its sponsors, and a bishop or archbishop officiating; one instance of which was the naming, in the year 968, of the great bell of the Lateran church by Pope John XIII. for himself, John. The Sanctus bell, which, as now used in Catholic churches, is a small bell rung by one of the attendants upon the priest just before the elevation of the Host in order to fix the attention of the people, was formerly a large bell, hung in an outer turret of the church and rung at the words "Sancte, sancte, sancte Deus Sabaoth," at the sound of which all who heard, whether within or without the church, were enjoined to bow in adoration. The Angelus, or Ave Maria bell, was rung at fixed hours, at the sound of which all were reminded to offer a supplication to the Virgin, and which, doubtless, also served to publicly mark the hours of beginning and cessation from labor. The Vesper bell was the call to evening prayer, while the Complin bell summoned the people to the last religious service of the day. The Passing bell was so named as being tolled when any one was passing from life, and it was ordered that all within hearing should pray for the soul of the dying. From this custom is doubtless derived that of tolling the church bells at funerals, the number of blows struck indicating the age of the deceased. Excommunication from the church by "bell, book and candle" was long practiced, the bell being rung to summon an audience, the service read from the book by a priest, and, when the anathema was pronounced, the candles were put out, as emblematical of the extinction of hope in the sinner's soul. The ringing of the Curfew bell was of civic rather than ecclesiastic appointment, the custom having been introduced into England by William the Conqueror, from France. It was rung at eight or nine o'clock in the evening when every one was expected to extinguish fire and lights in his house; hence it was called the *couvre feu* (cover fire)

At the left, reading down, we show the Old Mission at San Luis Rey, Cal.

Then the Mission Church at Ventura, Cal.

Then Santa Ynez, Cal.

That at bottom of page is the Pala, a part of San Luis Rey.

That at the right is the Bell Gable and Bells of Santa Ynez as seen from the graveyard.

Santo Domingo Church, Guadalajara, Mex.

Cathedral and Saddle Mt., Monterey, Mex.

The Cathedral at Mexico, Mex.

common of the old Latin bell inscriptions: "*Pestem fugo*," I drive away infections; "*Fulgura frango*," I abate the lightnings; "*Dissipo ventos*," I dissipate the winds.

Bells were used at a very early period to strike the divisions of time. Lucian, who died A.D. 180, refers in his writings to an instrument so constructed that the rise of water within it would cause a bell to strike at certain intervals. By the eleventh century lock bells were in general use in the monasteries of Europe.

The use of bells to sound alarms also dates from an early period, they being thus used when danger from fire, flood, or the common enemy threatened; and it is mentioned that they were sometimes rung to frighten off the enemy as well as to warn of his approach.

bell, from which comes its present name; there being localities in England where the "curfew tolls the knell of parting day."

The ringing of bells during eclipses — which were supposed to be occasioned by evil spirits — was common, and is referred to by Pliny and Juvenal. So, too, it was supposed that their ringing would avert tempests, drive away infections and abate the lightnings, since the evil spirits of the air, being alarmed thereby, would abandon their malignant purpose and flee in affright. This belief is evidenced by one of the most

Church and Steps, Cholula, Mex.

Macbeth, when he had shut himself in the fortress of Dunsinane, and it was announced to him that Birnam Wood was moving on the castle, cried out, in his desperation, "Ring the alarum bell!"

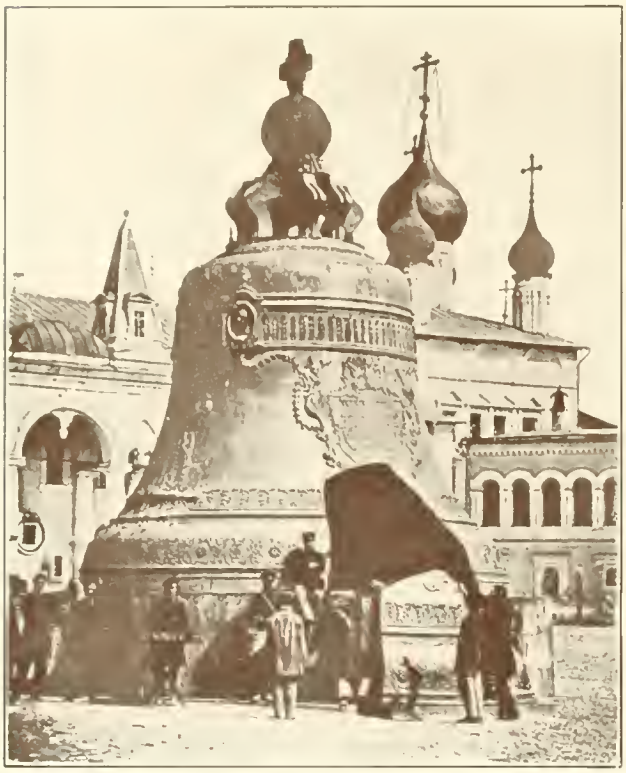
The immensely large bells in the world have always been objects of interest and wonder. Their existence is probably due to the display of magnificence and a religious enthusiasm prevailing at the time among semi-civilized nations who regarded the provision of these immense bells for churches, monasteries, etc., as being meritorious in proportion to their size. Both of these considerations tended to the production of the Great Bell of Moscow, at the casting of which it is recorded that the nobles from all parts of the Empire were present, vying with each other in the value of the votive offerings, such as gold and silver plate, jewelry, etc., which they cast into the furnace. This "King of Bells" stands at the foot of the tower of Ivan Veliki within the Kremlin at Moscow, not far, probably, from the spot upon which it was cast from furnaces erected specially for the purpose. It is placed upon a circular wall or base of granite of about five feet in height by four feet in thickness, in the front of which, looking toward the Moskva river, is placed a marble slab bearing the following inscription in Russ:

