RADIO CITY MUSIC HALL

Rockefeller Centre New York

PART TWO

BUILDING SERVICES ENGINEERING

LIGHTING & REFRIGERATION

CIBSE HERITAGE GROUP

RADIO CITY MUSIC HALL, NEW YORK CITY

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Rockefeller Centre New York

PART TWO
BUILDING SERVICES ENGINEERING
LIGHTING & REFRIGERATION

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Life Member ASHRAE

RADIO CITY MUSIC HALL

Rockefeller Centre New York

BUILDING SERVICES ENGINEERING

INTRODUCTION

Showplace of the Nation

More than 300 million people have come to the Music Hall to enjoy stage shows, movies, concerts and special events. There's no place like it to see a show or stage a show. Everything about it is larger than life.

Radio City Music Hall is the largest indoor theatre in the world. Its marquee is a full city-block long. Its auditorium measures 160 feet from back to stage and the ceiling reaches a height of 84 feet. The walls and ceiling are formed by a series of sweeping arches that define a splendid and immense curving space. Choral staircases rise up the sides toward the back wall. Actors can enter there to bring live action right into the house. There are no columns to obstruct views. Three shallow mezzanines provide comfortable seating without looming over the rear Orchestra section below. The result is that every seat in Radio City Music Hall is a good seat.

The Great Stage is framed by a huge proscenium arch that measures 60 feet high and 100 feet wide. The stage is considered by technical experts to be the most perfectly equipped in the world. It is comprised of three sections mounted on hydraulic-powered elevators. They make it possible to create dynamic sets and achieve spectacular effects in staging. A fourth elevator raises and lowers the entire orchestra. Within the perimeter of the elevators is a turntable that can be used for quick scene changes and special stage effects.

The shimmering gold stage curtain is the largest in the world. For more than sixty-five years audiences have thrilled to the sound of the "Mighty Wurlitzer" organ, which was built especially for the theatre. Its pipes, which range in size from a few inches to 32 feet, are housed in eleven separate rooms. The Hall contains more than 25,000 lights and features four-color stage lighting. And what's a show without special effects? Original mechanisms still in use today make it possible to send up fountains of water and bring down torrents of rain. Fog and clouds are created by a mechanical system that draws steam directly from a Con Edison generating plant nearby.

CIBSE HERITAGE GROUP


SHUTTERSTOCK

RADIO CITY MUSIC HALL

Rockefeller Centre New York

PART ONE
CONSTRUCTION
Rockefeller Centre
Radio City Music Hall

ARCHITECTURE & DECOR

SHOW PLACE OF THE NATION

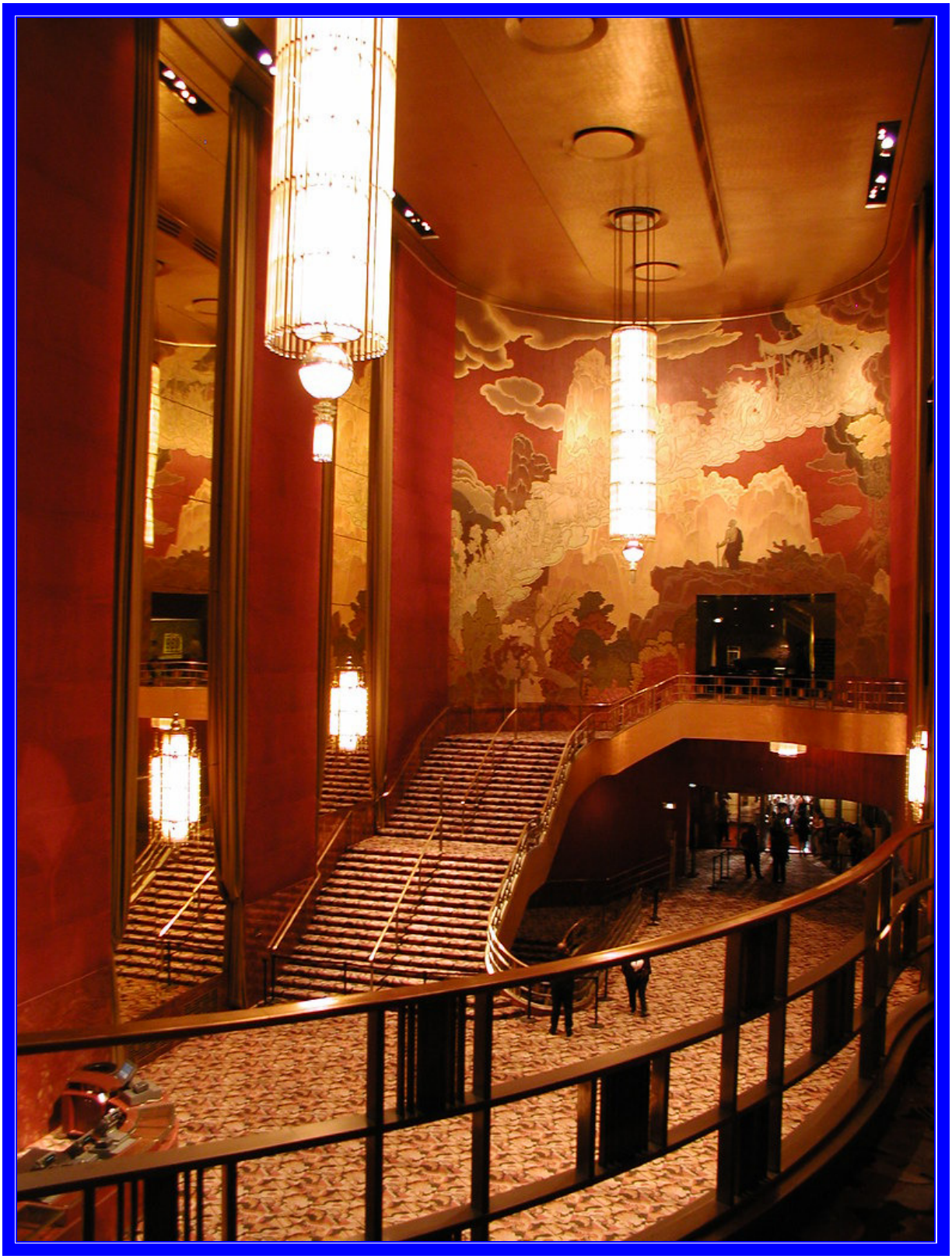
MUSIC HALL ENGINEERING SERVICES
Air Conditioning
Elevators
Drape Controls

PART TWO
MUSIC HALL ENGINEERING SERVICES
Lighting
Plumbing
Secrets of the Magic Theatre

ROCKEFELLER ENGINEERING SERVICES
Central Refrigeration
External Ice Rink
Centre Theatre Ice Rink
Energy Storage System

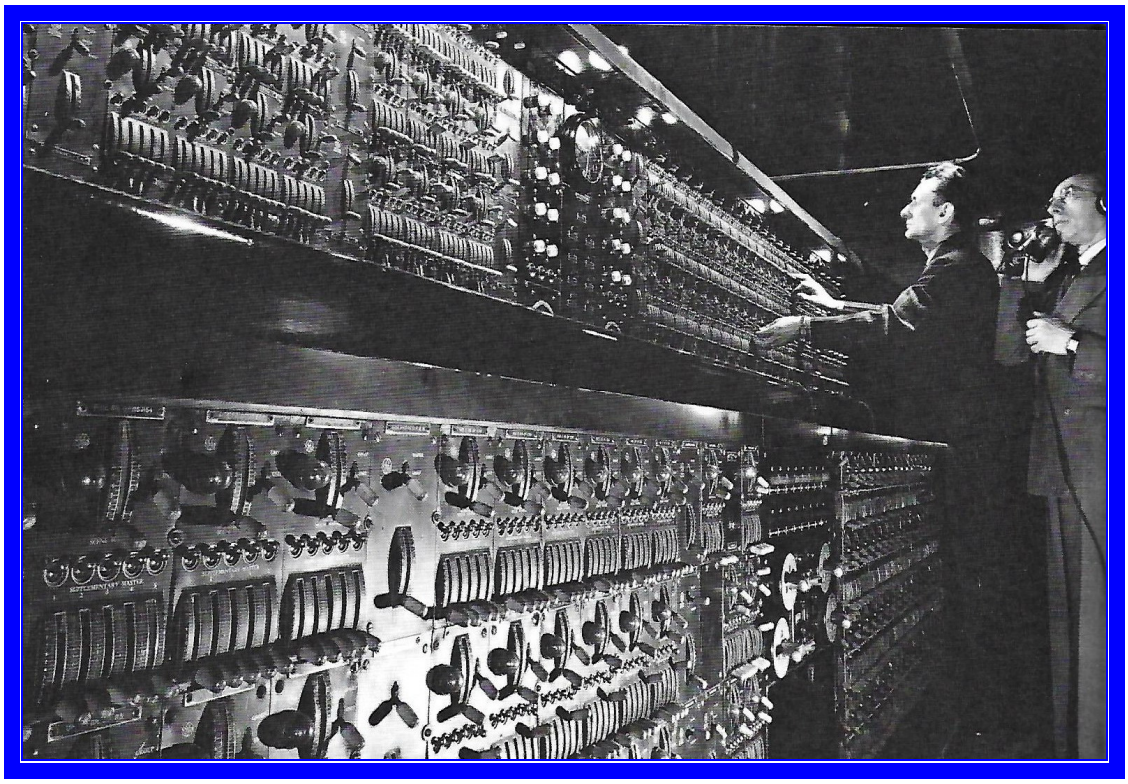
POSTSCRIPT
Postcards

MUSIC HALL ENGINEERING SERVICES
Lighting



The Lobby's giant chandeliers

MUSIC HALL ENGINEERING SERVICES
Lighting



Lighting control board (The Radio City Music Hall)

As might be expected, the Radio City Music Hall is equipped with a mind-boggling number of lights. In fact, in one of its early press releases before energy conservation became a priority, the Music Hall boasted its lighting system used enough power each year to supply the electrical needs of a city of ten thousand people. In 1978 the publicity department took the more conservative approach that "if every bulb in the Music Hall was burning at the same time, over three million watts would be in use." Concentrating only on those light bulbs of varying size that directly affect the stage production, there are some 1,950 on the stage, 500 used for a star effect on stage, and 7,184 used in the auditorium.

