Delintering Equip.

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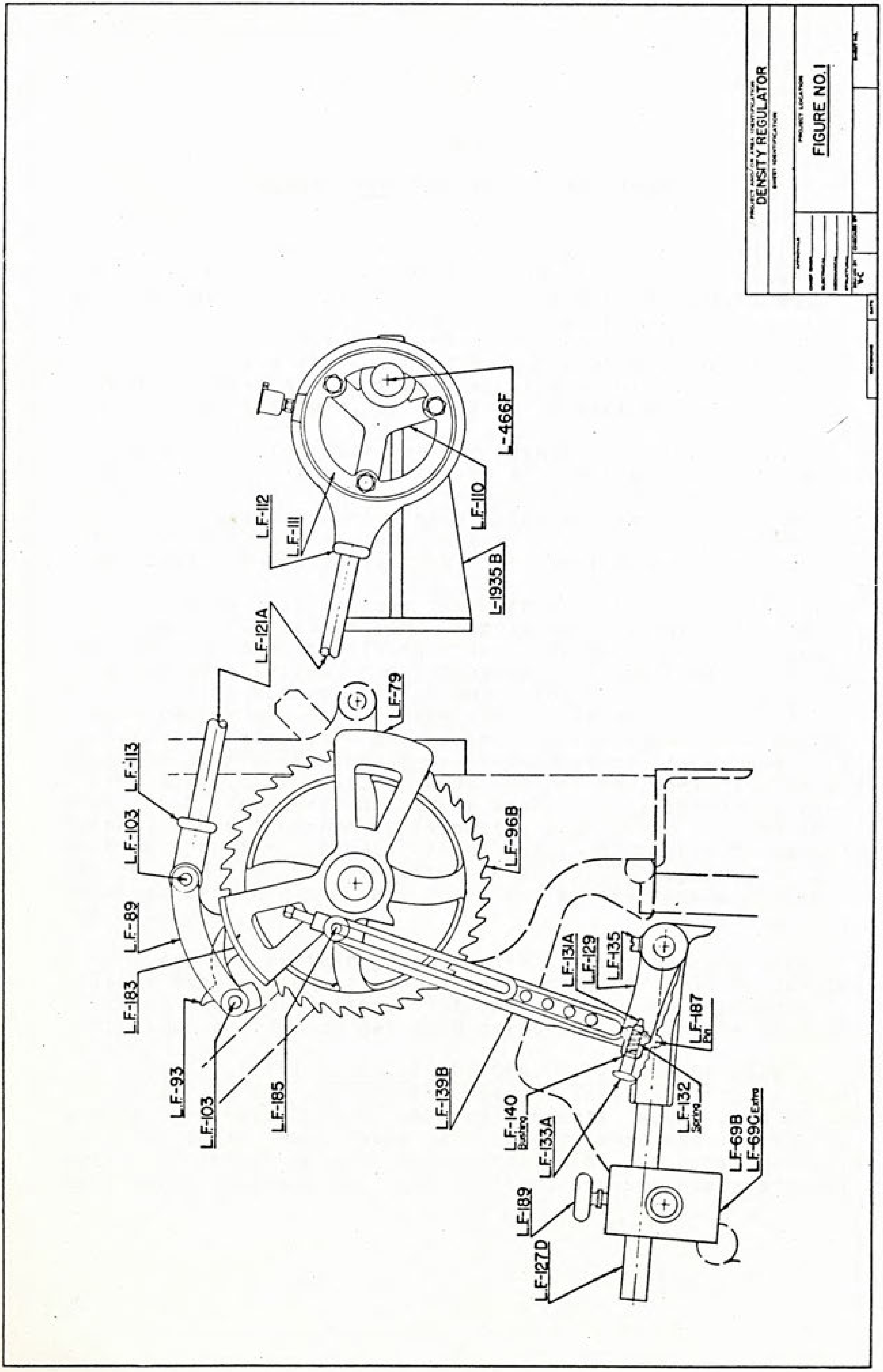
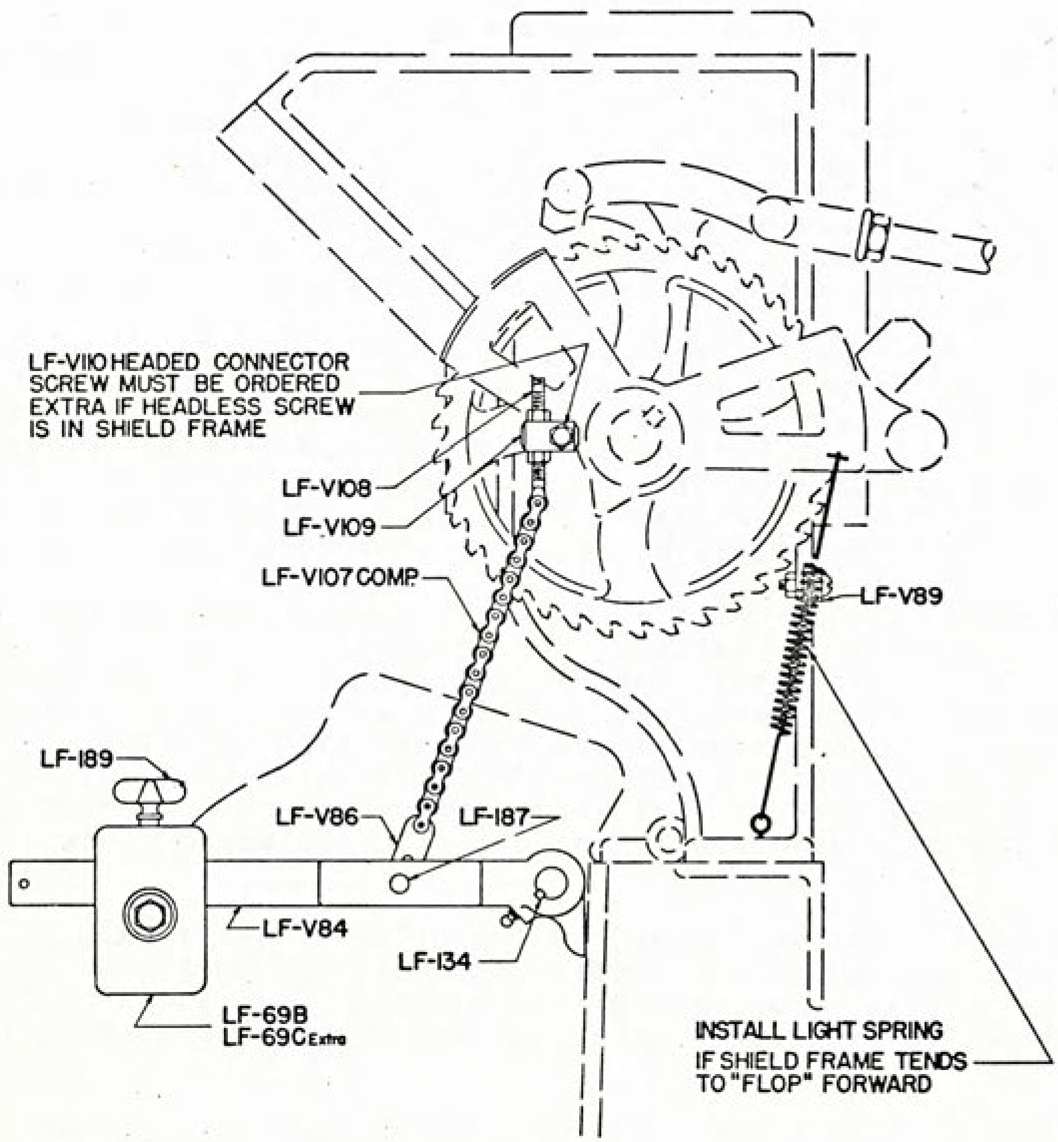

