

INSTRUCTIONS

for

Handling, Installing
and Adjusting the

SPENCER STEEL ORGOBLO



— THE SPENCER TURBINE CO. —



PREFACE

REALIZING that the ORGOBLO, as well as any well built machine, requires careful and intelligent attention, we have prepared this instruction book for the assistance of our customers and the users of our equipment, so that they may be able to give the machines the care which they require. We believe that you will find this booklet both informative and helpful, and earnestly request that you follow conscientiously the instructions which we have given.

Below is an index covering the various features, which involve the handling, installation, adjustment and care of the ORGOBLO, which will enable you to readily find instructions on any particular point in question.

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I. Instructions for Handling, Installing and Adjusting the Spencer Steel Orgoblo

Installation of the Orgoblo

Handling

Instruct the truckmen to handle the ORGOBLO with a reasonable degree of care while putting in into place. Never attach a lift rope to the end of the motor or bearing housing.

If the machine is to be stored in a building before it can be permanently installed, it must be carefully protected from dampness, plaster or any other dirt that might get into the motor or turbine.

Location

Select a location for the machine which is dry, cool and as free from dirt as possible; also be sure that the blower is so located that it is easily accessible. Sufficient space should be left at both ends of the equipment so that it may be easily taken apart should this ever be necessary.

In selecting the best location for an ORGOBLO, several things should be taken into consideration. The size, wind pressure, speed, kind of motor, the construction of the building, all have a definite bearing on a satisfactory installation, and should be given careful attention. In general practice, high speed machines should be placed farther away from the organ than slow speed outfits in order that any humming or other noise peculiar to high speed motors may not be audible in the organ proper. The standard ORGOBLO of small and medium sizes can usually be placed in the basement beneath the organ, or sometimes placed in back of it, provided it is installed in some type of sound-proof enclosure.

Special slow speed machines can be furnished that may be placed inside of the organ or in fact almost anywhere that it is desired. This practice, however, is not to be recommended, and unless absolutely impossible, we recommend that the blower be installed somewhat removed from the organ. Particularly large ORGOBLOS handling large volumes of wind at various pressures should be placed at a considerable distance from the organ, and in a room especially built for them. Large volumes of air, especially at high pressures, cannot be handled with absolute silence, and in order to have a noiseless installation, care should be exercised in providing a suitable location for the blower. The room should be large enough to permit easy access to motor and blower, and also should be *well ventilated*; otherwise, any heat which is generated will be drawn into the blower and delivered to the organ.

Foundation

No elaborate foundation is required for the ORGOBLO, although a cement base is to be recommended. In any event, however, the foundation should be substantial and practically level.

The machine should be placed on the hair felt pads which are furnished with it, and *under no condition should it be bolted to the floor in any way.*

Piping

Be sure that all piping connections to the ORGOBLO are of ample size and absolutely air tight.

A piping system once installed, leaky or too small in size, is forever after a source of loss and unsatisfactory results. Also, leaks consume an unbelievable amount of power and are often responsible for apparent wind shortages. Below is given a table of pipe sizes which we recommend for the average installation. These sizes have been worked out for various volumes of air and permit a loss of not over $\frac{1}{2}$ in. water column.

C.F.M.	SIZE OF PIPE
200	6 in.
400	8 in.
700	10 in.
1100	12 in.
1900	15 in.
3000	18 in.
3900	20 in.
4800	22 in.
6000	24 in.

If pipe runs are extremely long, use the next size larger pipe than is given in this table.

Electric Wiring

Be sure that the voltage, cycles and phase correspond to the markings on the name plate of the motor.

Wiring instructions are attached to each motor and should be followed explicitly. Line wires must be of ample capacity to maintain voltage at the motor terminals both while starting and running.

If a solid metal conduit is used to carry the electric wires, be sure that it is *not* carried up to the motor junction boxes, but is stopped a foot or so away, allowing the wires only to be attached to the motor.

Starters

The wrong type or the wrong use of motor starters is the cause of an unbelievable amount of trouble and expense, which can and should be avoided. We, therefore, offer the following suggestions:

For all remote control starters the pilot line from the starter to the switch should be of the *three wire* type, using a *momentary contact double push button* (one side



Size of Wire (B & S Gauge) Required for Single Phase, Two Phase and Three Phase Motor

H.P.	RUBBER INSULATION												OTHER INSULATION														
	110 volts			220 volts			440 volts			550 volts			110 volts			220 volts			440 volts			550 volts					
	Phase			Phase			Phase			Phase			Phase			Phase			Phase			Phase					
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
1/2	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
1	8	14	14	12	14	14	14	14	14	14	14	14	8	14	14	12	14	14	14	14	14	14	14	14	14	14	14
2	6	10	10	8	14	12	12	14	14	14	14	14	6	10	10	8	14	12	12	14	14	14	14	14	14	14	14
3	4	8	8	8	12	10	10	14	14	12	14	14	4	8	8	8	12	10	8	14	14	12	14	14	12	14	14
5	2	6	6	6	8	8	8	10	12	10	14	14	2	6	6	6	8	8	8	12	12	10	14	14	10	14	14
7 1/2	0	4	4	4	8	6	6	8	10	8	12	12	0	4	4	4	8	6	6	10	10	8	12	12	8	12	12
10		2	2		6	6		8	8		10	10		2	2		6	6		8	8		10	10		10	10
15		1	0		4	4		6	8		8	8		1	0		4	4		8	8		8	8		8	8
20					2	2		6	6		8	6					2	2		6	6		8	6		8	6
25					2	1		4	6		6	6					2	1		6	6		6	6		6	6
30					1	0		4	4		6	6					1	0		4	4		6	6		6	6
35					0	0		4	2		6	4					0	0		4	2		6	4		6	4
40					0	00		2	2		6	4					0	0		4	2		6	4		6	4
50					00	000		1	1		4	2					0	0		2	1		4	2		4	2

Two phase sizes for Four Wire Systems.

normally open and one normally closed), which is noiseless in operation and provides true *low voltage protection*.