Church at San Luis Potosi, Mex.

This Bell
was cast in 1733 by order of the
Imperial Empress
Anne, Daughter of John.
It was in the earth 103 years
and
by the will of the
Imperial Emperor
Nicholas
was raised upon this pedestal in 1836, August 4th.

In the inscription which the bell itself bears it is stated that the *first* great bell was cast in 1553 and weighed 36,000 lbs.; that during the reign of the Tsar Alexis it was ruined by fire, and in 1654, with additional metal, was recast into the *second* great bell, the weight of which was 288,000 lbs.; that in 1706 this bell was also ruined by fire, and in 1733, with still further additional metal, was recast by order of the Empress Anne into the *present* great bell. It measures 22 feet 8 inches across the mouth, 19 feet 3 inches in height, and its thickness at the point where the clapper would strike is 23 inches. Its estimated weight is from 400,000 to 440,000 lbs. A nearly triangular-shaped piece of about 6 feet in height by 7 feet at the base, the estimated weight of which is 11 tons, is broken out of its side at the rim and stands upon the ground just below the opening thus formed. Besides this fracture there are eight cracks, distributed around the remaining portion of the rim at about equal distances.

Santa Guadalupe Church, San Luis Potosi, Mex.



That the bell never was rung — a question which has caused some discussion — is evident from the inscription upon its base; in addition to which it may be stated that our Mr. G. R. Meneely, who examined it in 1871, observed that although the ponderous clapper by which it was *intended* to have been struck lay beneath it, yet it bore no clapper marks. There are several religious figures cast upon its outer surface, among which is that of the Saviour, the Holy Virgin, and the Evangelists, surrounded by cherubims. It also bears a representation of the Tsar Alexis and the Empress Anne. As a *casting*, the great bell is a specimen of excellent workmanship, the numerous *bas-relief* figures upon its outer surface, together with its ornamentation and inscriptions, being brought out clear and distinct, while the section shown by the fracture exhibits homogeneousness of composition and solidity of structure.

Judging from the mode of manufacture now employed in the extensive and celebrated Moscow Bell Foundry, it is probable that no improvements in the art of bell-making have been introduced in Russia since the casting of the great bell — a remark that will apply, too, for a period of two centuries past, to any country in Europe.

The Cathedral Bells, St. Augustine, Fla.

In addition to the "King of Bells" just described, Russia contains others of greater immensity than can be found elsewhere in the world, among which may be mentioned that upon the Troitsa Monastery, celebrated both for the depth and richness of its tone, and also the "Assumption" bell, in Moscow, the diameter of which is eighteen feet, and its estimated weight 220,000 lbs. It is suspended above the chapel of St. Nicholas, in the Kremlin, but as it is reached by a passage leading from the tower of Ivan (at the foot of which is the "great bell") it is usually spoken of by travelers as being one of the thirty or forty bells suspended *in* the tower. It was cast in 1817 from the metal of a previous bell destroyed in the conflagration of 1812.

At Novgorod there is a bell of about 70,000 lbs. weight, while there are a number of others in different parts of the country weighing from 30,000 to 50,000 lbs.

Among other bells noticeable for their size might be mentioned that of Erfurt, in Germany, weighing 30,000 lbs., which was cast in 1497 and was long distinguished as being not only the largest but the best in Europe. In Vienna and Olmutz are bells of 40,000 lbs. each, cast in the last century; while that of Notre Dame Cathedral at Paris, cast in 1680, weighs 30,000 lbs.