DENSITY REGULATOR
FIGURE NO.1
L-466F
L.F-110
L.F-112
L.F-111
L-1935 B
L.F-121A
L.F-79
L.F-113
L.F-103
L.F-96B
L.F-89
L.F-183
L.F-93
L.F-103
L.F-185
L.F-139B
L.F-140 Bushing
L.F-133A
L.F-131A
L.F-129
L.F-135
L.F-187 Pin
L.F-132 Spring
L.F-69B
L.F-69C Extra
L.F-189
L.F-127D

NEW STYLE DENSITY REGULATOR

FIGURE NO.2



the efficiency of the Linter. Most of the trouble with this mechanism can be avoided by simply replacing the Pawl Pins (L. F. 103) as soon as they show signs of wear. After several years operation the holes can be re-bored and over-size pins used.

A common difficulty with this mechanism is due to the little Countershaft (L-4 66-F) becoming loose or getting out of line. The Babbit Bearings supporting this shaft must be re-Babbited when necessary and the supporting brackets (L.F. 26A and L-1935B) must be securely bolted. New Linters are now equipped with B. B. Countershafts and replacements are available for old machines.

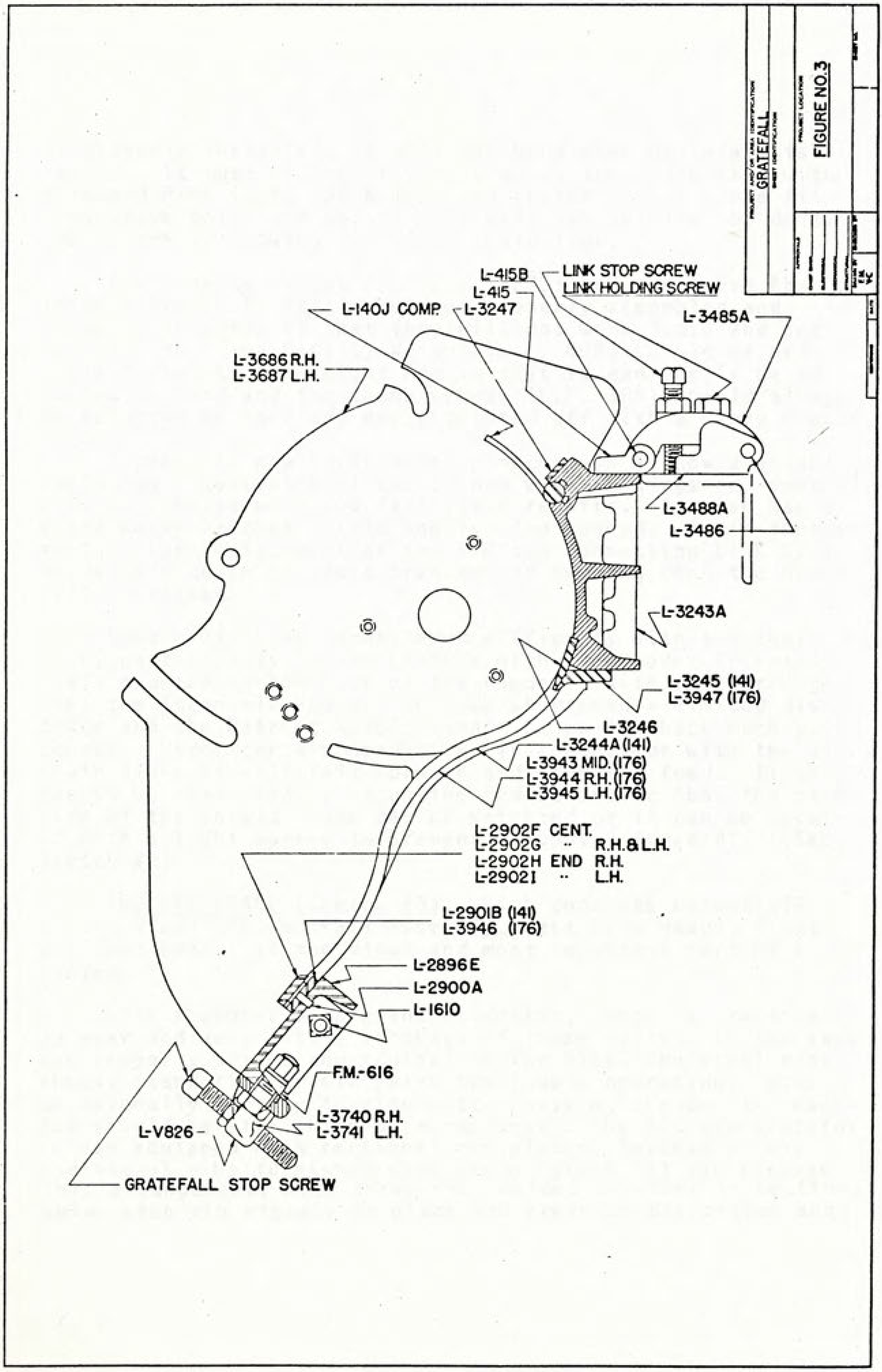
As soon as the tip of the Pawl (L.F. 93) becomes worn and rounded, it should be immediately replaced or it will cause excessive wear on the ratchet wheel (L.F. 96B). The tip of the Pawl may be repointed on an emery wheel and after several grindings, can be built up by welding. The teeth on the ratchet wheel will wear very little if the Pawl is kept in good condition, but if the teeth become rounded, they also may be pointed by grinding them out with a special emery wheel, which must be dressed to fit the angle of the tooth.