All polyphase motors should be equipped with a starter having some kind of *overload protective device*, which will protect the motor against what is known as "single phase" operation. If this protection is not provided, a burn out usually results, in case the motor "single phases."

Don't depend on plain knife switch and fuses as this affords no real protection and is, therefore, more than likely to result in a *burned out motor* sooner or later.

For single phase motors (except sometimes very small sizes) we recommend remote control starters with the three wire double push button switch, thereby securing low voltage protection.

The wiring for all alternating current motors should be installed *no smaller* than the size given on the above table for single, two or three phase, and one size larger is better. Where motors are started across the line, we recommend wiring two sizes larger.

All *direct current* motors, except 1/3 H.P. or smaller, should be started with hand resistance starters or with some form of remote control starter having *several steps of resistance*. The single step type should not be used over 1/2 H.P.

If hand starters are used, they should be started very slowly, consuming from 15 to 30 seconds in moving the handle through its full range.

Connection to the Organ

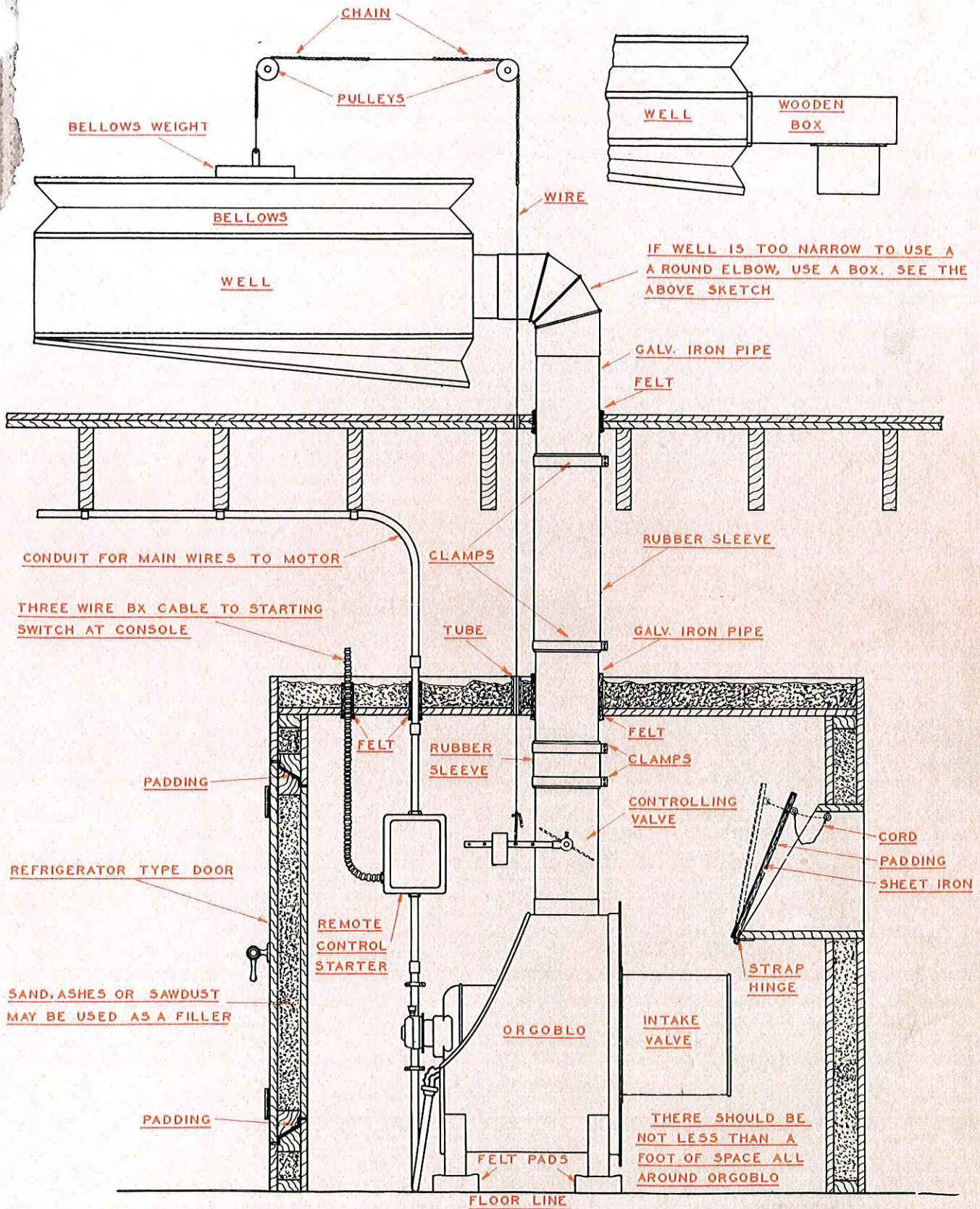
Practically all new organs are provided by the builder with an air tube connection for the blower. In attaching ORGOBLOS to old organs, a great deal may be gained by carefully selecting the proper place to make this connection.

If the "well" of the bellows is high enough, the connection may be made with a round elbow and flange collar, as shown in Cut No. 3462. If the "well" is too low to permit use of the round elbow, a wooden box made sufficiently wide to afford an opening in the bellows of at least two-thirds the area of the pipe is a convenient form of connection. (See sketch, Cut No. 3462.)

