Owning Your Own Organ

Part III. About Wind Supply and Blowers

This is the second of the series of articles designed to help those readers who are desirous of learning the fundamentals of organ construction in terms that can be readily understood and without previous technical experience or knowledge.

Section 1 — Wind Supply By Roy Gorish

SINCE THE PIPE ORGAN IS A WIND INSTRUMENT, fundamental to its proper functioning is a copious, well regulated and steady supply of air from a dependable source. This is particularly true for the high-pressure unit organ whose responsive action and tonal qualities are possible only through the culmination of many ingenious advancements in the evolution of the wind supply for the organ.

For hundreds of years, the pipe organ obtained its breath from a crude system of bellows, reservoirs, and weights. It is, indeed, a credit to the skill of the old-time builders that so many large instruments were capable of filling large buildings with sound obtained from a wind supply which more often than not came from the manual labor of several men operating a series of bellows or feeders. These bellows, much like those from a forge, were affixed to the bottom of a reservoir which, in turn, literally stored the air until it was needed. A single bellows, or even a series of them, could provide only a most unsteady supply of wind; so the reservoir (frequently measuring 15' x 18') not only reserved a large amount of wind, but through weights resting on its top, it calmed the turbulence and regulated the pressure.

Reservoirs somewhat resemble the corrugations of an accordion and are capable of ascending and descending with fluctuations in the amount of air contained within. Inside are several valves — one of which is an exhaust valve to prevent the reservoir from rising beyond a safe height. As air is called on to make the pipes speak, the reservoir's top starts a downward movement aided by the weights affixed to it. Thus, air is forced into the various wind lines leading to the chests beneath the pipes. In the case of the hand-pumped organ, this downward movement inaugurated a never ending battle for the "pumper" in an effort to keep the wind supply up above the point where insufficient air would result in a drop of pitch and silent notes should the organist suddenly shift to full chords.

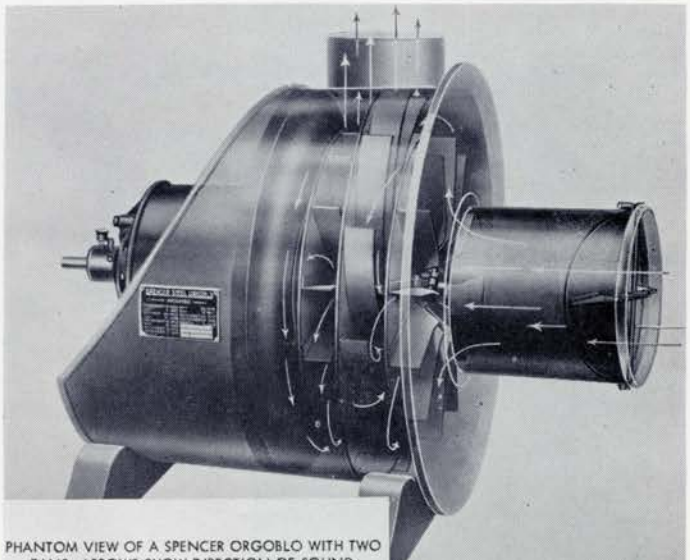
With progress, the larger instruments frequently were outfitted with water wheels, water engines, steam engines, gasoline engines, or electric motors which motivated a series of bellows on cam shafts. At their best, however, these various contrivances were exceedingly unreliable, noisy, and space-consuming affairs.

The omnipresent shadow of inadequate wind supply dictated the size and tonal qualities of the organ for generations. The old organs were constructed with mechanical action which did not draw on the wind supply to lighten the touch, and since this action operated only through the force of the organist's fingers and feet it meant that the wind pressure had to be kept as low as possible to facilitate his playing. Furthermore, to conserve wind, pipes were small in scale and voiced on pressures seldom exceeding three or four inches. Although flue pipes do use more wind, proportionately, than do reed pipes for the amount of sound produced; reed pipes on such low pressures were voiced "freely" and little refined tone could be obtained from them. Flue pipes, however, can be voiced with great beauty on such low pressures. Therefore, the old organs depended heavily on flue voices in their ensembles with only a few reeds utilized for power and the piquant quality their harmonics lent to brighten the chorus.

The last quarter of the nineteenth century brought revolutionary changes in the organ's wind supply. Mr. Cousans of Lincoln, England, introduced the principle of fans in series in an organ blower somewhat patterned after the centrifugal blower used, again, in the forge. This particular organ blower is known as the Kinetic Blower and is manufactured in America today by the M. P. Moller Company. The principle of this blower is that one or more fans connected together on a common shaft when set in motion compress air in stages, i.e., the first fan raises the pressure from that of the atmosphere to, say, three increases; this air is then passed on to the second fan which in turn increases the pressure. This pattern may be continued until pressures exceeding 100 inches are reached. Air may be tapped off at any one of several pressures, and this is frequently done in large organs which employ several different pressures. Such a blower powered by an electric motor freed the organ building from the hampering effect of limited wind supply. Furthermore, it released the "organ pumper" from his thankless task. For the first time, the organist was free to play as often and however he wished without first considering the man behind the organ.