The ratchet shield (L.F. 183) should always be kept in good condition and replaced when worn or bent, as this is very important for proper operation of the mechanism. A liberal supply of factory made ratchet shield screws (L.F. 183A) and shields should be stocked as it is difficult to get a good fit, making them on the job, and unless very hard steel is available, they soon wear or bend and cause trouble.

The greatest excess wear on the ratchet wheel mechanism is on the first cut Linters where the feeder and eccentric usually must run twice as fast as on a second or third cut Linter. Carver now has a ratchet mechanism that feeds on both forward and back throw of the eccentric and may operate at approximately half the speed of the old single ratchet. This is recommended for first cut Linters where greater tonnages are handled and problems are encountered with the feeder mechanism.

A more recent development by Carver for the Linter Feeder is the deep fluted roll. This allows the feeder to put out about twice as much seed per revolution and is helpful on first cut linters where the feeder does not feed sufficient volume.

The Slotted Connecting Link (L.F. 139B) must be kept in good order and straightened or replaced when bent or broken.


GRATEFALL
FIGURE NO.3
L-415B
LINK STOP SCREW
L-415
LINK HOLDING SCREW
L-140J COMP.
L-3247
L-3485A
L-3686 R.H.
L-3687 L.H.
L-3488A
L-3486
L-3243A
L-3245 (141)
L-3947 (176)
L-3246
L-3244A (141)
L-3943 MID. (176)
L-3944 R.H. (176)
L-3945 L.H. (176)
L-2902F CENT.
L-2902G .. R.H.& L.H.
L-2902H END R.H.
L-2902I .. L.H.
L-2901B (141)
L-3946 (176)
L-2896E
L-2900A
L-1610
F.M.-616
L-3740 R.H.
L-3741 L.H.
L-V826
GRATEFALL STOP SCREW

If properly installed, it will not bend when Gratefall is raised. It must be properly secured at top and bottom with Standard Pins (L.F. 185 & 187) and Cotter Keys. Loose fitting stove bolts and baling wire will not get the job done. See Sketch #2 showing new style chain link.

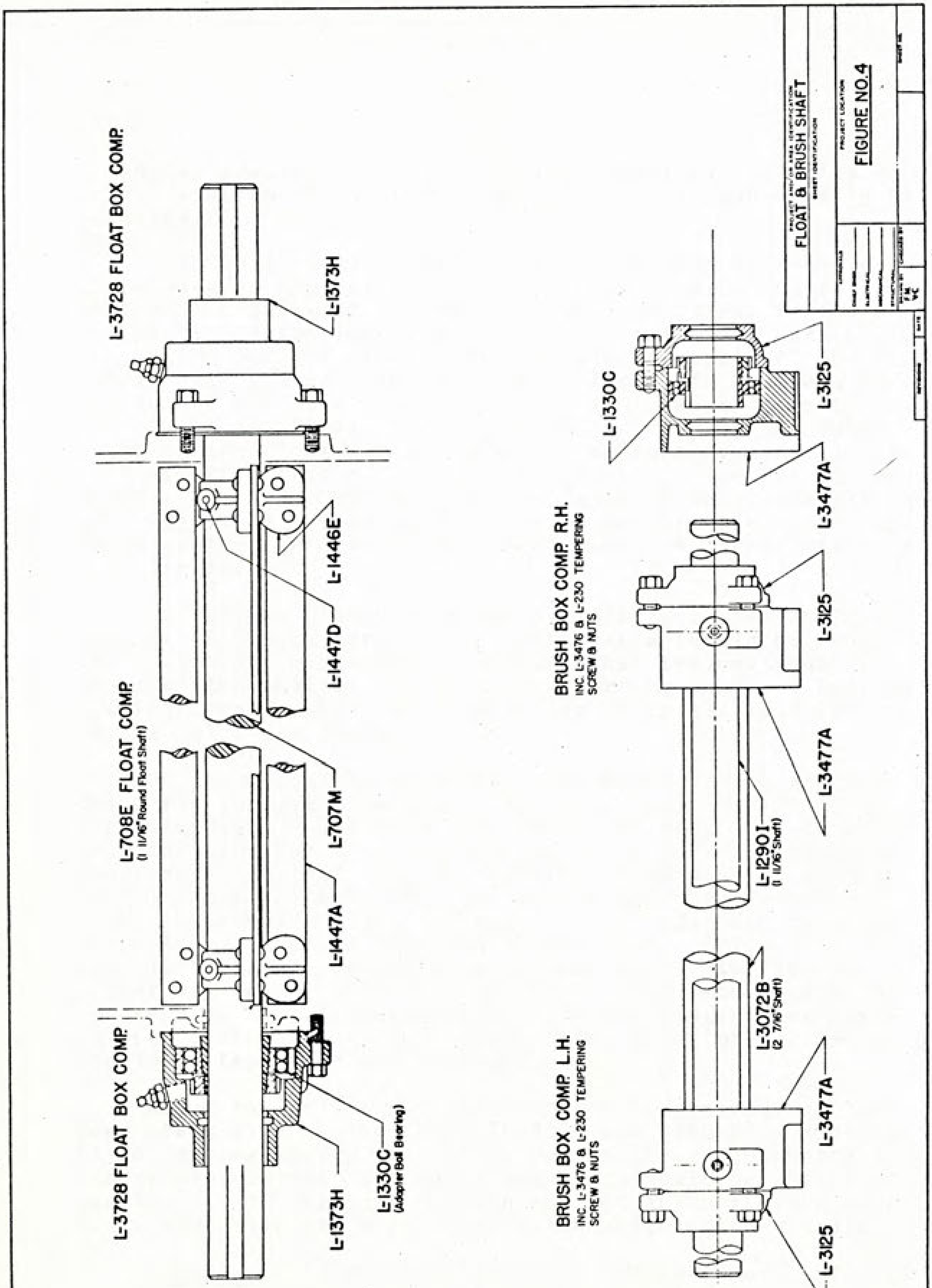
The Density Weight Arm (L.F. 127D) and the Curve Adjusting Arm (L.F. 129) should be properly assembled and fastened securely so that they will not work loose and get out of line. The Density Weight (L.F. 69B) should be properly fitted to the Weight Arm so that it can easily be adjusted by hand and the thumb screws (L.F. 189) should always be adjusted by hand and never twisted off with a heavy wrench.