Wire Tables

Sizes of Wires for Direct Current Motors

HORSE-POWER	110 VOLTS SIZE OF WIRE	220 VOLTS SIZE OF WIRE
1	14	14
2	12	14
3	8	14
5	6	10
7.5	4	8
10	1	6
15	00	4
20	0000	1
25	250,000	0
30	300,000	00
40	500,000	0000
50	700,000	250,000



(Cut No. 3462)



Controlling Valve

The controlling wind valve which is furnished with the blower should be placed directly at the blower outlet whenever possible. This valve may best be operated mechanically by means of a pulley system connected to the organ reservoir. (See Cut No. 3462.)

If some other type of control valve is used in place of our standard balanced valve, care should be taken that it is of such ample size that it will not retard the air flow. The frictional loss through any valve increases as the square of the volume of air which is being used; hence, the loss is greatest when the greatest volume is being drawn. A valve of the cone or poppet type needs to be very much larger than our standard butterfly type, in order to allow the same volume of air to pass.

Sound Proof Enclosures

Sometimes, owing to the size or speed of the ORGOBLO, high wind pressure or acoustic properties of the building, it is necessary to sound-proof a blower in order to secure sufficiently quiet operation. Should this be necessary, we refer you to Cut No. 3462, which shows housing made of double walls, filled with hair felt, sawdust, cork or some other sound insulating material. This room is constructed similar to refrigerator construction, and proves very effective.

Another method of sound-proofing a blower is to build a sound insulating box, as shown in Cut No. 3470. These boxes may be lined with flaxlinum, celotex or sacket board, or a combination of any two of these materials. Celotex is probably the best known and most readily obtained of any of the materials mentioned above. All of them, however, prove very effective as sound deadeners and have been used in a great many instances with good success.

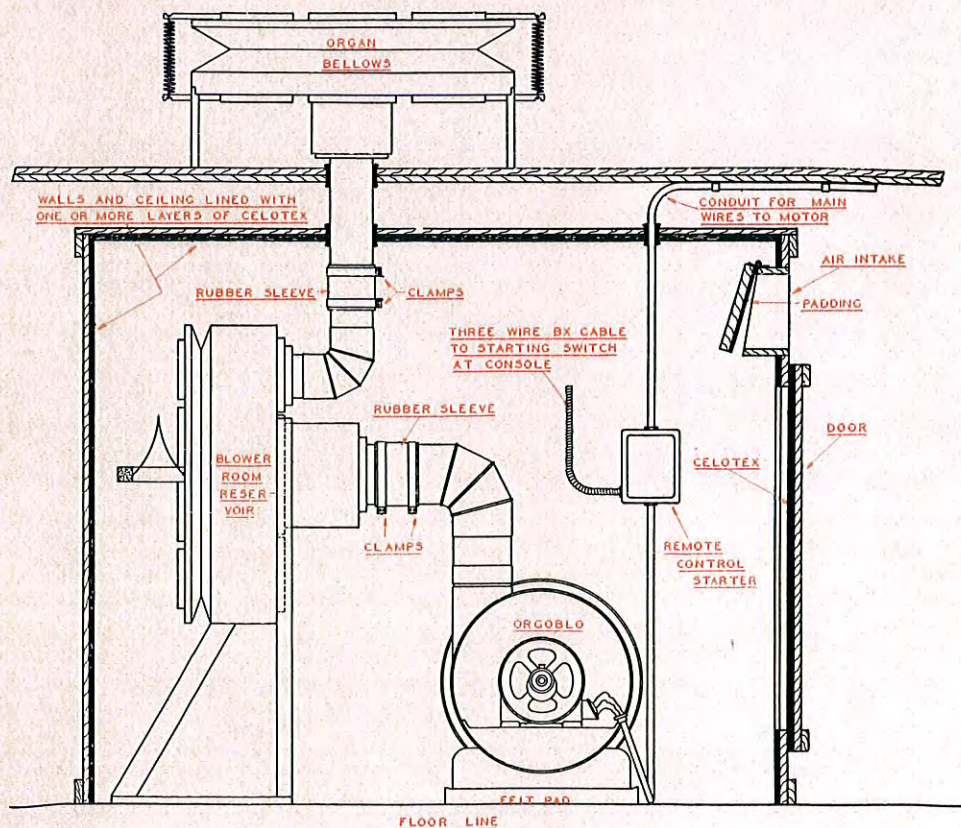
In building a blower enclosure, be sure to allow for an inlet valve of ample size similar to those shown in Cuts Nos. 3462 and 3470. An inlet valve of this type permits the air to enter the blower without difficulty, and at the same time remains closed or nearly so, when the blower is running and only a slight amount of air is being used.

Special Notes

If there is occasion to start the ORGOBLO before wind connection with the organ has been completed, be sure to place a board or something similar over the intake of the machine; otherwise, you will overload the motor and possibly injure it.

Do not under any condition try to hang the ORGOBLO from the ceiling or floor above.

Felt padding must be placed between all pipes and pipe hangers or supports. Failure to do this will cause a noisy outfit.



(Cut No. 3470)



II. Instructions for the Care of the Orgoblo

FIRST: It is assumed that the ORGOBLO will be installed in a good level place, and on the felt pads furnished for the purpose, that it has received reasonable care in handling, that all instruction tags, plates and sheets have been read and followed.

SECOND: That the place where it is installed is reasonably dry and clean.

THIRD: That the blower is connected to the wind pipe with the flexible rubber sleeve furnished with the machine; also that all piping is absolutely air tight and of ample size.

FOURTH: That the solid electrical conduit is not attached in any way to the motor or blower casing.