Roxy and his original Music Hall associates were not the first to place a light console in the auditorium of a theater, but they did perfect the innovation. The Music Hall's light control console was manufactured by the General Electric Company and is fifteen and a half feet long, three and a half feet wide, and five and a half feet high. The console device occupies a space out of the audience's vision directly in front of the first row of orchestra seats. The master electrician who controls it sits in front of a keyboard containing 4,305 color-keyed handles, that can flood the stage with a variety of lighting effects. These individual handles can be preset before a show and then operated during the performance by a master switch and dimmer that can come up with twenty different combinations.

MUSIC HALL ENGINEERING SERVICES
Lighting

This marvel of technology operates on the principle of the radio tube. Because of its thermionic control system, it is from six to eight times smaller than other light boards capable of handling an equal number of controls. It is also equipped with a selsyn automatic color change control that does away with the need for an individual lighting man to hand-change the metal gelatin holders in front of each spotlight. The gelatins provide the stage with colored lighting effects. The selsyn-equipped spotlights have a metal housing containing four colored gelatins that move across the front of the light on tiny tracks, powered by small motors. All of these lights can be operated by one individual sitting at the console. Music Hall arc lamps are also equipped with electrically operated "blackout dousers," metal shutters that close over the face of the lamp in two seconds. Normally, arc lamps will continue to give off a faint glow for up to half a minute after they're turned off. With the automatic dousers, the Music Hall stage is totally dark at the immediate conclusion of a "blackout scene."

Lighting is one of the most important components in any stage production, and the Music Hall is equipped with a dazzling array of lighting paraphernalia that can be remotely operated by the central console in front of the stage. The original stage equipment includes six 104-foot light bridges (the largest ever built), which hold literally hundreds of spotlights of different sizes to bathe the stage in brilliance. The auditorium console also controls six light towers holding lights capable of putting out nearly ten thousand watts of spot and flood power each.

When even bigger spotlights are needed, they are manned by individual people in two separate booths at the very top of the back wall of the vast auditorium on either side of the projection room. These mammoth 150-ampere spots are used to wash special areas of the stage in extra-brilliant light, or to "follow" individual singers or dancers. The light booths are also equipped with Linnebach Lanterns capable of projecting lifelike outdoor scenes on a specially constructed screen on the stage, creating still another dimension for the patron's imagination. High above the heads of the audience in the curved ceiling is a special light cove equipped with six more 150-ampere arc lights.

There is also a hand-controlled lighting switchboard backstage. This board operates the footlights on the stage apron (which can be automatically raised or lowered flush with the stage floor) as well as the footlights for the great curved cyclorama at the rear of the stage. The lights that flood the cyclorama curtain can create a feeling of infinite space for dazzling sunrises, sunsets, and any number of other natural-looking effects. The stage light board also controls the ceiling lights that bathe the audience in overhead color. Inside the semicircular, fluted bands in the ceiling are three thousand reflectors in eight strips, capable of painting the ceiling in brilliant or muted color.

It has been reported that Roxy ordered some last-minute alterations inside the Music Hall auditorium scant hours before the opening curtain in 1932. He was concerned about the acoustics in the vast hall, which contains over 1,800,000 cubic feet of space. Even his acoustical plaster "megaphone" design couldn't completely correct the problem. Today, Broadway shows in theaters of less than one thousand seats use microphones and intricate sound systems to pick up the singing and speaking voices of performers who have, presumably, been trained in the art of stage projection.

The Music Hall was one of the earliest users of an amplification system because of the size of its auditorium. RCA called in its finest engineers to design and build the largest master control console ever constructed. Today the Music Hall has a high fidelity sound reproduction system that is completely stereophonic, with the sound coming from speakers directly in front of the stage performers. The stage microphones are hidden along the front of the stage and rise into position automatically at the press of a button.

MUSIC HALL ENGINEERING SERVICES
Lighting

Lighting the Lobby

MUSIC HALL ENGINEERING SERVICES
Lighting

Lighting the Proscenium Arch

Suspended stage lighting

MUSIC HALL ENGINEERING SERVICES
Lighting

Lighting the Proscenium Arch

Light display in the Lobby

MUSIC HALL ENGINEERING SERVICES
Lighting

Stage lighting rig

Auditorium lighting effects

MUSIC HALL ENGINEERING SERVICES
Lighting

External sign and canopy lighting (Philippe Gonnard photograph)

MUSIC HALL ENGINEERING SERVICES
Lighting

Radio City illuminated at night

MUSIC HALL ENGINEERING SERVICES
Plumbing & Rest Rooms

Gentlemen's Rest Rooms

MUSIC HALL ENGINEERING SERVICES
Plumbing & Rest Rooms

Ladies Rest Room

Downstairs Men's Lounge

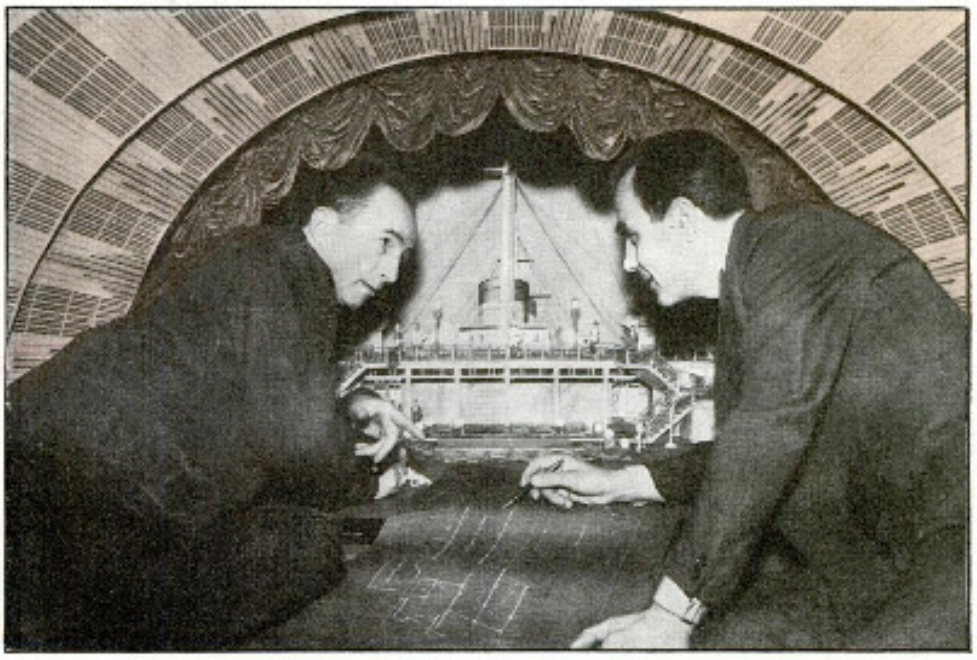
MUSIC HALL ENGINEERING SERVICES
Secrets of the Magic Theatre

SECRETS of the "MAGIC" THEATER

COMPARATIVELY few of the patrons who have purchased more than 48,000,000 admission tickets in eight years have walked out of Radio City Music Hall in New York City's Rockefeller Center without wondering: "How do they do it?"