A complete new style density mechanism is now available, including a special Pawl Rocker Arm with bushings and special pins to prevent wear and facilitate repairs. It also has an extra heavy Ratchet Shield and is also bushed. A big improvement is the replacement of the Slotted Connecting Link by an adjustable chain to avoid breakage or bending when the Gratefall is raised.

Some mills have encountered difficulty with the chain link, particularly on new Linters with the Feeder Eccentric Shaft mounted on the back of the Feeder. With this arrangement the Eccentric Rod may only be shortened a limited distance and the Ratchet Shield cannot be pulled back much past center. Under certain conditions in connection with the all chain links it will fall forward and stop the feed. If this cannot be corrected by adjusting the Eccentric Rod, the back side of the shield frame can be weighted or it can be secured with a light spring to prevent "flopping forward". (See Sketch #2)

<u>THE GRATEFALL</u> (Sketch #3), which consists essentially of the Steel Rib and Rail Assembly, Cast Iron Heads, Float and Seed Board, is the vital and most important part of a Linter.

With reasonable care and attention, there is practically no wear and very little breakage of these parts. If the saws are properly spaced and central in the Ribs, the steel ribs should stand five or six years continuous operation. Ribs occasionally bent by foreign matter passing through the machine should be straightened or replaced. The 176 saw Grateful is now equipped with sectional rib plates, instead of the individual ribs furnished with the original 141 saw Linters. This arrangement, with three ribs welded together in section, holds each rib rigidly in place and prevents distortion and



L-3728 FLOAT BOX COMP.
L-1373H
L-1446E
L-1447D
L-708E FLOAT COMP.
(1 11/16" Round Float Shaft)
L-707M
L-1447A
L-3728 FLOAT BOX COMP.
L-1373H
L-1330C
(Adapter Ball Bearing)
BRUSH BOX COMP. R.H.
INC. L-3476 & L-230 TEMPERING
SCREW & NUTS
L-1330C
L-3125
L-3477A
L-3125
L-3477A
L-12901
(1 11/16" Shaft)
BRUSH BOX COMP. L.H.
INC. L-3476 & L-230 TEMPERING
SCREW & NUTS
L-3072B
(2 7/16" Shaft)
L-3477A
L-3125
FLOAT & BRUSH SHAFT
FIGURE NO.4

irregular spacing. This, of course, requires replacing an entire section if one rib is damaged, but it can usually be repaired.

The Float requires very little attention but should occasionally be checked to see that it is running central and this may be adjusted by loosening the set screws on the Float Pulleys and adjusting it end-wise. If the Float Bars or Spiders become bent or damaged they should be repaired. On the latest type Linters, the outside surfaces of the Float Bars are turned off to a true circle and it is worthwhile to put all of the old floats in a lathe and grind down the outer edges of the Float Bars to obtain a uniform diameter. This will assure a true running Float and will allow the distance between the Float Bar and the saw tooth to be accurately gauged. Adjusting the Gratefall in this manner is a simple operation if the surfaces of the Float Bars are turned off to a true circle.

On the new Floats with the 1-11/16" diameter shaft and adapter bearings, very little maintenance should be required, and it is only necessary to be sure that the bearings are tight on the shafts. It is also important that the bearing housings are properly secured to the Gratefall Head and all of the bolts are tight.

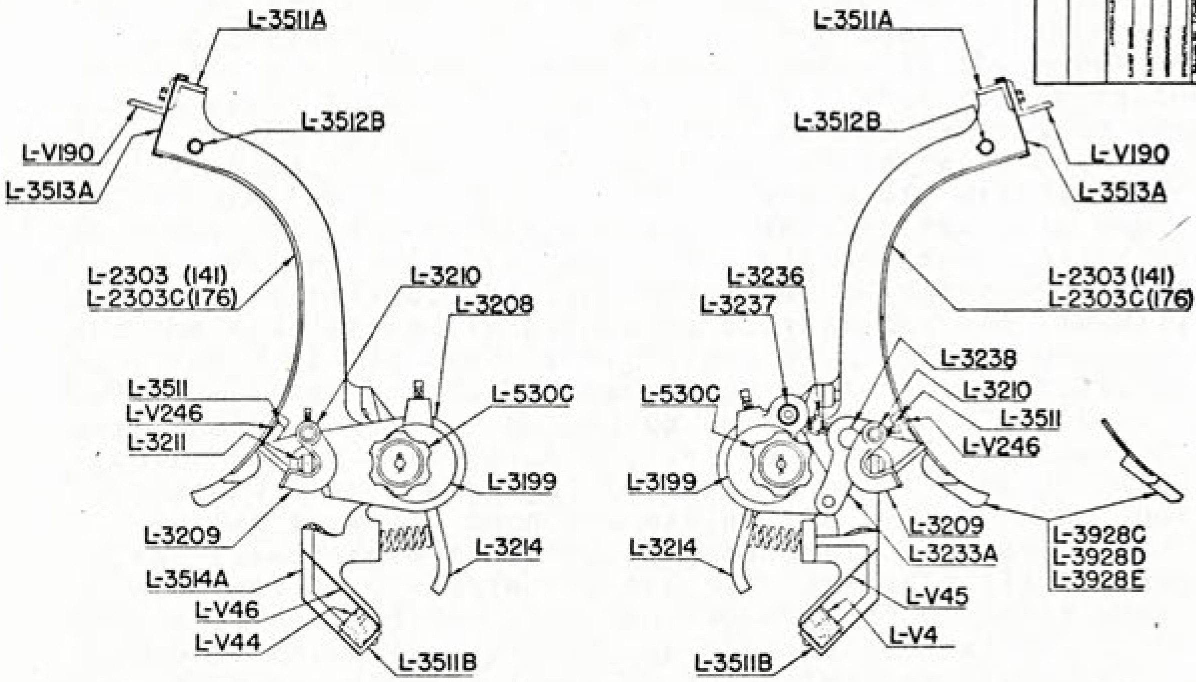
On the Eccentric adjusting Seed Board, there are very few parts subject to wear and the principal item to watch is the Rake Heads. The cast iron Rakes are very easy to break when the Seed Board is removed and it is very important for good operation that they be replaced immediately. When one of the fingers breaks off, the entire Rake Head assembly should be removed and a spare one installed. The damaged assembly can then be repaired in the shop. It is also advisable to have a complete spare Seed Board, so that the Linter may be put back into operation immediately, when making repairs to Rake Heads, etc. 176 Saw Linters are now equipped with steel rakes. These rakes occasionally bend and should be kept true and straight.