Care

A thing most important in the care of the ORGOBLO is to see that the lubricating instructions are conscientiously carried out, as no machine will give permanent satisfaction without adequate and efficient lubrication.

If the motor is of the commutator type, this commutator also must be kept clean and free from dirt. A clean cloth held on the commutator while it is running is about the best method of cleaning. Sometimes a little fine sandpaper carefully used will help if the commutator is in bad shape. *Never use emery cloth, however.*

The brushes must not be allowed to become wedged in the brush holders by dust and dirt, and must be renewed before they wear to the point where the spring fails to keep them in perfect contact with the commutator.

Lubrication

Do not jump to the conclusion that "any kind" of lubricant will do. If good service is expected, high grade lubricant absolutely free from acid, grit or dirt must be used in accordance with the lubricating instructions given on the blower.

Before starting be sure that the lubricant retainers are filled. If the machine is of the ball bearing, grease lubricated type (See Cut No. 3453), the bearing housing should be filled with good grade of acid-free cup grease. Do not, however, force in so much grease as to cause it to work out along the shaft into the motor windings. This not only gums up the motor, but also increases the temperature of the bearing.

If the machine is of the sleeve bearing, ring oiler type, with ball thrust bearing (See Cut No. 3459), fill with first-class motor oil the cups No. 11 and No. 12 until the oil wells below the shaft are filled to the overflow level on the overflow cups, and be sure that the thrust bearing housing is filled with acid-free grease at cup No. 14.

The thrust bearings on new machines may sometimes be found to run quite warm. This is usually due to new and tight packings, or because there is too much grease in the bearing. This slight heating is not alarming, however, unless it continues after the blower has been in service for a reasonable length of time.

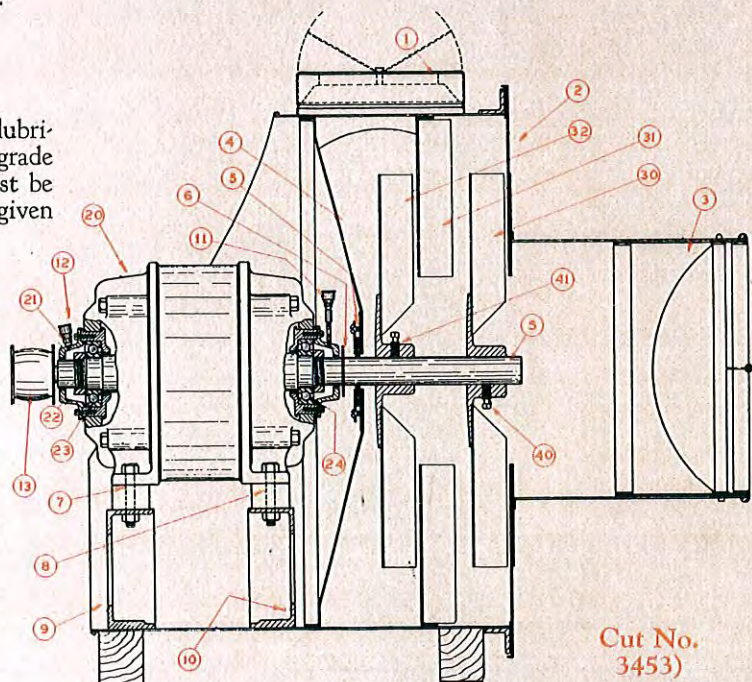
Thrust Bearings

Where sleeve bearings are used, they are usually of the ring oiler type, as shown in Cut No. 3459, and the thrust load, which is in a direction towards the blower fans, is carried by a ball thrust bearing installed on the commutator end of the motor. To remove this ball thrust bearing, first remove the bearing cap No. 50, and drive out taper pin (P), being exceedingly careful that you drive on the small end of the pin, slide off the collar No. 52 and bearing No. 53, then remove the bearing plate No. 51 by taking out the screws holding it to the bearing housing.

When reassembling the thrust bearing, follow the reverse order from what it was dissembled, being very careful everything is absolutely clean and free from dirt, and that the taper pin (P) is driven firmly into place.

Ball Bearings

On machines where the motor is of the ball bearing type, no thrust bearing is furnished, inasmuch as the bearings in the motor itself are designed to carry whatever thrust there may be. These bearings will usually be found to



Cut No. 3453



be of the single row deep groove type, such as the Hess-Bright, 6300 Series bearings, which are quite universal everywhere.

If it becomes necessary to change one of these bearings, proceed as follows:

Remove the bearing housing cap No. 21 or end bracket No. 20 (Cut No. 3453), open the nut locking device (sometimes a bent projection on the washer, sometimes a clamp screw, sometimes a spring pin or set screw), then remove the nut No. 22 and bearing No. 23.