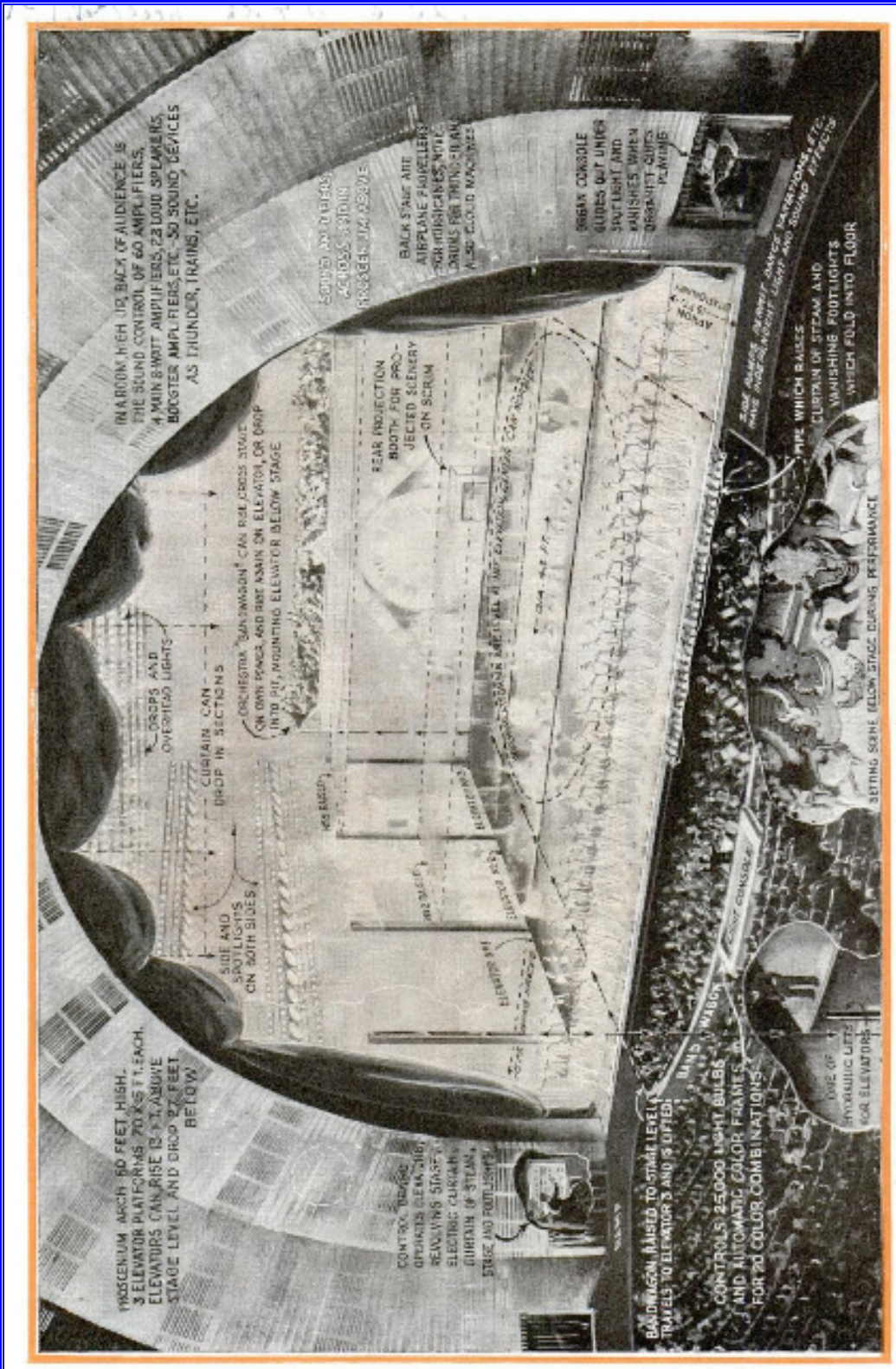
Amazing theatrical effects have caused thousands to call it the "magic" theater. Apparently instantaneous changes of elaborate spectacles occur. Huge stage settings rise or disappear at unpredictable moments. Whole scenes including large numbers of dancers take a sudden notion to whirl in circles while up in the air. An orchestra of 100 pieces drops out of sight and reappears backstage a little later high above the bewildered audience. A bandwagon rises from orchestra pit to stage level, rolls back and seemingly floats in the air while the musicians continue playing.

Puzzling the audience is good showmanship and is worth money. So for years the management of the largest theater in the world kept secret many of the methods



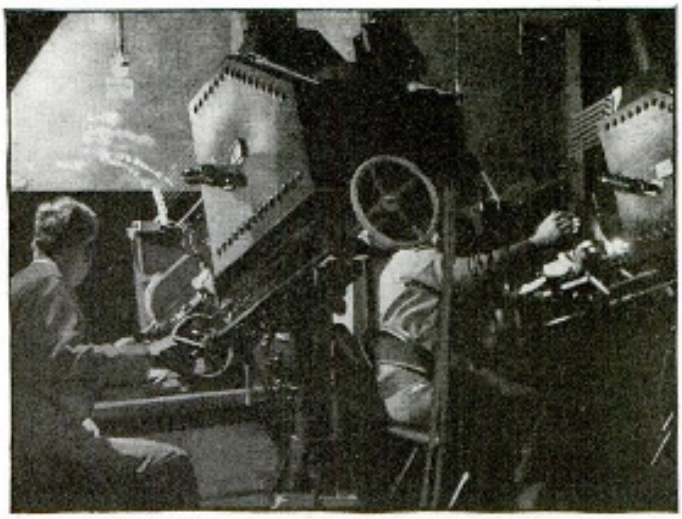
Top, sound mixer at panel which controls sixty microphones, sixty amplifiers, four main amplifiers, twenty-three loud speakers and other equipment. Bottom, planning scene with model of the vast stage

MUSIC HALL ENGINEERING SERVICES
Secrets of the Magic Theatre

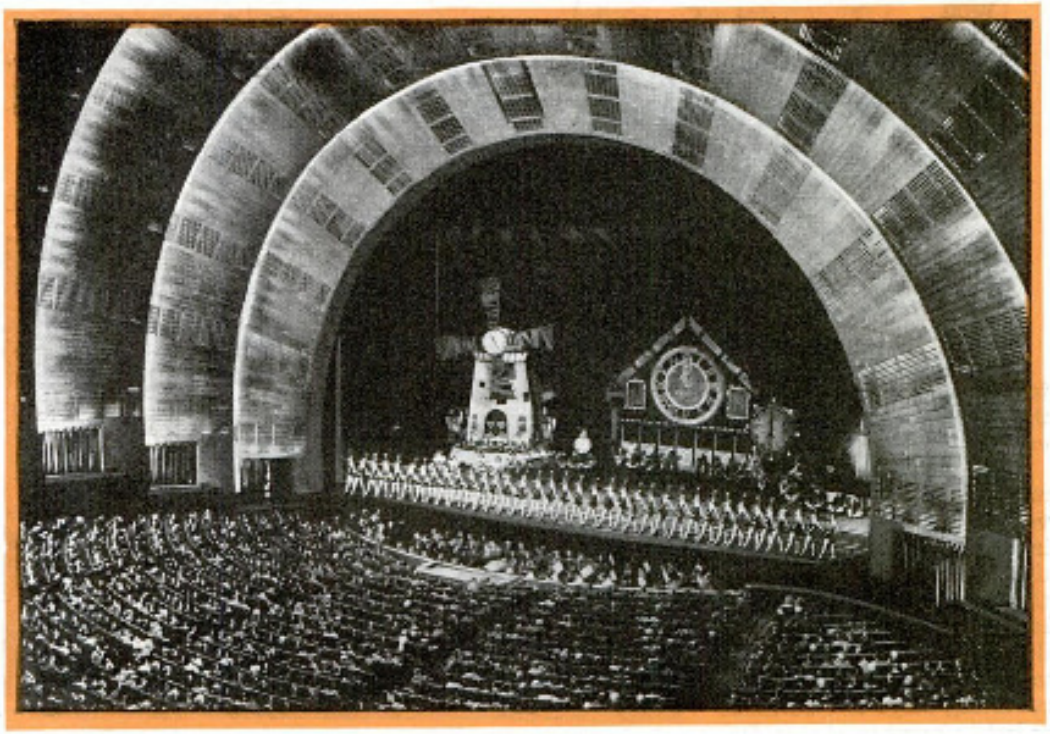


MUSIC HALL ENGINEERING SERVICES
Secrets of the Magic Theatre

used. Some they are still shielding. However, they are now willing to reveal that the theory behind all of the apparent magic is simply this: modern mechanical devices are faster than the hand and the hand is faster than the eye. So, with a wealth of mechanical equipment aided by unusual lighting effects, a whole stage scene may be figuratively snatched right from under the noses of the audience time and again without the patrons discovering exactly how it is done.



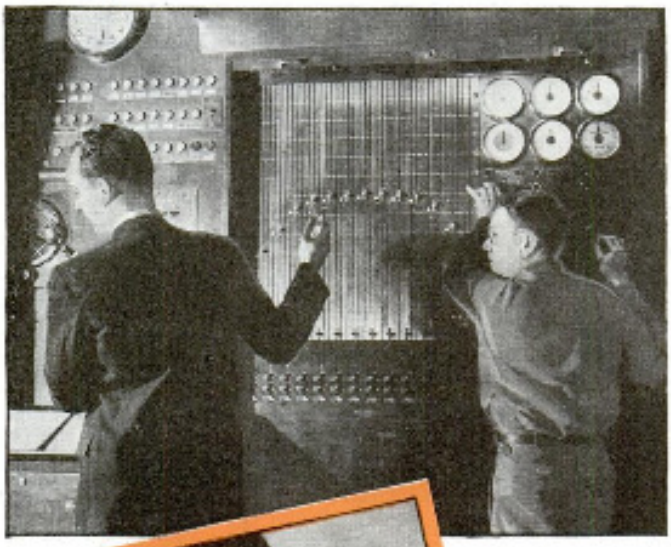
The secret of the trick stage lies in the fact that it is not a stage at all in the ordinary sense, but instead consists of three fifty-ton hydraulic plunger elevators, seventy feet wide and fifteen feet deep. These elevators may be lifted thirteen feet above "stage level" or dropped twenty-seven feet below, singly or together. Thus, for example, while two rows of dancing girls might be performing on two of the elevators, the third might be loading up with a third group down below. A quick and complete blackout for a very short time would permit the stage director to drop two elevators and raise the third so that when the lights came on, an entirely different group of girls in different cos-



Top, giant spotlights used in the theater. Some are handled by individual electricians, but most are controlled from master console. Bottom, view of great stage, with a scene being presented

Radio City Music Hall

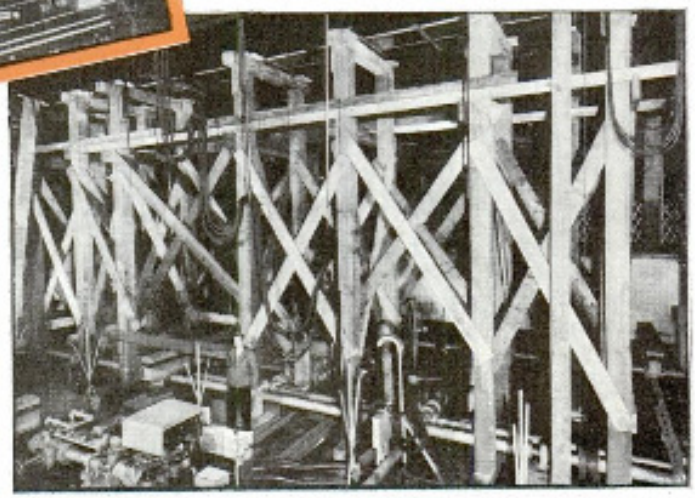
MUSIC HALL ENGINEERING SERVICES
Secrets of the Magic Theatre



and a partial turn while the elevators rise not only produces a new setting, but puts it at a different height, which is confusing as well as entertaining to the audience.