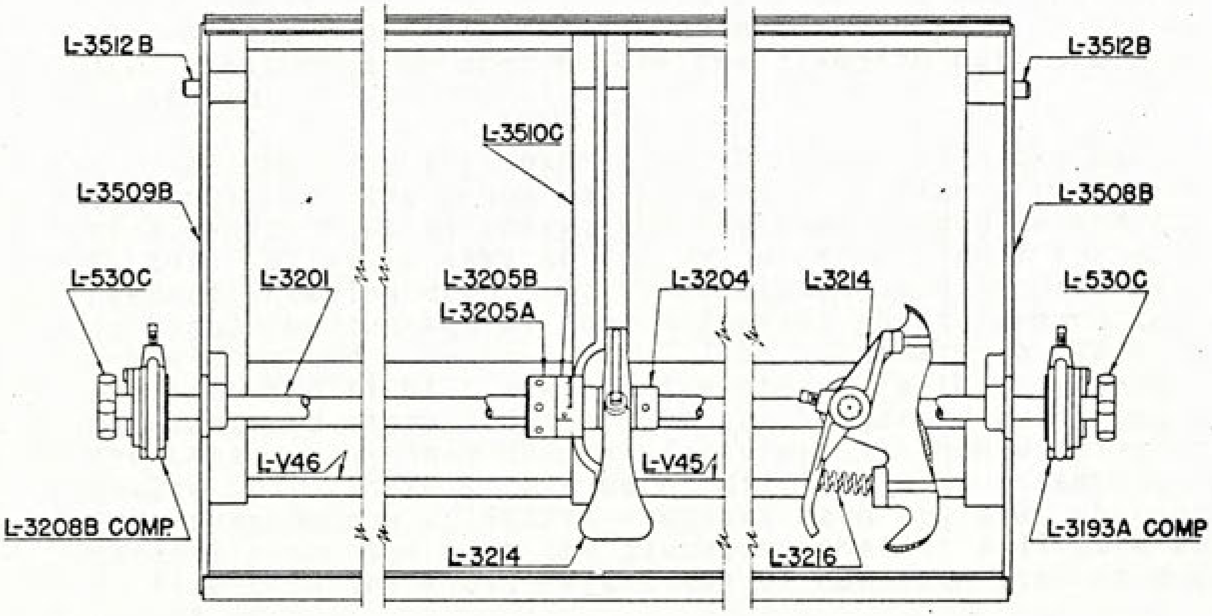
About the only other item subject to breakage on the Seed Board will be the Latch (L-3193 and 3208-B). Whenever it becomes necessary to replace one of these Seed Board latches the opening between the rakes and ribs should be checked to see that it is the same on each end and any necessary adjustments made with the right hand latch which is adjustable.

<u>THE SAW CYCLINDER</u> requires very little maintenance but due to its importance in delinting, a few items will be mentioned, that occasionally give trouble (the Gumming and Filing

STEEL SEED BOARD

FIGURE NO.5





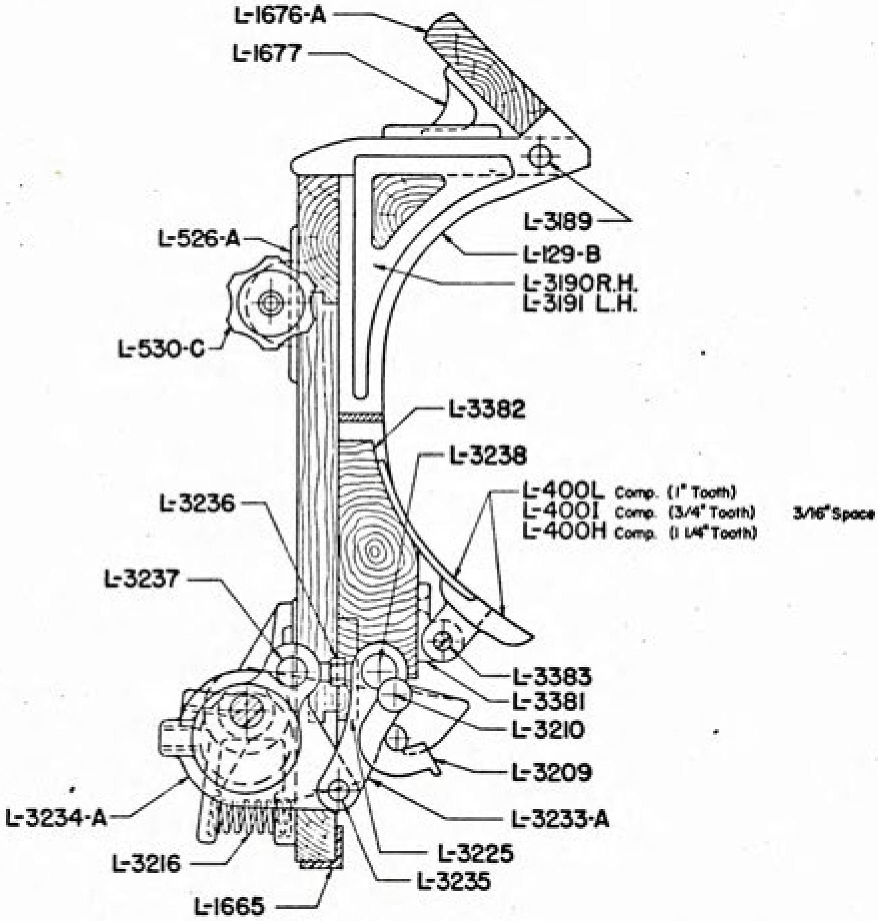
NOTE -
SEE FIGURE NO. 12
FOR RAKE DETAILS