The bell of St. Peter's at Rome weighs 17,000 lbs.; that of St. Paul's, London, 11,600 lbs.;

that in York Minster — called Great Peter of York — 27,000 lbs.; that of Notre Dame, Montreal — the heaviest in America — 29,400 lbs.; the Parliament House Bell, in London, 31,190 lbs. Great Tom, of Lincoln, weighing 10,000 lbs., cast in 1680, was long celebrated as the finest bell in England, but becoming cracked was recast in 1834. The celebrated Great Tom, of Oxford, which hangs in the tower of Christ Church, and strikes one hundred and one times every evening at nine o'clock, weighs 17,000 lbs., and was cast in 1680.

The Chinese are celebrated for their bells and gongs, the latter article being made among no other people. Their bells are fine specimens of casting, but, being nearly cylindrical in shape and of equal thickness throughout, their tone is panny and discordant like that of their gongs. They do not swing their bells nor provide them with a clapper, but strike them upon the outside with a wooden mallet. They, as well as the Russians, have produced some bells of colossal size, among which might be mentioned one at Pekin weighing 120,000 lbs., being 12½ feet high by 14½ feet in diameter.

Nearly half a century ago we received a Chinese bell (see illustration) weighing about 1,000 lbs., which was cast, according to one of the inscriptions upon it (interpreted by Rev. Dr. Wentworth), in the reign of the Emperor Chunchi, in the year 1651, the 5th month and the 16th day. It is a very fine casting, the inscriptions and ornamentation with which it is covered being brought out sharp and distinct, while a double dragon which is cast upon its top and by which it was suspended, is no less excellent in point of workmanship than it is hideous in design.

The metal of which it is composed appears to be a mixture of copper, tin and zinc, while its sound is no better than that of an iron kettle. The superior character of their castings would justify the inference that the tone of Chinese bells is not the result of accident, nor would it be inconsistent with the character of this strange people to suppose that they make their bells as discordant as possible in order to inspire awe and terror.

The old "Liberty Bell," which, on the 4th of July, 1776, announced that the Declaration of Independence was made, deserves every patriotic American's notice. It weighs somewhat over 1,500 pounds and was imported from England in 1752, but broke upon its first trial. It was soon after recast in Philadelphia by Pass & Stow, and was placed upon the hall in which the memorable Congress of 1776 assembled. During the occupation of Philadelphia by the British, in 1777, it was removed to Lancaster, after which it was returned again to its place and was used as a State House bell until 1828. After being removed it was rung only upon extraordinary occasions, the last time of its ringing being in honor of the visit of Henry Clay to Philadelphia. It was next tolled in memory of Chief Justice John Marshall,

This old Spanish bell is preserved as a relic and we shall be pleased to have anyone finding its location tell us of it.

of Virginia, when it broke. It was then placed upon exhibition in the old Independence Hall with other relics of Revolutionary times, where it now remains. The following inscription, taken from Leviticus xxv. 10, surrounds it near the top: "Proclaim liberty throughout all the land unto all the inhabitants thereof."

Independence Hall, Philadelphia, where the Old Liberty Bell is preserved.

INSCRIPTIONS UPON BELLS

WE could fill a volume with copies of inscriptions as cast upon ancient European bells, but for lack of space we must be content with those here presented. They afford a subject of curious interest and are, alternately, beautiful, quaint, whimsical and nonsensical. Many bells were cast as memorials of the events which are recounted in their inscriptions and so serve as historic records of undoubted authenticity. Prior to the 17th century the inscriptions upon English bells were almost exclusively religious epigraphs in Latin; the two most frequently used were:

"GLORIA IN EXCELSIS DEO" "AVE MARIA GRATIA PLENA DOMINUS TECUM"

and this is still much used.

Another, hundreds of years old, and fragments of which are still frequently used, was:

* "Laudo Deum verum, plebum voco, conjugo clerum,
Defunctus ploro, pestem fugo, festa decoro.
Funera plango, fulgura frango, Sahata pango,
Excito lentos, dissipo ventos, paco cruentos."

Another, used from earliest time of bell-founding to the present day:

"I to the church the living call
And to the grave do summon all."

*I praise the true God; I call the people; I assemble the clergy; I lament the dead; I drive away infections; I grace the festival. I mourn at the burial; I abate the lightning; I announce the Sabbath;
I arouse the indolent; I dissipate the winds; I appease the revengeful.

Upon a bell at Staffordshire, England, cast 1604:

"Be it known to all that doth me see
That Newcombe of Leicester made me."