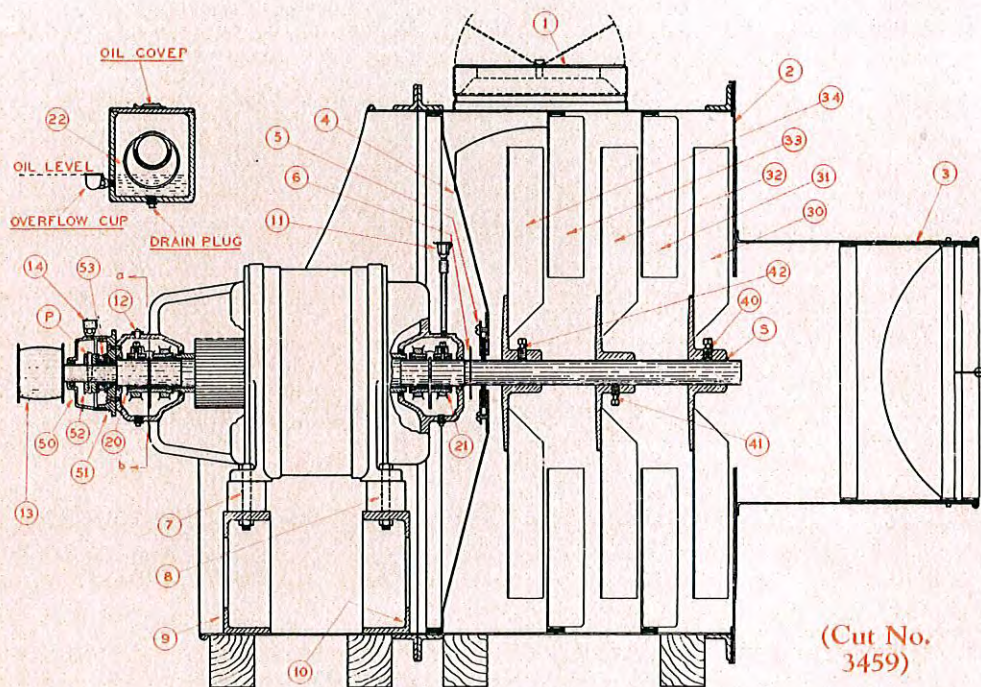
When putting this bearing into place, be sure that it fits snugly on the shaft, but is not cramped or distorted in any way. The handling of ball bearings must be a highly refined and careful job throughout. The least particle of grit, machine chips or foreign matter of any kind, will ruin the bearing in a short time. However, if

everything is kept scrupulously clean and the bearing carefully installed, splendid results will follow.

Be sure to fill the bearing housing about two-thirds full of high grade cup grease before operating the motor again.

Sleeve Bearings

Where sleeve bearings are used, they are usually of the ring oiler type, as shown at No. 20 and No. 21 in Cut No. 3459, and the thrust load is carried by the ball thrust bearing No. 53. These sleeve bearings are the same as furnished on any sleeve bearing motor, and any experienced mechanic should be able to change them without difficulty. When changing these bearings, it is usually best to remove the motor from the machine, however, in order to make all parts thoroughly accessible.



III. Assembly of the Orgoblo Standard Machines

To Take Apart

Don't forget that all parts of the ORGOBLO must be reassembled in exactly the same relative positions; therefore, if it is necessary to take the machine apart, the safest way is to place a mark of your own on each impeller, deflector head, etc., when you remove them, in order that there may be no mistake in reassembling. To take the ORGOBLO apart (See Cuts Nos. 3453 or 3459), begin at the intake end and remove the intake valve No. 3, end head No. 2, impeller No. 30, deflector No. 31, impeller No. 32, and so on until all impellers and deflector heads have been removed.

To dismount the motor, remove the bolts from the feet No. 7 and No. 8, and slide the motor straight back, being careful not to injure the packing No. 5 around the shaft.

NOTE: When removing the fans from the shaft, be sure to slide them straight without twisting in any way whatsoever. These fans are held in place by set screws which bite into the motor shaft, and if they are twisted when being removed, the hub is apt to become wedged on the slight burr which the set screws cause and give a great deal of difficulty in removing.



To Reassemble

Bolt the motor down tightly into its original position, making sure that the shaft is in the exact center of the blower casing.

Be sure that the leather or steel disc No. 6 is in its place on the shaft and turns with it. If this is left off, and there should be any air leakage around the shaft, it will be likely to blow the oil out of the motor bearing and cause trouble. This, however, cannot occur if the disc is in place.

See that the packing No. 5 is in place and fits tightly around the motor shaft. If this has been deranged in the moving of the motor or otherwise, a new packing should be installed before the motor is put back.

Before beginning to assemble the fans, start the motor and make sure that the shaft runs absolutely straight and true. Also be sure to remove any slight set screw marks which may be found on the shaft. If these set screw marks are not removed before sliding on the fans, they

are apt to cause the fans to wedge and give trouble. Any ordinary mill file should smooth up these places without difficulty. Then place impeller No. 34 on the shaft, but do not tighten it. Next insert deflector head No. 33, and be sure that it is driven back tightly against the stops. These deflector heads may be most easily put in place by sliding them into the casing at the bottom first, and then driving them at the top until they come up tightly against the stops.

Next set the first impeller so that the edge of the blade runs approximately $\frac{1}{2}$ in. away from the deflector head in front of it. In setting this impeller, make sure that the arrow mark which will be found at the end of the hub corresponds exactly with the scratch line on the motor shaft. Set up the set screws tightly in order that there may be no possibility of the impeller slipping on the shaft.

Place the second impeller No. 32 on the shaft without tightening, and proceed in a like manner with the rest of the deflector heads, impellers, and end head.

Three Bearing Orgoblos

Some of our very large machines may be found to be built in our three bearing construction (See Cut No. 3474). The care and installation of these outfits is highly refined, and we feel that they merit special instructions.

An inspection of Cut No. 3474 will give you a clear idea of their construction. You will note that they consist of a motor having the usual bearings, either ball or sleeve. There is a flexible coupling between the motor and the turbine proper and an outboard supporting bearing to carry the shaft and the weight of the fans at the intake end of the blower.

If it is necessary to take one of these machines apart in order to place it in the building, extreme care should be exercised in marking each part as it is removed in order to make sure that it is placed in the same relative position when the blower is reassembled.