To the three stage elevators, add one more: the elevator in front of the stage which supports the orchestra "bandwagon." This lift may be brought to stage level, or above. Again, it may be dropped twenty-seven feet under the audience. The huge bandwagon, in turn, is self-propelled by electric motors and batteries so that, lifted to stage level, it can move back onto one of the stage elevators and then continue its journey upward. Or, it can be dropped below, into the pit, shunted to the rear and placed on a lowered stage elevator, then lifted high above the stage. Accomplished in the dark, it is a very effective stunt.

Since practically all stage and scene legerdemain depends upon the slowness with which the eye accustoms itself to darkness following brilliant light, a complete blackout is necessary for the trick effects. This again is accomplished by clever mechanics. In addition to 25,000 light bulbs, any



tumes and in a different setting might be doing a different routine.

To make the possibilities more intricate, a sectional revolving stage forty-three feet in diameter is built into the three elevators. Thus with the three rectangular elevators locked, they can move up and down together while the revolving stage turns. Since the revolving stage can be made to hold a number of complete scenes and casts, a blackout

Top, control board for handling three-ton curtain. Center, console controls more than 25,000 light bulbs. Bottom, backstage

MUSIC HALL ENGINEERING SERVICES
Secrets of the Magic Theatre

number of which may be lighted at one time, 206 spotlights are used. Thirty-six of these spotlights are of the huge arc type capable of throwing a "spot" 190 feet and require about thirty seconds for the carbons to cool. Obviously unless all of these lights were extinguished instantaneously and the glow from the huge carbons was halted, there could be no blackout.

To douse thousands of light bulbs and 206 spotlights in an instant, the theater uses a remarkable piece of mechanical equipment called a light-control console which looks like an oversize telephone switchboard. By pre-setting the 4,305 vari-colored handles on this board, the throwing of a single switch performs what seems to be miracles of illumination. If a blackout is needed, a switch not only turns off the light bulbs in unison, but also causes thirty-six little motors to drop thirty-six shutters over the arc spotlight lenses. The same board regulates changes of light colors throughout the whole auditorium, whether it is to shift one spotlight from blue to purple, or to produce fifty combinations.

Each of the 25,000 light bulbs, which range from two to 5,000 watts and total 3,500,000 watts, has a tiny track running in front of it. Hundreds of little motors cause thousands of gelatin color frames to travel in these tracks. By setting a group of handles on the control machine and throwing a switch, the electrician at the light-control console can move color frames in front of thousands of bulbs and the whole light scheme can be changed.

The machine, through thermionic control, which works on a principle similar to that of radio tubes, will also regulate the dimming or brightening of the lights at will.

To the trick stage and trick lighting system, add such novel mechanical equipment as vanishing footlights which become a part of the stage floor, permanent fixtures which produce torrential rainstorms, fireproof snow storms, a hurricane effect by the use of airplane propellers and clouds from an imported cloud machine. The combinations of magical effects become numberless.

Even the curtain, the largest in the world, weighing three tons, is a puzzler. Normally it closes the proscenium, a gap sixty feet high by 100 feet wide. Yet, without the curtain being lowered, sections can be dropped independently to frame a single performer, or two groups.

(Continued to page 146A)

Secrets of the "Magic" Theater

(Continued from page 31)

To permit this, thirteen cables were sewn into the gold fabric and thirteen motors, operating independently or together, are controlled by the stage director. To drop two sections, he need only push down two buttons on the control board backstage.

Sound was a prime problem, for patrons in the front row are 160 feet closer to the performance than those in the rear and each of the 6,200 persons in a full house is a different distance from the stage. Thus, sounds must be uniform throughout the 1,800,800 cubic feet of space. Scientific application of sound mechanics plus planning along geometric lines has resulted in acoustics so perfect that the back row patrons hear the same tones with the same modulation as those up against the orchestra.

Key to the system is the sound mixer who, listening to the various sounds carried into his room from all parts of the theater, tunes each up or down as necessary to produce a harmonious effect evenly distributed throughout the auditorium. The sound mixer controls sixty microphones, sixty amplifiers and twenty-three loud speakers.

The frequency range of the system is from thirty to 13,000 cycles. Microphones, of the velocity ribbon type, are located in the orchestra pit, the footlights, the organ chambers, light bridges. Fifty special sound effects, such as a train or thunder, are also controlled in the room.

With three or four hundred performers taking part in a single spectacle, with thousands of stage, light and sound tricks available, planning a performance is not a matter of mere conferences.

The proposed show is actually registered on blueprints and sketches which, when approved, go to the great carpentry, "prop" and costume shops, far below the stage, for the production of material objects. Scripts must be prepared for sound and lights as well as for players. To synchronize the proposed performance, tiny models of the stage settings and the players are first tried out on miniature stages.

ROCKEFELLER ENGINEERING SERVICES
External Ice Rink

Ice skating at the Rockefeller outdoor rink (Rockefeller Centre Archives)

Children receive gifts from Santa Claus on Christmas Eve, 1936, the day before the Rockefeller skating rink opened. This Christmas marks the skating rink's 75th anniversary. (Courtesy of the Patina Restaurant Group)

ROCKEFELLER ENGINEERING SERVICES
External Ice Rink

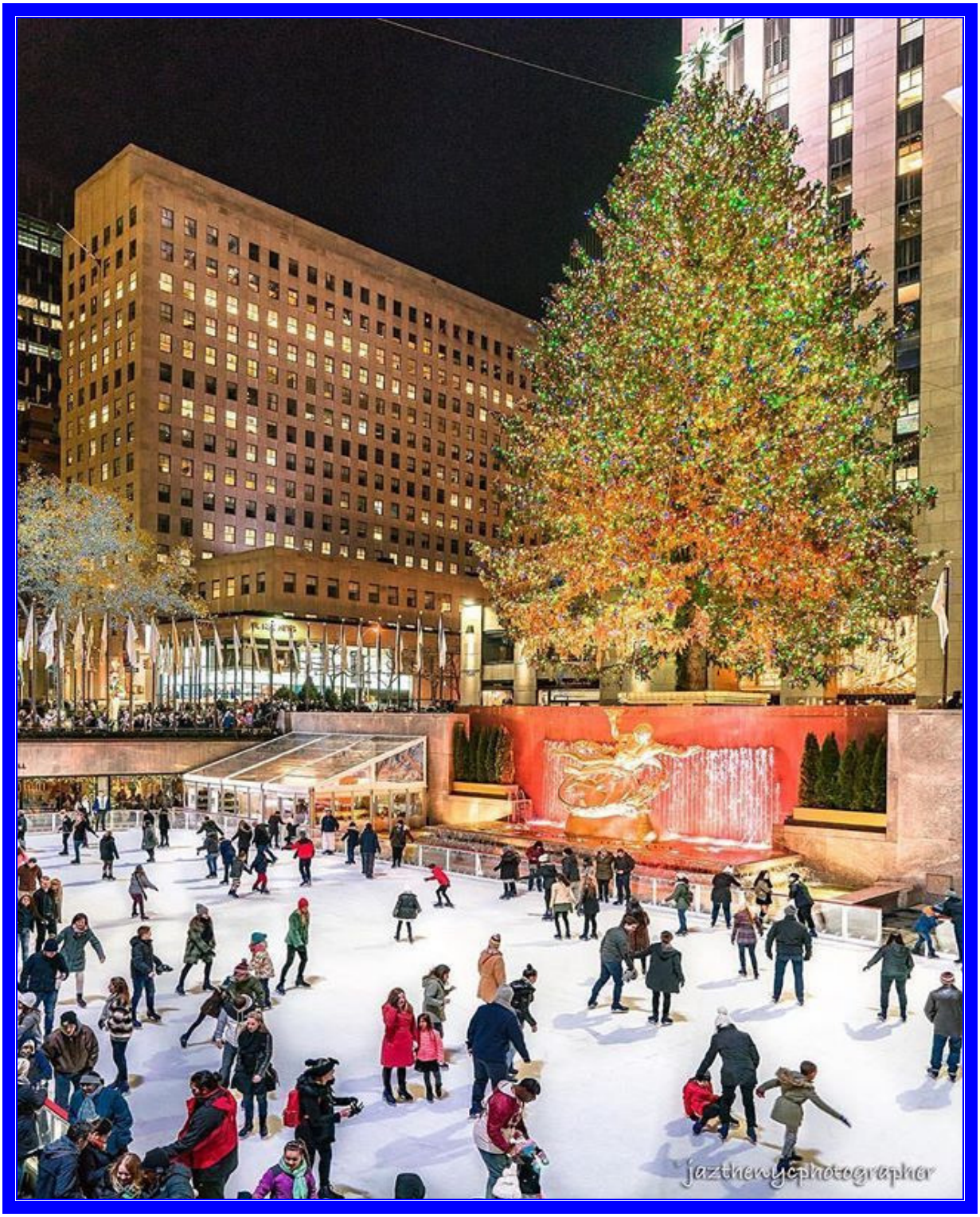
The grid of ice rink freezing pipes being installed in the Lower Plaza in front of the RCA Building. The rink opened Christmas Day 1936 (Works in Progress)