of saws will be covered under another heading). Too much care and attention cannot be paid to the careful assembling and spacing of the saws, when the Cylinders are filled, and each cylinder should be carefully checked with a Saw Spacing Gauge each time the cylinders are refilled. The Space Rings on the Standard Duplex Cylinders are furnished in gauged sets and it is important that these space rings be put back on the cylinder, exactly in the order in which they are removed. When dismantling cylinders, place space rings, in the order removed, over a broom handle or similar object. When replacing the rings on the cylinder they can then be easily kept in order. In filling a cylinder with new saws, or in replacing damaged saws, each saw should be carefully wiped off with a clean rag to remove all the grease and dirt; this is the only way you can be assured that the saws will pull up true. After the cylinder is filled, the saws should be held firmly in place and the head carefully pushed on so that the end saw will not be pinched as the head is tightened down. The four nuts that hold the head, should be gradually tightened, in rotation, so that the head will be pulled up uniformly on all sides. After tightening the nuts slightly, the spacing of the saws should be checked with the gauge, so that there will be no danger of tightening them too much and making the cylinder too short. If the saws happen to be running slightly over gauge and there is difficulty in tightening the nuts sufficiently, a block may be placed against the head and tapped with a sledge hammer. This will cause the cylinder to vibrate and relieve any binding, thereby allowing the saws to be further tightened. When using a Tru-Line Gummer, see Tru-Line operating instructions for filling cylinders, which calls for pulling each saw backward from its direction of rotation, so the key or tit in the hole of the saw rests firmly against the keyway in the cylinder. This must be done before the clamping nuts are firmly tightened.

In checking the spacing of the saws, with the saw gauge, the center of the gauge can be placed in line with the center ring, which is stationary, and the saws gauged toward each end. In this way it is easy to determine which end of the cylinder needs tightening down. After completely filling the cylinder it should be checked at four different points around the circumference and sometimes it will be necessary to slack up on one side and tighten down on the other. With the space rings manufactured since 1936 and put out in gauged sets, and with the Linter Saws that the manufacturers are now putting out in gauged sets, there should be no difficulty in assembling a true running saw cylinder, however, each cylinder should be carefully checked with the gauge, so that it will turn absolutely freely in the ribs, regardless of how much time it takes to adjust it.

WOOD SEED BOARD

FIGURE NO.6



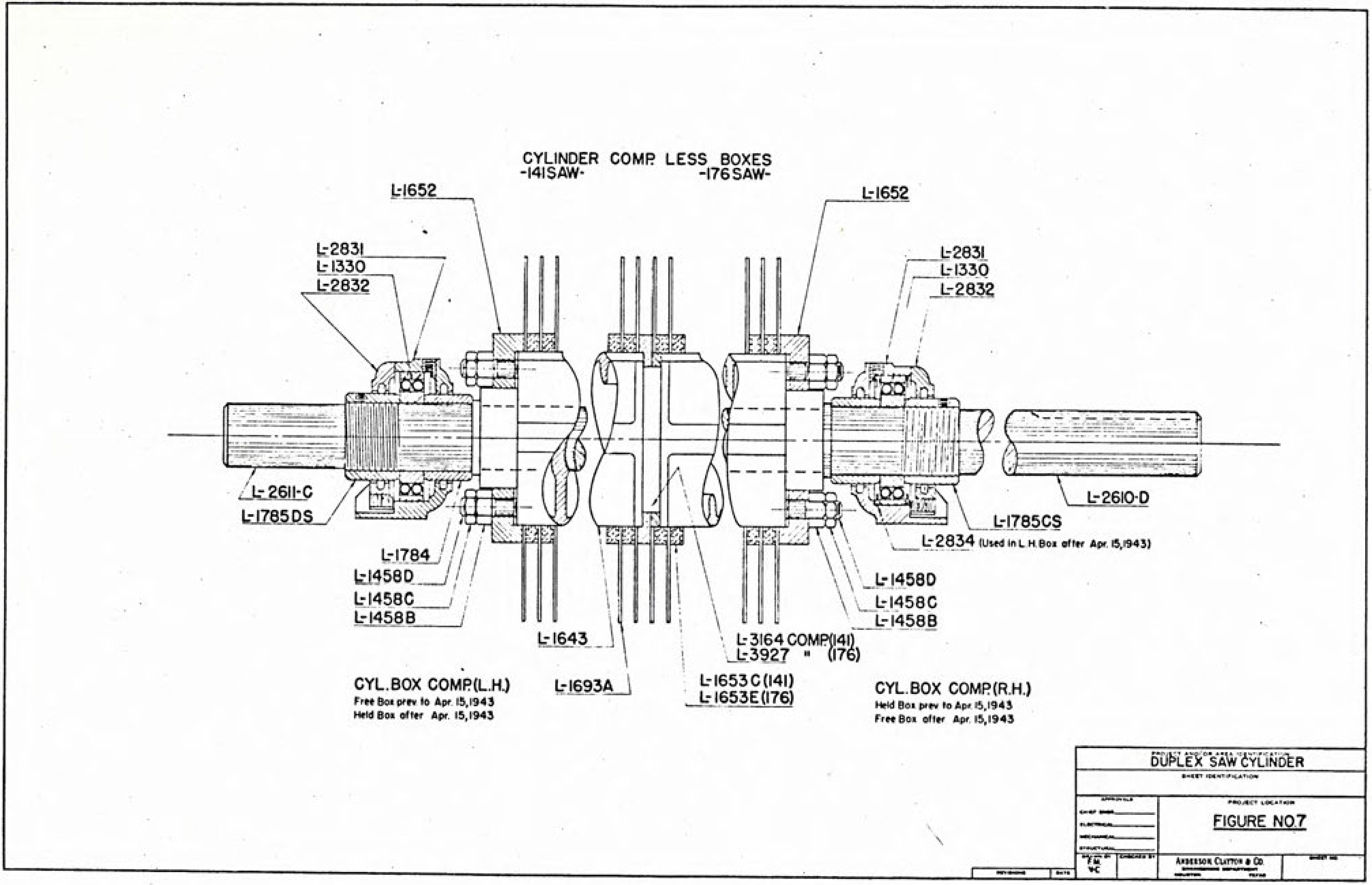
Every week or two, when the mill is shut down, each saw cylinder should be turned by hand, to be sure that it is not rubbing too hard against the ribs. If any of them are rubbing too hard, they should be taken out and re-checked with the gauge. Each time that a saw cylinder is changed for sharpening, the Linterman should turn it by hand and be sure it is running free in the ribs.