To Take Apart

When taking these blowers down, begin at the intake end, and first remove the intake valve No. 3, then take off the cap No. 20 of the outboard bearing assembly, and disassemble this mounting. Before this is done, however, it will be necessary to support the shaft by some external means. At the top of the blower, you will usually find a hand hole directly above the intake. By placing a rope through this hole and around the shaft, this shaft may be supported, thereby removing the weight from the bearing, enabling the housing to be taken apart or assembled readily. Next remove the bolts from the end head, and take away this head. Then loosen the set screws holding the first fan in position so that it may be easily removed. At this point, it will be necessary to obtain a stick or block of wood to support the shaft, and thus remove the tension on the rope through the hand hole at the top. After the block has been placed under the shaft, remove the rope and place it again around the shaft in back of this fan. When this is done, the block is again removed, and the fan slipped off. This operation has to be repeated for each fan and deflector until all of these parts have been removed.

After all of the fans have been removed from the blower, loosen the bolts on the flexible coupler which holds the shaft in place, and slide the shaft straight out from the division head, being careful not to injure the packing on this head in any way.

If it is necessary to remove the motor from the casing, unbolt the feet at points No. 7 and No. 8, and slide the motor straight back. It should never be necessary to remove the flexible coupling from the motor shaft, and it is best left where it is. The various sections of the casing may be now unbolted, and the entire machine taken in the building where it is to be put in position.

To Reassemble

When assembling the blower, follow the exact reverse procedure which was used in taking it apart. First bolt all the sections of the casing together, and set the casing in the exact position where you wish it to stand. Place the motor in the motor section if it has been removed, but do not draw the bolts up tight. Next place the turbine shaft in position by sliding it through the division head packing, and into the coupler. Do not, however, tighten the bolts on the flexible coupler which holds this shaft in position. *Also be sure to support the end of this shaft at all times so that it will not have any tendency to bend down, and strain the coupler or packing.*

When this is done, it is a good idea to put the end head on the blower and assemble the supporting bearing just as though the outfit was completely assembled and ready to use. The reason for doing this is to check up the position of the motor and flexible coupling to see that everything is in exact alignment. If you have been very careful to mark the exact position of every part before disassembling the blower, this may not be necessary, but it is very good insurance and may save trouble later on.

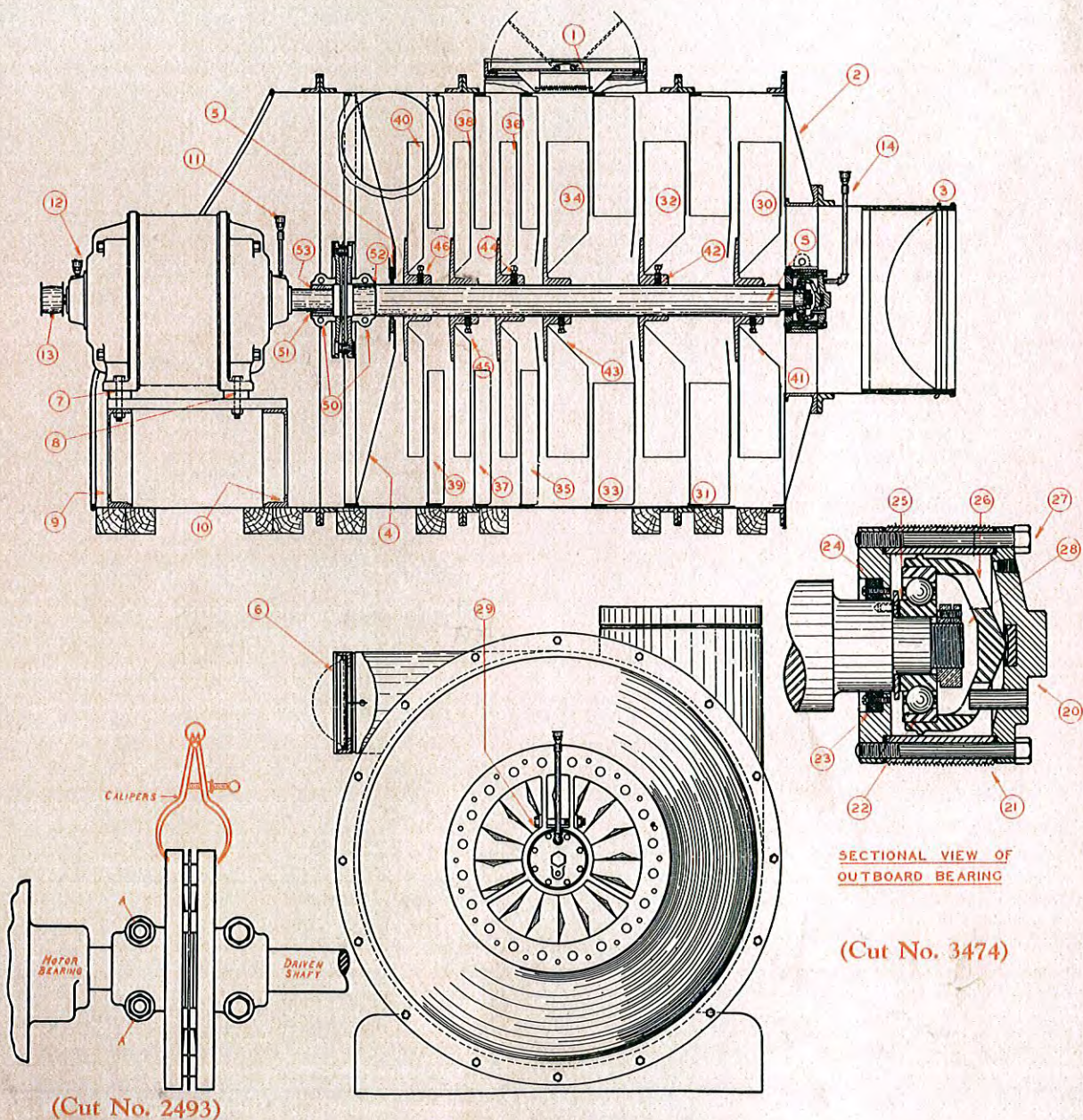
To align the flexible coupler, caliper three points around its periphery. During all this time the coupling should remain stationary, and not turned or moved. If it is found that the coupling does not caliper exactly the