The rink in 1949

ROCKEFELLER ENGINEERING SERVICES
External Ice Rink

When the lower plaza in front of the RCA Building at Rockefeller Center was opened in 1934, it was flanked by shops. They were off the beaten track, however, and failed to attract customers. To animate the space, they were replaced with an ice-skating rink and a restaurant, both of which opened on Christmas Day 1936. As the photograph shows, a grid of water pipes lies under the rink's surface. The bronze-gilded figure *Prometheus* by Paul Manship (1885–1966), located against the west wall of the rink, was installed in 1934. One of Rockefeller Center's well-known traditions is its annual community Christmas tree—a ritual that began when workers on the construction site set up a tree on December 24, 1931. The tree has reappeared each year on the same spot, now the approach leading to the ice rink.

ROCKEFELLER ENGINEERING SERVICES
External Ice Rink



Ice skating on the outdoor rink in progress (jazthenycphotographer

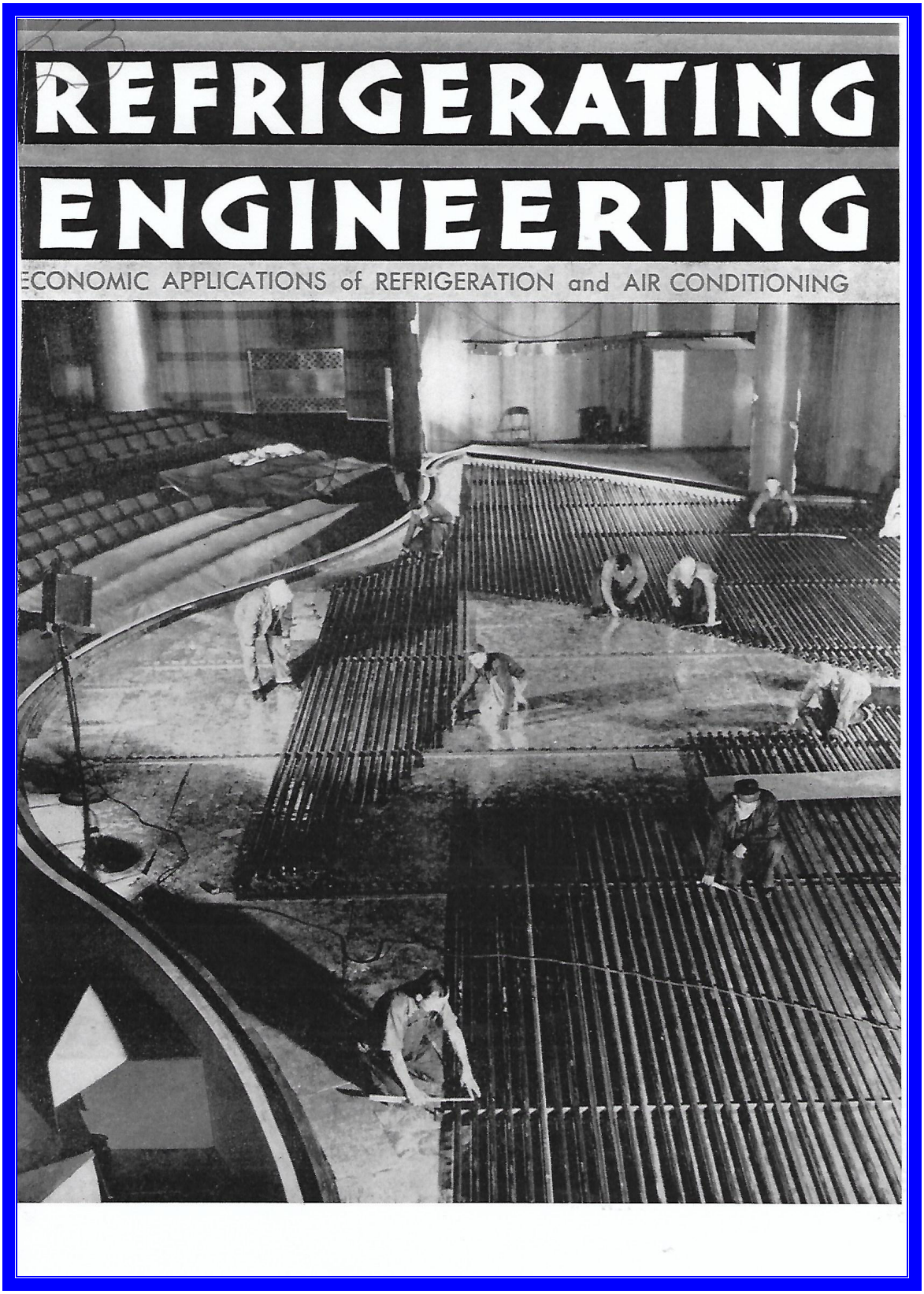
ROCKEFELLER ENGINEERING SERVICES
Centre Theatre

ROCKEFELLER ENGINEERING SERVICES
Centre Theatre

Opened 1932 Seats 3500
Architect: Edward Durrell Stone
Ice Rink & Refrigeration: Vilter Manufacturing
Air Conditioning: Carrier Engineering Corporation

The Centre Theatre was demolished in 1954

ROCKEFELLER ENGINEERING SERVICES
Centre Theatre Rink



(Refrigerating Engineering, April 1941, Vol. 41, pp.238-239)

ROCKEFELLER ENGINEERING SERVICES
Centre Theatre Rink

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An Ice Skating Rink On the Stage

SKATING CHORUS IN "IT HAPPENS ON ICE"

At the Rockefeller Center Theatre—New York City

By Charles G. Bach

Chief Engineer, The Vilter Manufacturing Company, Milwaukee, Wis.

THE lavish and handsome artificial ice skating show, "It Happens on Ice," at the Rockefeller Center Theatre in New York City, is outstanding. Anyone who appreciates the finest in the art of skating, chorus formations, ballets and acrobatic feats on ice with all their charms and beauty, surely will not miss seeing this show.

The artificial ice rink, of a very intricate construction (see plan on opposite page) required considerable study, since to my knowledge, nothing like it had ever been tried before. It was the opinion of some engineers that a rink with the short and long runs of 1¼-in. pipe, also with many of the pipes being bent where they enter the rectangular shaped headers, would be a complete failure, especially since no valves are provided so that the flow of brine can be throttled.

To avoid soft spots in the ice surface we were very careful to keep the ice not more than 1 in. thick and the brine range below 2°, as the lighting and occupancy load is very heavy. At times there are as many as 100 performers on the ice at one time, with an audience of more than 3000 people. To keep the brine from skipping some of the 1¼-in. pipes at the corners we provided vanes in the headers to direct its flow. Furthermore, in no case did we exceed a brine velocity of 200 ft. in any of the rectangular headers. The headers in the front part of the ice rink on the right hand side are provided with gates of a very ingenious design to keep the brine from short circuiting through the short pipe runs.

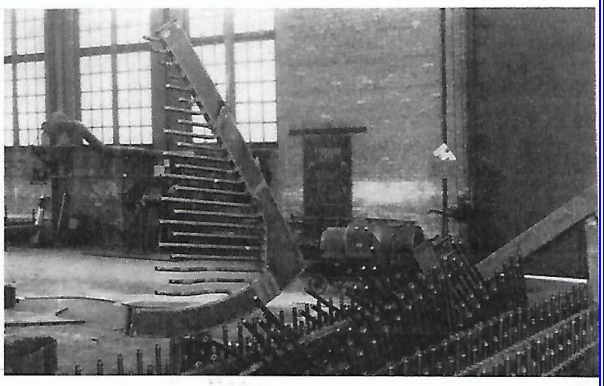
Rink Is of Unusual Construction

THIS rink has an ice area of 4400 sq. ft. and contains 13,000 ft. of 1¼-in. steel pipe spaced at 4-in. centers, with expansion couplings to allow for expansion and contraction and also for easy assembly. The floor construction consists of Cantilite clamped to heavy beams on which is applied 3 in. of rock cork laid in asphalt. On the waterproofed cork there is one layer of metallic coated reflector paper. The 1¼-in. pipes are all supported at approximately 10-ft. centers on built-up T irons and the T irons rest on 18 ga. by 7 in. wide galvanized iron protecting shields to spread the pipe load over a wider surface and keep the T irons from tearing the metallic coated reflector paper. The space around the 1¼-in. pipe is filled with sand 3 in. deep, well tamped, ½ in. above the top of the pipes and flush with the top of the rectangular headers. The photographs reproduced here show at a glance that this rink is of unusual construction.