Upon one of later date at Northamptonshire:

"I to the church the living call
And to the grave do summonds all.
Russell of Watten made me
In seventeen hundred and forty-three."

Another at Hampshire, cast 1695:

"Samuel Knight made this ring
In Binstead steeple for to ding."

The above was a favorite advertising couplet for several founders of about that period, each one putting in his own name.

The following inscriptions, selected at large, are upon bells at the various places named.

A bell at Derbyshire, cast 1622:

"I sweetly tolling men do call
To taste on meats that feeds the soul."

An old bell in Cornwall, recast in 1829:

"Jesus fulfill with thy good grace
All that we beckon to this place."

One in Wiltshire, cast 1628:

"Call a soleme assemblie — gather the people."

Another, cast 1582:

"Be mec and loly to heare the word of God."

Ooe in Hampshire, cast 1600:

"God be our guyd."

One in Nottinghamshire, cast 1603:

"Jesus be our spede."

Another in Wiltshire, cast 1585:

"O man be meeke and lyve in rest."

One in Yorkshire, cast 1656:

"When I do ring Gods prayses sing.
When I do toule pray heart and soule."

One a fire bell in Dorsetshire, cast 1652:

"Lord quench this furious flame,
Arise, run, help, put out the same."

Another in Wiltshire, cast 1619:

"Be strong in faythe, prayes God well
Frances Countes Hertford's bell."

One in Warwickshire, cast 1675:

"I ring at six to let men know
When to and from their worke to go."

One in Somersetshire, cast 1700:

"All you of Bathe that heare mee sound
Thank Lady Hopton's hundred pound."

One in Northamptonshire, cast 1601:

"Thomas Morgan Esquier gave me
To the church of Heford frank and free."

The FORMS of Inscriptioos are many and vary in accordance with local conditions and preference of purchasers. We present a few of the most common forms, using fictitious names and places.

"SANCTA MARIA, ORA PRO NOBIS"

"Enter into his gates with thanksgiving, and into his courts with praise."

January, 1911.

"THIS BELL WAS ERECTED IN
ST. DANIEL'S CHURCH,

IN DECEMBER, A.D. 1910,
TO THE GREATER GLORY OF GOD.
"O COME LET US WORSHIP."

HOLY TRINITY
EVANGELICAL LUTHERAN CHURCH,
ORGANIZED FEB. 1903,
THIS BELL PLACED FEB. 1911.
"GLORY TO GOD IN THE HIGHEST."

MRS. JANE MARTIN HAS
ERECTED THIS BELL IN MEMORY OF
HER DECEASED HUSBAND
JOHN HENRY MARTIN,
BORN JAN. 10, 1843,
DIED NOV. 21, 1904.

CLEARY NORW. LUTHERAN CHURCH.

H. O. HEFFNER, PASTOR,
A.D. 1910.

PRESENTED TO
THE FIRST PRESBYT. CHURCH,

IN LOVING MEMORY OF
JOHN O. AND MARY E. HOWARD,
BY THEIR CHILDREN,
A.D. 1910.

MARGARET KENNEDY DONAVIT
A.D. 1863.
JULIA, ALBERTUS, ROBERTUS BROWNE,
LUDOVICA, HELENA, ADRIANUS DALTON
RESTAUVERUNT
A.D. 1910.

IN MEMORY OF
THOMAS McDONALD
AND
JACOB G. SILBERMANN.

✝

IMMACULATE CONCEPTION CHURCH,
OLYMPIA, OKLA.
A.D. 1909.

TO THE HOLY ANGELS CHURCH,

BY THE FENNIMORE FAMILY,
A.D. 1910.

✝

SANCTA TRINITAS, UNUS DEUS,
MISERERE NOBIS.
SPES NOSTRA, SALUS NOSTRA,
HONOR NOSTER.
1906.

✝

FORTITUDE DEI.
AVE, GRATIA PLENA; DOMINUS TECUM,
BENEDICTA TU IN MULIERIBUS.
LUC. 1, 29.
SANCTE GABRIEL, ORA PRO NOBIS.
1906.

When a Chime of Bells is the gift of some one person or family, it is customary to confine the inscription to the Tenor Bell. If anything is inscribed on the remaining bells, it is generally a continuation of that on the largest bell, beginning with a passage of Scripture, or a series of virtues, or a list of names, as indicated in these few examples.

On the bells of the Chime placed in St. James' Episcopal Church, Sault Ste. Marie, Mich., on one side

"GLORY TO GOD IN THE HIGHEST"

and on the other side the donor's name and year date.