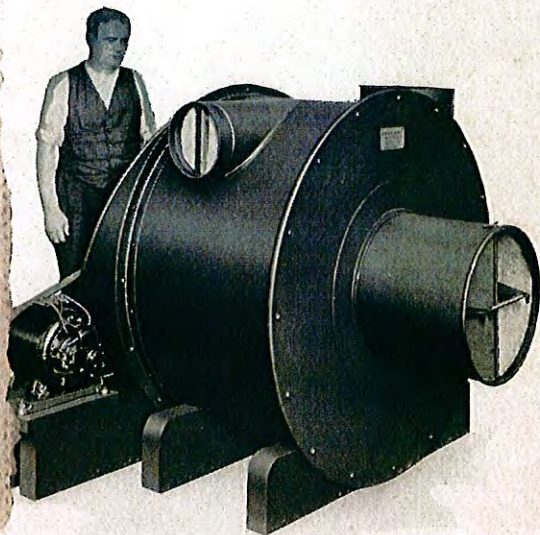


same measurement at all points, shift the position of the motor slightly until it does caliper the same at all points. If it is found that the coupling is wider at the top than at the bottom, it is an indication that the motor is too high. This can usually be corrected by removing a shim or two from beneath the motor feet on the fan end. If the coupling does not caliper the same on both sides it is an indication that the motor is not exactly in the center of the casing, and should therefore be shifted slightly in one direction or the other. After the motor and coupling have been perfectly lined up, then tighten the bolts in the motor feet, place the fans on the turbine shaft and install the deflectors in exactly the same position from which they were removed. You will notice that there are usually hand holes provided at the side of the blower casing for setting the fans. It is therefore not necessary to clamp

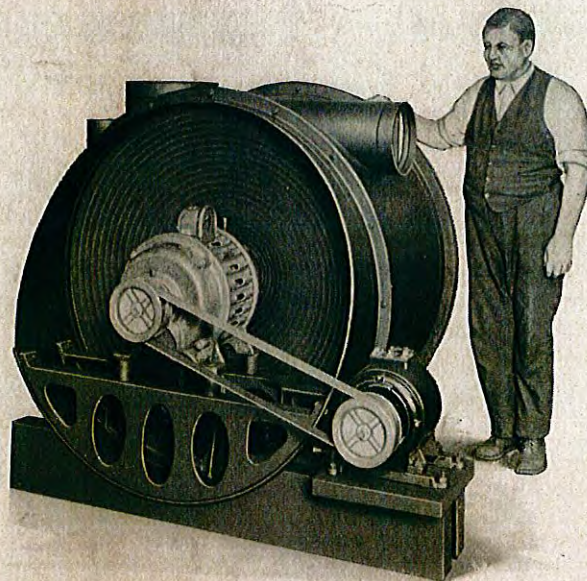
them to the shaft when they are put on, as they may be left loose and set with a wrench which is provided for the purpose after the blower has been completely assembled. When all fans and deflectors have been put in place, mount the end head and reassemble the outboard supporting bearing.

It will be noted that the ball bearing on the intake end of this machine is of the radial thrust type. It is therefore designed to take thrust in one direction only, and should the bearing be placed in the wrong position, trouble is sure to follow. The thrust of this machine is in the direction of the intake of the blower, and consequently the thick edge of the outer ball race should be toward the worker when this bearing is put into position. *Be doubly sure that this bearing is so placed or you will have trouble later.* Next complete the assembly of the