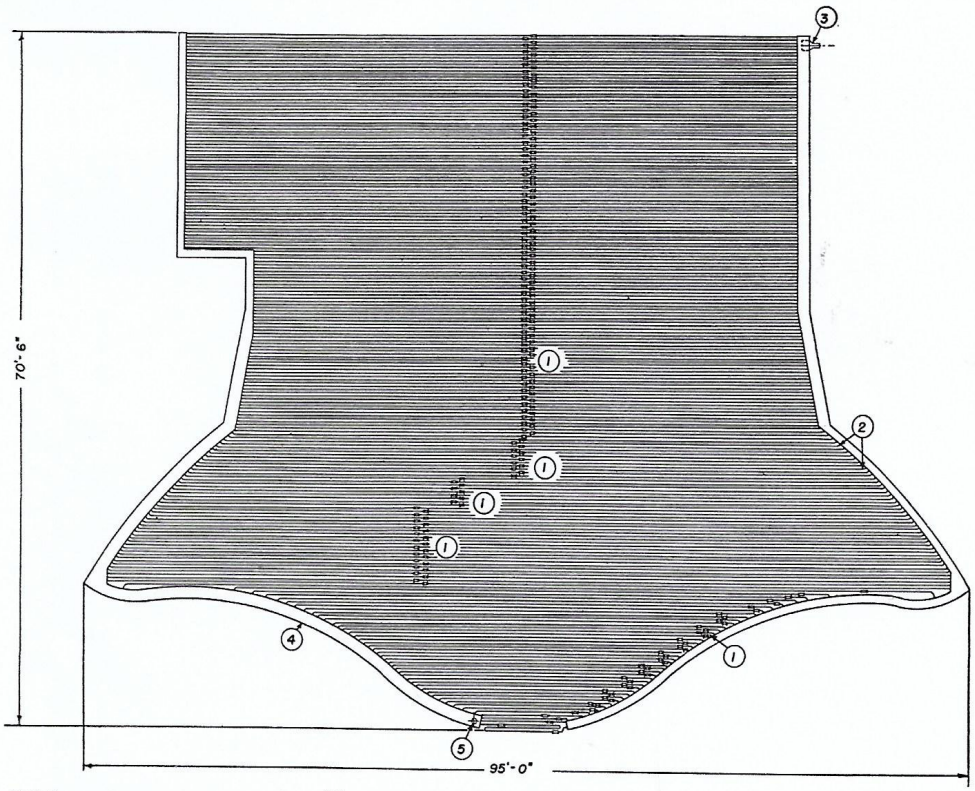
Refrigeration Equipment

THE compressor is a twin cylinder 10¾ x 8½ in. force feed Freon compressor direct connected to a synchronous motor and mounted on a concrete foundation with vibro dampers and flexible connections in the suction and discharge pipes to avoid carrying any vibration to the building. The compressor also is pro-

PIPE SECTIONS READY FOR INSTALLATION ON THEATRE RINK



ROCKEFELLER ENGINEERING SERVICES
Centre Theatre Rink



OUTLINE OF ROCKEFELLER THEATRE RINK—(1) EXPANSION JOINTS; (2) BENT 1¼-IN. PIPE ENTERING HEADERS; (3) BRINE SUPPLY; (4) HEADER WITH GATES; (5) BRINE RETURN

vided with a double shaft seal and the Vilter patented Capacitrol which is responsible for the very uniform brine temperature control and quality of the ice. The temperature of the ice is held at 22°F., and it has been claimed by the different performers to be equal to the best ice they ever skated on.

In the discharge line there is provided an oil separator with large impinging surface to separate the oil from the Freon and return the oil automatically back to the crank case of the compressor. The condenser is of the shell and tube multipass type and is mounted directly above the shell and tube brine cooler. The shell and tube brine cooler is also of the multipass flooded type with heat exchanger mounted above. The brine mains to and from the headers on the rink to the machine room are each approximately 200 ft. long and have cross over valve connections so that the brine can be reversed when first starting up the rink to help remove the air. In the ice rink all expansion couplings have given very satisfactory results and all couplings are located so that standard stock lengths of 1¼-in. pipes could be used. All pipes welded into the headers were placed flush on the inside of all rectangular headers to avoid all obstructions for free flow of brine. Obstructions would cause eddy currents and thus poor brine distribution to the pipe branches.

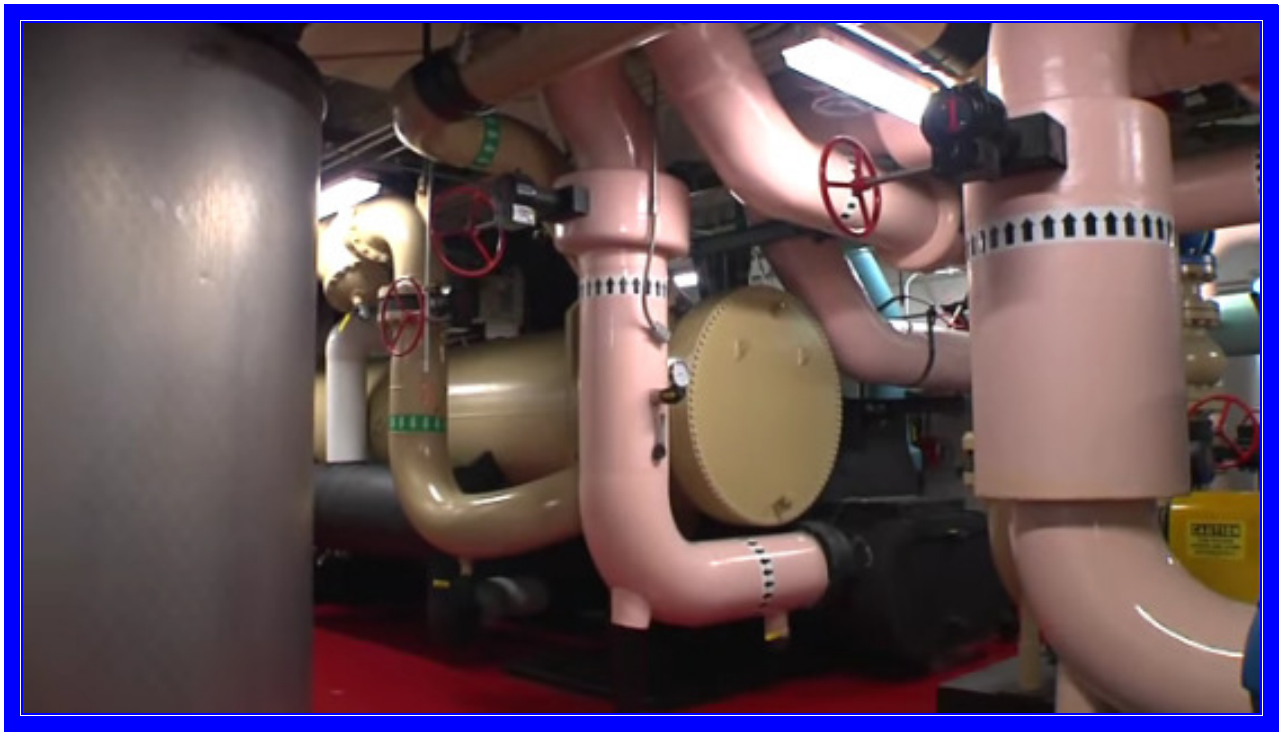
No Valves Used

A NUMBER of years ago builders of ice skating rinks were of the opinion that there had to be control valves on each branch pipe to control the flow of brine properly, then later on branch headers for supply and return were used with one control valve for each header, and finally it has been proved that no valves are necessary at all, even with different length branch pipes across the rink, providing 200 ft. per min. brine velocity is not exceeded in the headers. The rectangular flat headers as devised by The Vilter Manufacturing Company are an improvement over the round header construction, as it is possible to obtain greater area in a small space, trenches are not required, there is less chance for air pocketing, cheaper building floor construction around the rink is permitted, and a much neater installation results. Instead of using a trench and connections with elbows and unions, as has been done in the past, to allow some free movement for contraction and expansion, expansion couplings can be used, as at the Center Theatre, which are very satisfactory, and if necessary expansion couplings can be placed outside of the rink.

We are greatly indebted to Arthur Wirtz and the Rockefeller Center engineers for the successful performance of the rink.