Reservoir Improvements

At about the same time the organ blower was invented, Robert Hope-Jones added his talents to the question of regulating and steadying the wind. His placement of coil springs on the reservoir in place of the old lead weights had far-reaching effects. The inertia of the old reservoirs,



PHANTOM VIEW OF A SPENCER ORGOBLO WITH TWO FANS. ARROWS SHOW DIRECTION OF SOUND.

necessarily encumbered with hundreds of pounds of lead, was one of the prime reasons for organs being slow in speech. Full chords played staccato would exhaust the wind-chest of its meager supply of air so fast that the large reservoirs could not drop quickly enough to force more air into the chests. Since there is little inertia to overcome in a spring, the reservoir introduced by Hope-Jones was capable of responding immediately to any demand made upon the wind supply.

With the advent of the fan-type blower, the reservoir, as such, went out of existence. Although it has still retained its name, the reservoir of today's modern organ is not much more than a regulator where static or "raw" air as it is received from the blower is steadied and regulated to a pressure predetermined at the time of the voicing of the pipes. It is a valve which regulates the maximum supply of air available at all times from the blower. Furthermore, its dimensions have been reduced considerably for today's reservoir does not need to hold in reserve any great amount of air.

The modern wind supply for an organ is relatively simple. From the blower where the air is compressed and made available in thousands of cubic feet per minute, it passes through wind lines, often called "wind trunks," to the reservoirs. After the reservoirs, or regulators, have their desired effect, the wind passes through smaller wind lines into the chests which hold and control the pipes. The only other devices it encounters on its way may be the tremulants and a concussion bellows. The former is a large pulsating valve which produces a vibrato or tremolo by varying the wind supply in its process of letting air escape. The latter may take the form of another reservoir or may be simply a pneumatically controlled gate in the wind line itself. Its purpose is to help overcome the concussive effect of a large column of elastic air in very long sections of wind trunk. It does one other important thing, it helps eliminate "wind-line rumble" which is conveyed from the blower through the various wind lines.

Although it is still possible today to find instances of church organs operating with an out-moded wind supply system, all theatre organs because of their high pressures utilize the efficient fan-type blower. Fundamentally, all makes of theatre organs have a system of wind supply based on common ground; and parts from various organs are usually interchangeable within reasonable circumstances.

The leading manufacturer of organ blowers in America is the Spencer Turbine Company of Hartford, Connecticut, whose produce is called The Spencer Orgoblo. It is found on all leading makes of theatre organs with the understandable exception of the Moller.

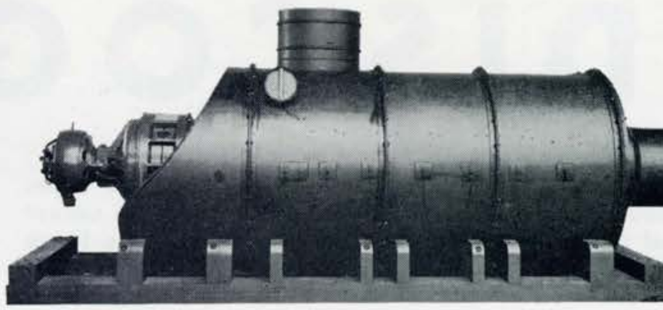
Section 2 — These Three-Phase Blowers

By L. F. Steinert, P.E.

PRACTICALLY ALL THEATRE ORGANS had three phase blowers and this seemed to be the greatest drawback to the purchasing of these old instruments even when the price was a steal.

This is a pretty tough proposition especially since three-phase service is so costly and usually impossible to obtain for the average homeowner.

The writer purchased a 6 rank Wurlitzer in 1940 which had the usual 3-phase 220-volt blower motor. This did not seem to be much of a problem at that time until I tried to get a three-phase service. I found that it would practically have taken an Act of Congress and even if I got it, there would have been a cost of $10.00 per month just for the service charge.



100 H. P. Spencer Orgoblo installed on the Barton Organ at the Chicago Stadium, Chicago, Illinois.

After spending considerable time trying to get that three-phase supply installed, I decided to do it the easy way and buy a single-phase motor.

I found that this would also require on Act of Congress to get a requisition from the War Production Board just to *order* the motor, and then delivery would have been about two years later. It wasn't so easy after all and besides a considerable amount of currency (more than the organ cost) would have had to change owners.

So the next solution was to rewind the motor for single-phase 220 volts. Well, I was stuck here again, because wire was scarce (the size I needed) so now I had to do some thinking.