Constant changing of the Saw Cylinders for sharpening, which necessitates removing the Saw Cylinder Pulley, or Sheave, will eventually burr and damage the shaft unless particular care is taken in putting the pulley on and off. The pulley is generally key-seated to the shaft and the set screw, which comes down against the top of the key, will eventually swell or mark the key, to where it is difficult to get it into the keyway. This little difficulty is frequently overcome by driving the key in with a hammer, which finally results in damage to the pulley and the shaft. All of this trouble can be avoided, and the shaft and pulley kept in good condition, by simply filing the burr from the top of the key, as soon as it becomes difficult to insert into the keyway. Never drive the key into the key-seat or drive the pulley on to the shaft with a bar or hammer. If the pulley will not slide on easily, it should be removed and the shaft dressed with a file. A very light tapping with a small hammer, should be sufficient to insert the key.

If the above instructions are closely followed, the shaft of the Saw Cylinder, and the pulley, will remain in good condition for many years.

On the modern 141 and 176 Saw Linter, the location of the Saw Cylinder is fixed to assure the saws centering in the ribs, by means of a Dowel Pin in the base of one of the cylinder bearings. The Dowel Pin is definitely located in the Linter Girt at the factory, and as long as standard bearing housings are used, the Dowel hole in the base of the bearing will conform and the cylinder will automatically go in the proper place in the Linter.

There is a slight clearance around the Dowel Pin and inside the bearing case, which will allow approximately 1/32" endwise movement of the Saw Cylinder after it has been placed in the Linter. This is to allow for any minor inaccuracies. When the Saw Cylinder is placed in the Linter, the Gratefall should be lowered, before the bearings are tightened down, and the Cylinder turned by hand, to be sure it is running free in the ribs. If endwise adjustment is necessary, it will generally push itself into position, when the cylinder


CYLINDER COMP. LESS BOXES
-141 SAW-
-176 SAW-
L-1652
L-2831
L-1330
L-2832
L-2611-C
L-1785 DS
L-1784
L-1458D
L-1458C
L-1458B
L-1643
L-1693A
L-3164 COMP.(141)
L-3927 " (176)
L-1653 C (141)
L-1653E (176)
L-2610-D
L-1785CS
L-2834 (Used in L.H. Box after Apr. 15, 1943)
CYL. BOX COMP.(L.H.)
Free Box prev. to Apr. 15, 1943
Held Box after Apr. 15, 1943
CYL. BOX COMP.(R.H.)
Held Box prev. to Apr. 15, 1943
Free Box after Apr. 15, 1943
DUPLEX SAW CYLINDER
FIGURE NO.7
ANDERSON, CLAYTON & CO.

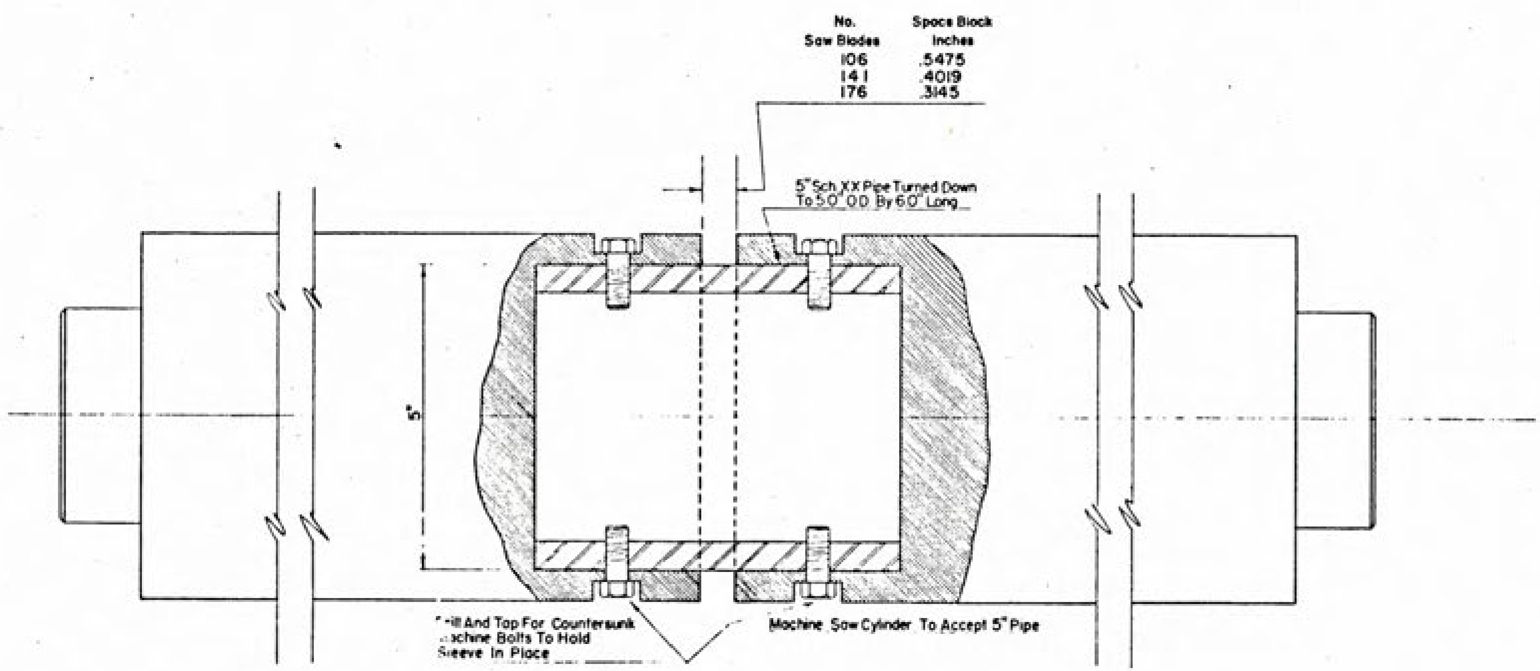
is turned by hand, but if necessary it should be tapped lightly on one end and centered. This can only be done within the limits of the above mentioned 1/32" clearance.

After making the above adjustments, and if the Saw is still pushed too far to one end and rubbing against the ribs, it is evident that something is wrong with the location of the Dowel Pin or with the Dowel hole in the base of the bearing. The first thing to do will be to check the bearing, and be sure it is properly located on the shaft and pulled up tight with the clamping nut, which holds the bearing on the shaft. After checking the bearing if the saw is still off center, there is a possibility that the frame of the Linter may be sprung and the Dowel Pin itself has been thrown out of position. On wood frame Linters, this can generally be remedied by loosening the four cap screws which hold the angle iron top rail to the top of the girts, and tapping the top rail in the proper endwise direction. By this means the entire Gratefall may be moved one way or the other, in order to get the proper spacing of the saw in the ribs. The steel frame Linter is equipped with adjusting screws for this purpose, the screws being incorporated in the adjustable butt hinge.