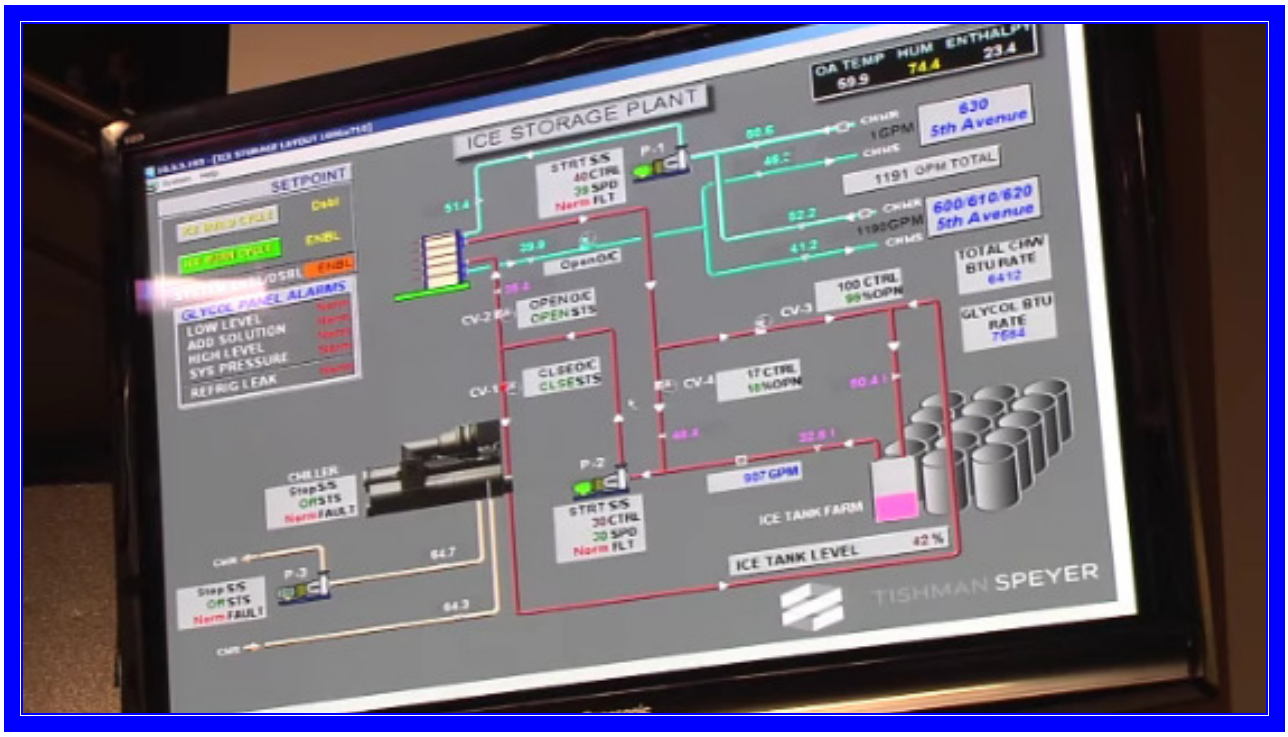
ROCKEFELLER ENGINEERING SERVICES
Ice Storage System

Calmac Ice-Storage Tanks (YouTube & HPAC Engineering 2012))



Trane centrifugal refrigeration plant for ice storage system located below the ice rink (YouTube)

ROCKEFELLER ENGINEERING SERVICES
Ice Storage System



Ice storage plant controls (YouTube)

The buildings of Rockefeller Center are served by a central chilled water plant containing 14,500 tons of steam and electric driven chillers. The water is distributed around the entire building campus through a primary water loop which travels around the perimeter of the site. There are six primary pumps located in the main plant, four having 6,000 GPM capacity at 125hp and two having 2,000 GPM capacity at 50hp. Each individual building has pumps which then draw off of the primary loop and send the main plants chilled water to heat exchangers located within each building. There are seventeen of these primary chilled water riser pumps which range in size from 1000 GPM at 40hp up to 3500 GPM at 200hp. The secondary side of the heat exchangers have pumps which serve the air handlers and fan coils which serve the tenant spaces, and individual building pumps draw chilled water to heat exchanges located within each building.

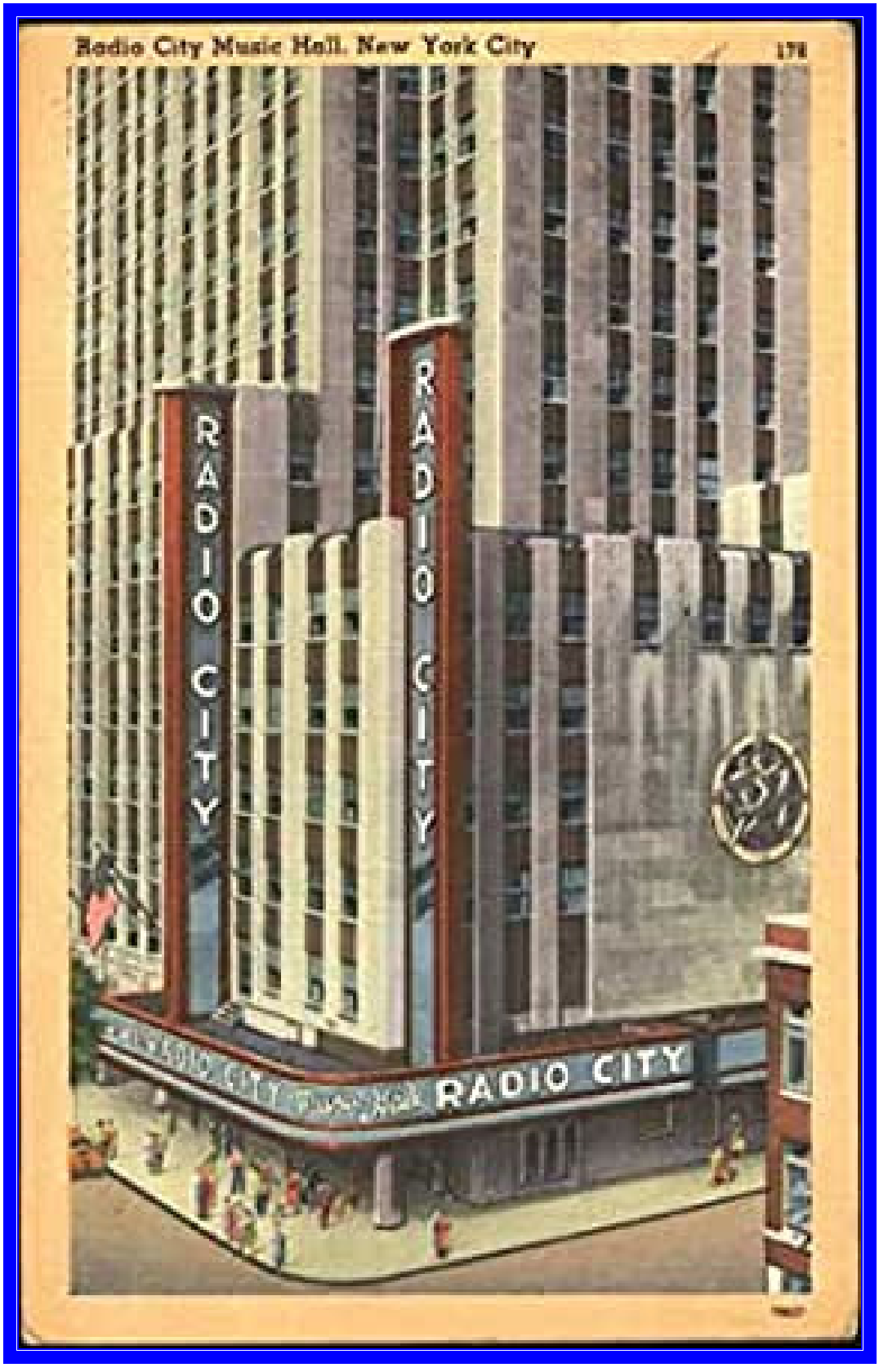
ROCKEFELLER ENGINEERING SERVICES
Ice Storage System

Prior to the energy storage plant, on peak cooling days, the building engineers would run one 4,000 ton steam turbine chiller, one 4,000 ton electric chiller, and one 2,500 ton electric chiller. Incorporating the ice burn into the operation of the main plant allowed Tishman to eliminate putting the 2,500 ton electric chiller on line. The operators also take advantage of the fact that the ice burn rate can be adjusted from four hours to 10 hours as needed based on plant conditions.

"Not only does the Ice Storage refrigeration plant provide 'banked' cooling capacity for peak demand periods during the day, it also increases your operational flexibilities to the assets during spring and fall seasons, when you can side stream the ice reserve with smaller refrigeration machines to reduce your overall demand in shoulder months," Szabo said.

The installation of a thermal energy storage system has significantly improved the energy efficiency of Rockefeller Center and dramatically lowered overall energy costs.