Intake End. 15 H.P., 3 pressure Orgoblo with belt driven generator

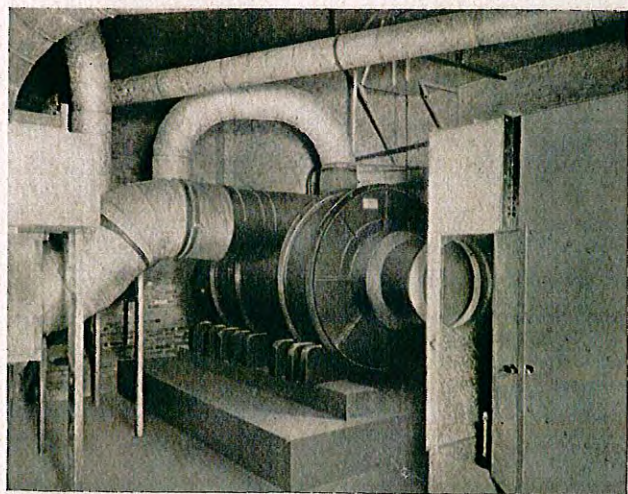


Motor End. 15 H.P., 3 pressure Orgoblo with belt driven generator

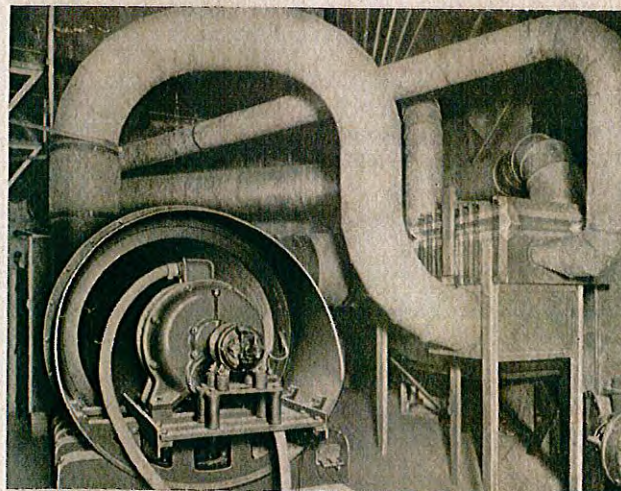
bearing mounting, and screw the housing into the bracket in the same position where it was originally found. Next set the fans on the shaft up tightly with the wrench provided for the purpose. These fans should run about $\frac{1}{2}$ in. behind the deflectors directly ahead of them, and we would caution you to make sure that they are set accordingly. *Do not, under any conditions, tighten the bolts in the coupler yet.* After the blower is completely assembled, try turning it by hand to make sure that everything is free, and the outfit turns easily. If this is true, connect the wires to the motor, and start the blower, allowing it to run several minutes. By so doing, you permit the motor armature to find its magnetic center, as well as the fans and turbine shaft to find their proper positions. After the blower has run for a short time, stop it, and then tighten the bolts which clamp the flex-

ible coupler to the turbine shaft. Also make sure that the bolts holding the coupler to the motor shaft are tight. At this point, it is good insurance to recheck the flexible coupler to make sure that it is in proper alignment. As explained above, caliper the three points of this coupler to make sure that they all measure exactly the same. If this is true, the blower is ready to run; if not, it will be necessary to re-align the motor until the coupler does caliper correctly at all points.

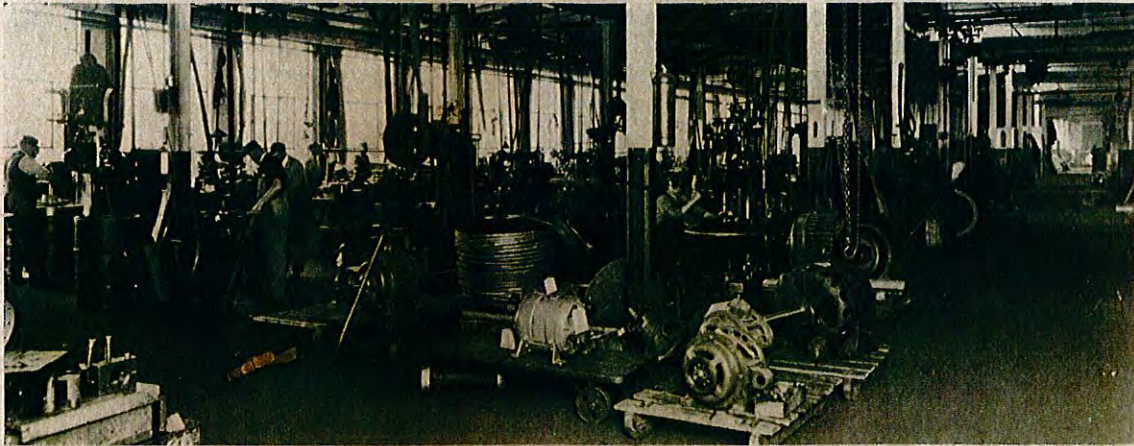
If it is found necessary to re-align the blower after it has been completely assembled, loosen the clamp and nuts on the coupler again, and move the motor until it calipers correctly at all points. After this is done, again start the machine, to allow the motor to find its magnetic center, and then tighten the clamp and nuts on the turbine shaft.



60 H.P., 2 pressure Orgoblo, Municipal Auditorium, Minneapolis, Minn.



60 H.P., 2 pressure Orgoblo with motor and generator. Municipal Auditorium, Minneapolis, Minn.



One corner of the Spencer Machine Room is illustrated at the top of the page

Spencer Service

SPENCER SERVICE begins when the purchase of an organ blower is first given consideration. Our engineers contribute the knowledge gained in contact with many installations and help in making out specifications when this service is desired. Special requirements are given detail attention, so that the unit submitted may give the maximum efficiency in the foundry where it is to serve.

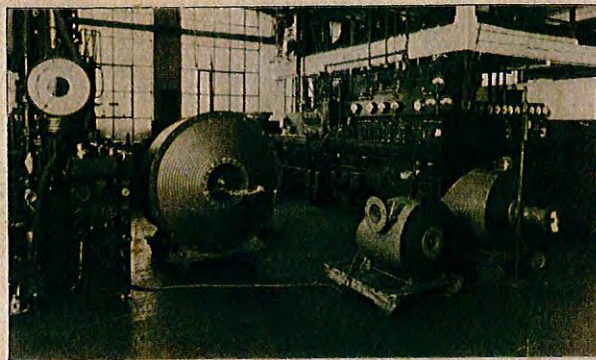
Spencer Service also includes the ability to serve promptly. One entire floor is required for the electric motors that are ready for immediate application. Many of the parts are in stock—and since the complete unit is made up in one fac-

tory, the purchaser is assured of constant attention and prompt deliveries.

All Spencer Organ Blowers are given tests in the factory—not only for load—but for noise, vibration and for assurance of satisfactory service over a period of years.

Spencer Service on repairs is a factor the purchaser can depend upon for the life of the organ blower. Spencer Compressors are built to last—every item in the

design and manufacture is decided on the basis of maximum life of the machine under severe conditions, and the Spencer Company regards their permanent satisfactory operation not only an obligation but a matter of deep interest.



A section of the Spencer Testing Department is shown at the right

Our organ power engineers will gladly furnish complete information on any phase of organ power service

An interview can be arranged promptly by writing to the address given below

THE SPENCER TURBINE CO.

Organ Power Department
HARTFORD, CONNECTICUT