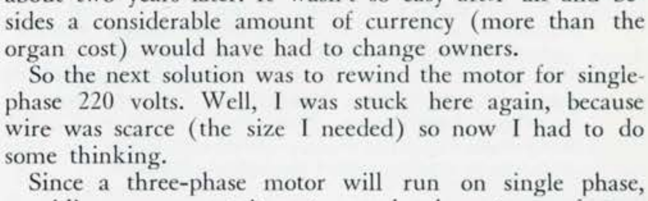
Since a three-phase motor will run on single phase, providing you can get it up to speed, why not manufacture the starting phase with capacitors and inductances.

So out came the engineering handbook in regards to figuring out the capacitance and inductance necessary for the third leg or starting current. This was easy but where do we get the capacitors and materials to make the inductance?

I called a few friends at Westinghouse and General Electric and all they had to offer was some shorted power-factor-correction capacitors which I could have if I would pick them up. These were better than nothing so I picked up a few of them in hopes that I might find the short.

It worked out better than I expected because the capacitors were assembled in banks of separate units and unsoldering the pigtails soon located the bad section. So I had capacitance to give away.

These capacitors came in sealed steel cases with stand-off insulated connections. With a grinding wheel it took



Schematic of connections for using three-phase motor on single-phase line

no time at all to grind off the welded edge along the top of the case, exposing the sections below.

Note these sections are immersed in Inerteen which is an acid.

WARNING — You fellows who try this stunt be careful not to get any of this stuff on clothing or in eyes.

Today you can go to any electronic surplus house and buy ten-microfarad capacitors for about a dollar each, and for $10.00 you can get enough to start up to a three-horse-power motor.

When buying these capacitors be sure that they are the tin-foil and-paper type as electrolytic types will not

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Canada Organs

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was disappointed to miss the Byrd and Loew's Wurlitzers, but I wouldn't have missed this experience at the Mosque for anything.

On the way home we found an unusual "organ" in the Luray Caverns. A 3m blond drawknob console is set up in one of these caverns, but this is apparently a dummy, as the guide switches the power on and the music is played automatically from a tape. The tones are produced with electromagnetic hammers striking stalactites of varying sizes on the ceiling, giving an effect resembling chime tone, although in some respects the rapid decay makes it more like a xylophone. As the tone source is from such a wide area over the whole ceiling, the effect is quite uncanny.

Back in Canada, the principal item of interest is Toronto's famous 3-15 Shea's Wurlitzer. This is a Style 260, installed in 1922, and is possibly the best known theatre Organ in Canada. It has been frequently recorded and broadcast, and has been played by many well known organists such as Kathleen Stokes, Quentin Maclean, Al Bollington, and so on. When the City required the site to be cleared to make way for Toronto's new civic square, tenders were called for demolition, which has now been completed. The Wurlitzer was purchased from the Maple Leaf Gardens management, and was removed from the theatre by the Organ Dept. of the T. Eaton Co. The removal took place in the middle of the winter with heat turned off in the building, so with the wreckers breathing down their necks, these Organ men must have encountered slightly adverse conditions. The Organ is now stored at the Gardens awaiting re-installation in this famous sports palace. At the time of writing no start had been made on the installation, and I was told by the management that a start would not be made until a rather extensive escalator installation had been completed.

The Hillgreen-Lane at the Odeon-Carlton is silent again, and Mr. Bobby Jones, the former organist, is at present in Buffalo, N.Y. Mr. Forsyth, the Odeon manager, states that the Organ will soon be in use again, and there is also a possibility of CBC broadcasts of the Organ from the theatre in the near future. The 3m Legge Unit Organ in the Jarvis Street studios of the CBC is used infrequently now.

In conclusion, I should like to ask all the readers of THE TIBIA who can assist me with historical data or information of any kind on Canadian theatre Organs to please write me. I am especially interested in data on the Canadian-built Warren theatre Organ. Can anyone help me with information from the West, or the Maritimes? Any available data will be greatly appreciated.

—THE EDITOR

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work for this application. The working voltage should be rated at 330 volts a.c. or higher.

In actual practice I found that you do not need the inductance as capacitance alone will supply enough push to start the motor, providing the motor is in good shape. I also found that running the motor on single phase a.c. does not detract from its output of air. We have loaded up a three-horsepower blower — which normally blows six ranks — with 12 ranks and full super and bass octave couplers playing full for hours without any loss of speed or excessive heating. All this with Wurlitzer pipes and 10-inch wind.

Below is a schedule of capacitors for the various horsepowers to avoid the need for another lengthy process of calculation:

Horsepower	Capacitor
up to 1	60 mf.
2	80 mf.
3	110 mf.
5	170 mf.

The above table is based upon 220-volt, 60-cycle current for use with a 220 volt, 3-phase, 60-cycle motor.

The capacitors must be rated at an a.c. working voltage of at least 330.