POSTCARDS


Radio City Music Hall, New York City
178
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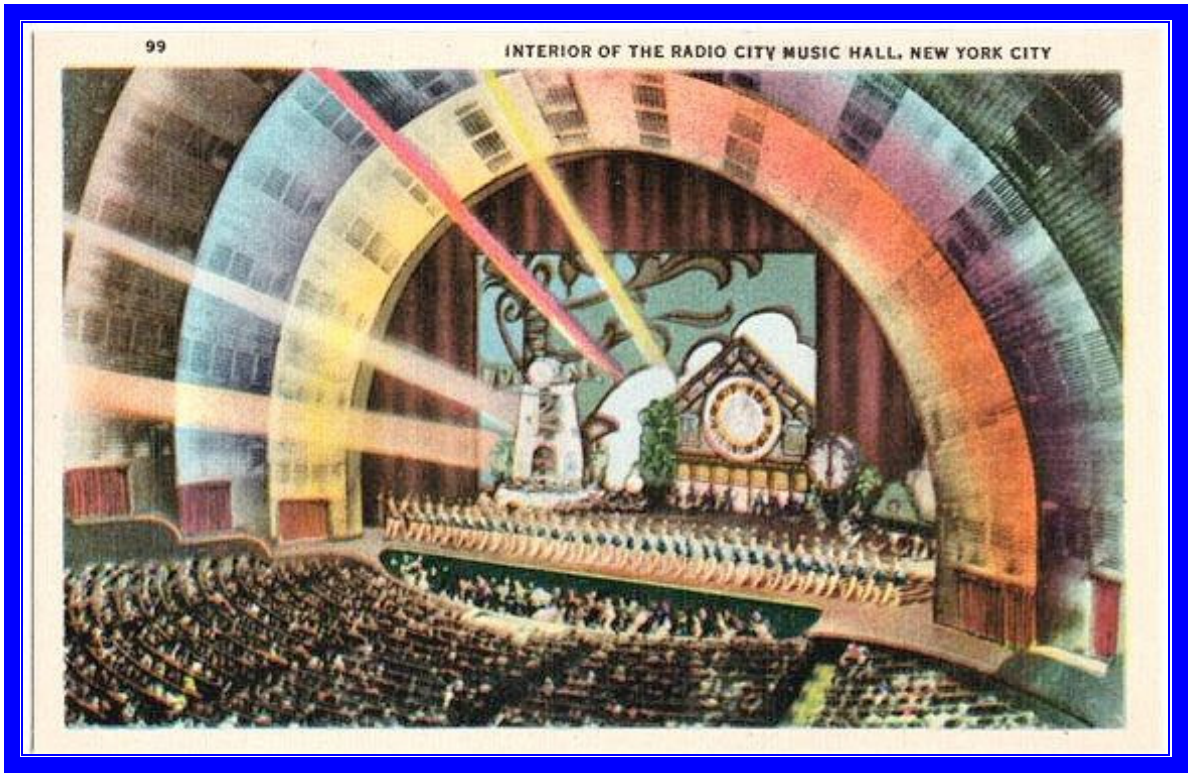
GRAND FOYER
FAMOUS ROCKETTES
RADIO CITY
WORLD'S LARGEST THEATRE ORCHESTRA
SECTION OF CORPS DE BALLET
GRAND LOUNGE
Radio City Music Hall
Largest Theatre in the World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INTERIOR OF THE RADIO CITY MUSIC HALL, NEW YORK CITY

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44 — SCENE OUTSIDE RADIO CITY MUSIC HALL, N. Y. C.
MUSIC HALL
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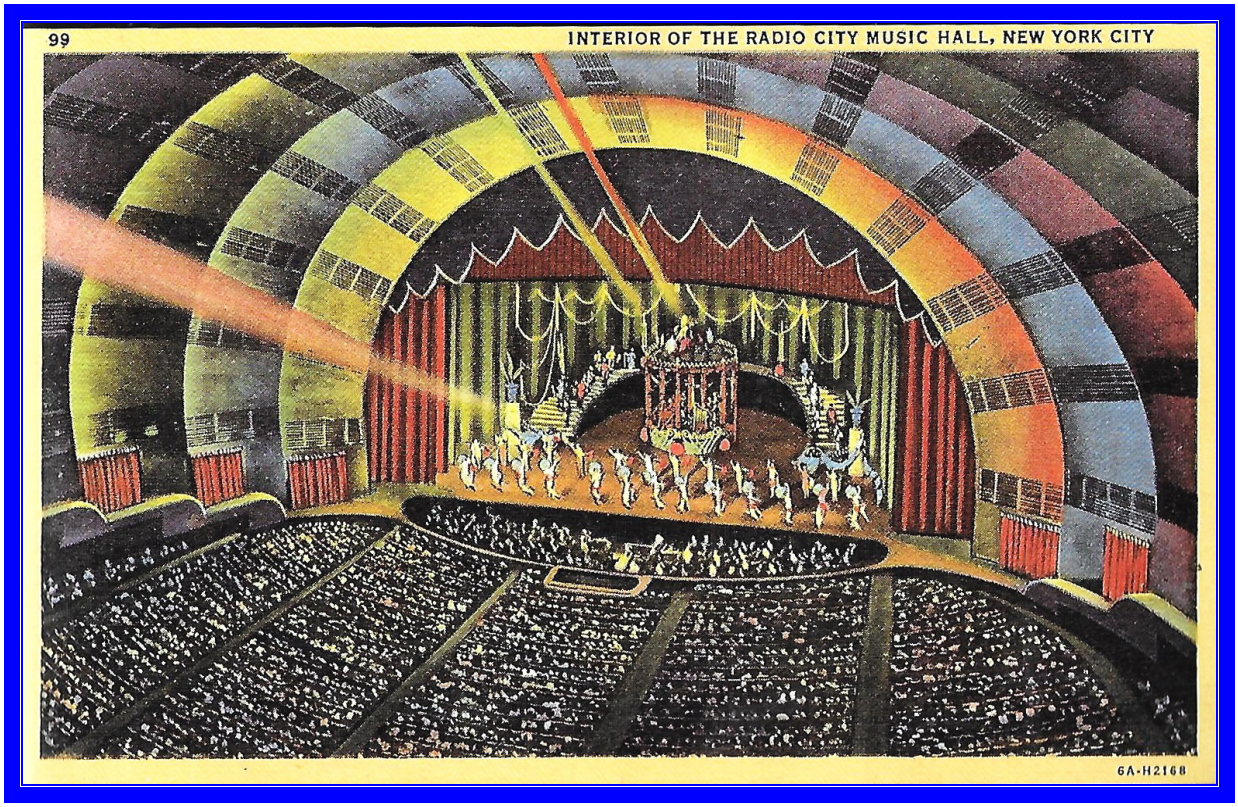
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15 — RADIO CITY MUSIC HALL, NEW YORK CITY
RADIO CITY
Photo by Wurtz Bros.

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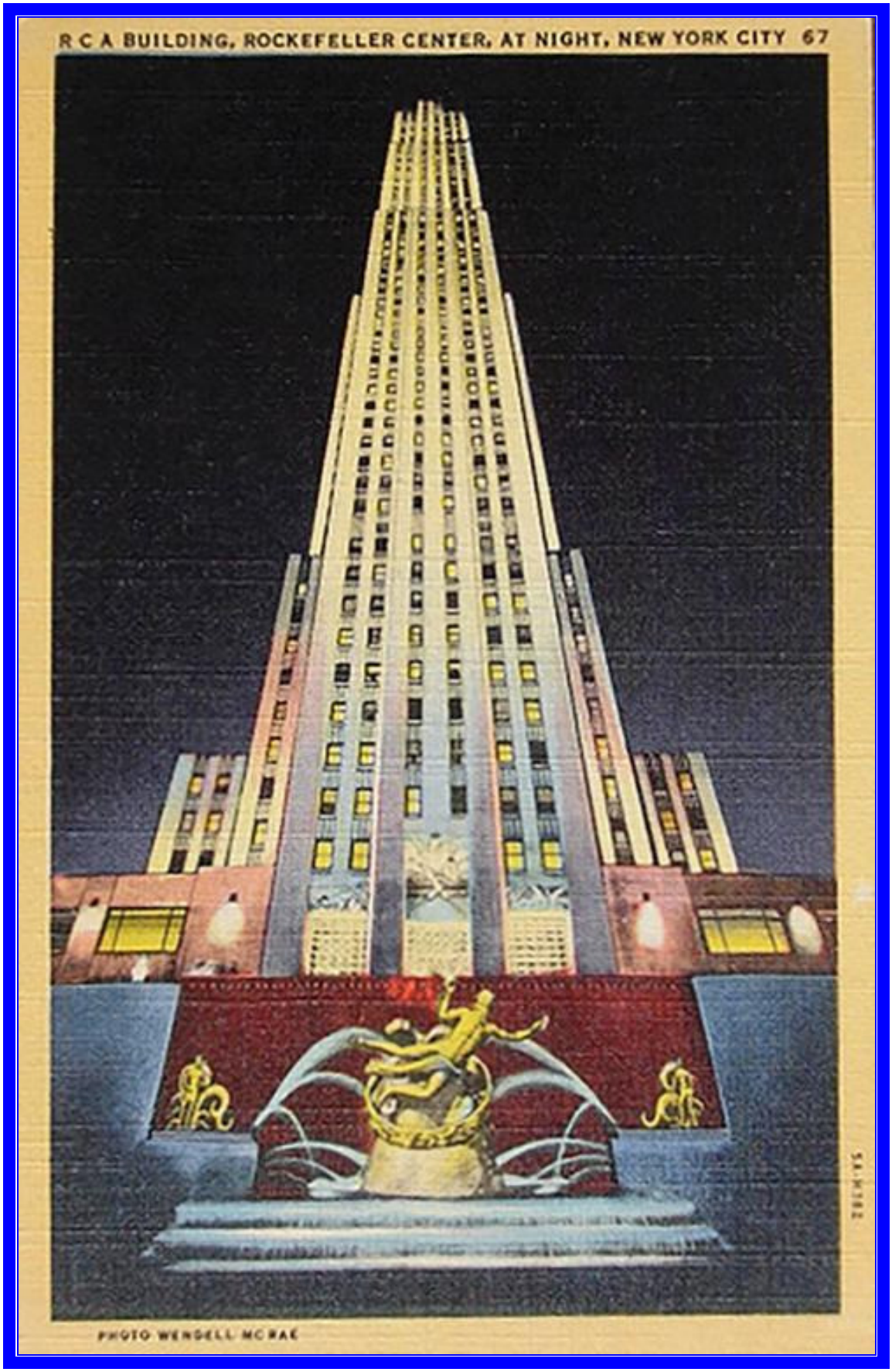
R C A BUILDING, ROCKEFELLER CENTER, AT NIGHT, NEW YORK CITY 67
PHOTO WENDELL MC RAE


RADIO CITY
MUSIC HALL