On the Tenor Bell of the Chime in All Saints' Church, Great Neck, N.Y.:

"I hang in a lofty place and
I call you to love and praise
Him who hath given you life and
the beauty of wondrous days.
Mine is the voice of His words that
calls you from toil and stress.
I want you to be happy, and know
that God is fain to bless."

On the Tenor Bell of the Chime in Christ Church, Binghamton, N.Y.:

IN MEMORY OF
THE JARVIS FAMILY
THIS CHIME OF ELEVEN BELLS
PRESENTED BY

TO CHRIST CHURCH,
BINGHAMTON, N.Y.
1903

On the Tenor Bell of the Chime in St. Peter's Cathedral, Erie, Pa.:

AD GLORIAM DEI ET IN HONOREM SANCTI
PETRI, ME FIERI FECIT REDMUS JOAN-
NES E. FITZMAURICE, LEONE XIII
FELICITER REGNANTE.

On each of the remaining bells a patron saint's name and the words

ORA PRO NOBIS.

On the Tenor Bell of the Chime in Guardian Angels' Church, Manistee, Mich.:

THIS CHIME OF BELLS WAS DONATED TO
GUARDIAN ANGELS' CHURCH, MANISTEE, MICH.,
BY CARRIE FILER,
SEPT. 20, 1909, INSTALLED APRIL, 1910.

On the reverse side is

"CAROLINE"

Each of the remaining bells a name in like manner, thus:

THOMAS,	PIUS,	HENRY JOSEPH,
MARY,	GERTRUDE,	PHILOMENA,
ALPHONSUS,	CAECILIA,	ALOYSIUS,
JAMES,	ANNA.	

A Roman cross above each name.

On the Tenor Bell of the Chime in Christ Church, Petrolia, Ontario:

THIS CHIME OF BELLS
WAS PRESENTED TO
CHRIST CHURCH, PETROLIA,
IN LOVING MEMORY OF
CHARLOTTE ELEANOR THOMPSON
BY HER HUSBAND,
JACOB LEWIS ENGLEHART,
DIED, 31st DECEMBER, 1908.

On the reverse side the word "CHARITY," the remaining bells bearing these words in the order given:

FAITH,	HOPE,	LOVE,
JOY,	PEACE,	LONG SUFFERING,
GENTLENESS,	GOODNESS,	MEEKNESS,
TEMPERANCE.		

On the Tenor Bell of the Chime in Christ Cathedral, Salina, Kansas:

THESE BELLS ARE GIVEN TO
CHRIST CATHEDRAL, SALINA, KANSAS,
IN LOVING MEMORY OF
ARTHUR M. CLAFLIN,
BORN JANUARY 23, 1836.
DIED NOVEMBER 6, 1904.

The one hundred and fiftieth Psalm, suitably divided, is inscribed on the bells, the division fitting well to eleven bells.

The late Philip Corbin presented a Chime of Fourteen Bells to the South Congregational Church, New Britain, Conn., and on the Tenor Bell was inscribed the presentation to the church "In Recognition and Praise of the Goodness of God" elaborated under the General Theme "The Goodness of God," and the General Mood: "Proclamation and Praise."

Each bell is inscribed with a short verse of Scripture carrying out the idea of the Theme and Mood stated on the large bell.

On the original chime of nine bells furnished by this foundry in 1868 to Cornell University were inscribed the well-known lines from Tennyson's "In Memoriam," cvi, beginning with

"Ring out the old, ring in the new;
Ring out the false, ring in the true."

A year later Mrs. Mary A. White presented the great Clock Bell, which bore the presentation inscription and the following lines, the quatrain being especially composed for it by James Russell Lowell:

"To tell of thy loving-kindness early in the morning
And of thy truth in the night-season."

"Glory to God in the highest,
And on earth peace, good-will toward men."

"I call as fly the irrevocable hours,
Futile as air or strong as fate to make
Your lives of sand or granite; awful powers,
Even as men choose, they either give or take."

In 1908 the bells were taken to our foundry, the eight smaller ones recast and incorporated into twelve additional bells, increasing the set to fourteen bells, using the great Clock Bell as the Tenor of the new chime, the respective lines inscribed on the same number of new bells, the four added bells bearing the following inscription:

THE HUMAN MIND
On earth there is nothing great but Man
In Man there is nothing great but Mind.

KNOWLEDGE
Happy is the man that findeth Wisdom
And the man that getteth Understanding.

BEAUTY
A thing of Beauty is a Joy forever.

VIRTUE
Whatsoever things are
True, Honest, Just, Pure, Lovely,
of Good Report;
If there be any Virtue, and Praise,
think on these things.