If it is ever necessary to install a Dowel Pin in a Linter Girt, it is advisable to use a factory made jig and fixture, but if this is not available, the job can be done by placing a Saw Cylinder in the Linter and drilling into the Girt through the Dowel Hole in the bearing. Special care must be taken in doing a job of this kind and a Saw Cylinder and bearing used which has been tested in another Linter. In order to drill down from the top side of the bearing the Dowel hole will have to be drilled all the way through the base so that the drill can be entered from the top side.

The system of using Dowel Pins for the Saw Cylinder bearings has been found helpful and beneficial and if properly handled, it assures you the saws will always run true in the ribs. However, it must be very carefully checked and the bearings properly installed on the shaft, or else it will do more harm than good.

The Saw Cylinders are generally handled to and from the Linter by means of two Cylinder Lifts (L.1798). The Cylinder Lift is mounted in a stud attached to the Linter Frame. These studs should be kept tight and in good condition so that the Lift will fit snugly and never shake loose causing the Cylinder to drop. In some poorly operated oil mills the Cylinder Lifts are sometime used to drive the saw pulleys on and off the cylinder. This is harmful both to the saw shaft, the pulley and the lift and this practice is never allowed in



REPAIRING BROKEN DUPLEX CYLINDER

FIGURE NO.8

an efficiently operated Lint Room. Most new mills are now equipped with overhead trolleys or Tram Rails, for handling cylinders to and from the Linters, which eliminates the use of the cylinder lift and eliminates manual handling of the heavy cylinders.

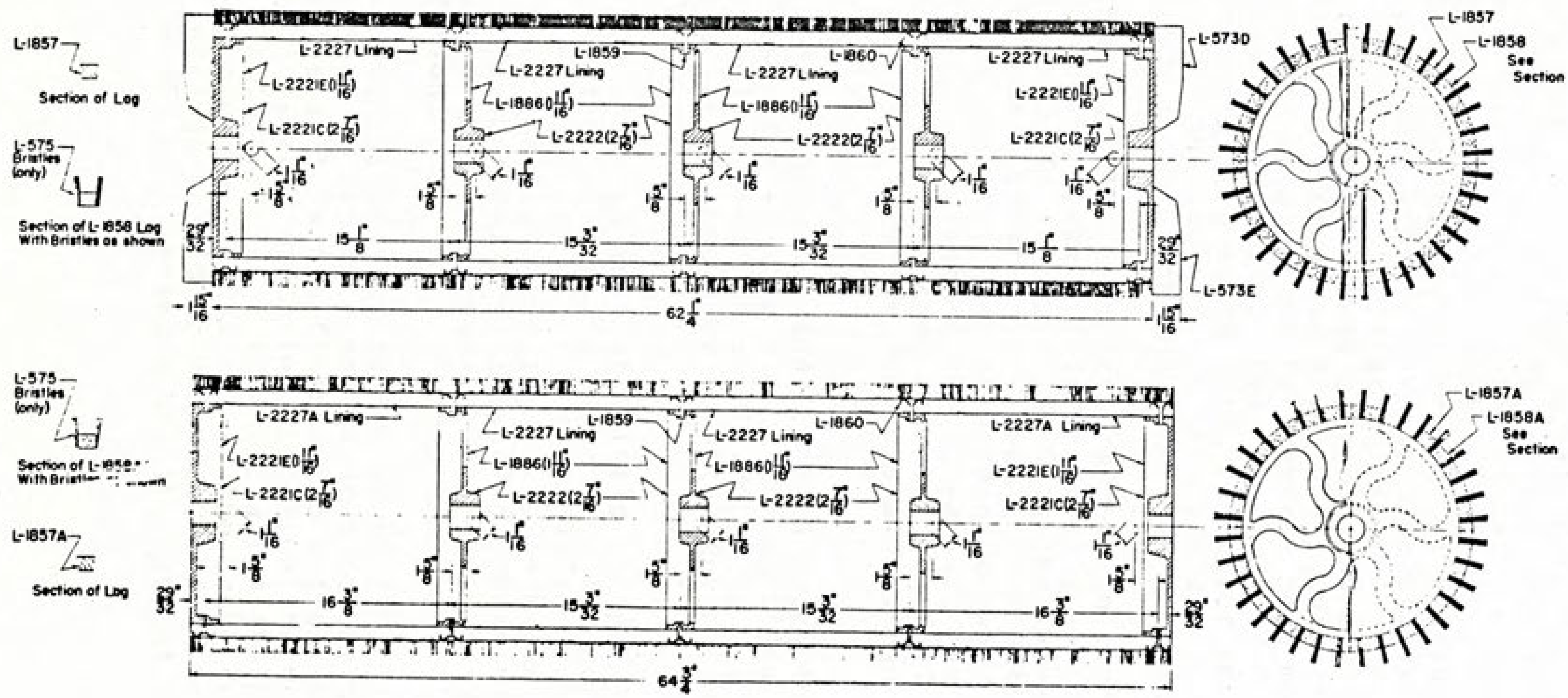
Whenever a Linter Saw becomes broken or damaged it should immediately be replaced. In order to take care of such emergencies and to be assured of an available supply of spare saws of the proper diameter, an ample number of extra saw cylinders should always be in circulation in the Lint Room.

THE LINTER BRUSH (Sketch #9) in the modern Linters, manufactured in recent years, is dust-proof, easy to keep in balance and with the exception of special care and attention to the bristle strips, requires very little maintenance. The cost of Linter Bristle strips will run into a considerable sum if they are not properly conserved and the following outlines briefly how to conserve them. (The setting of the bristle strip to the saw will be covered under another heading.)

The manufacturers now furnish two types of Bristle strips. The less expensive synthetic bristle and the better quality hog's hair bristle, costing about twice as much. The synthetic bristle sometimes tends to curl and hang up lint, but is usually satisfactory. With expert supervision, where the bristles can be conserved to the maximum, the hog hair is preferable, but where there is any question of neglect or carelessness the synthetic is recommended.

On a new Linter Brush the bristle strip projects approximately 15/16" above the lag, but when installing new bristles it is possible to trim them to exactly one inch projection, and in that way obtain some additional service from the bristle. With the brush adjusted as covered in Part #3 of these instructions, the bristle strip will last for several months without any further trimming or setting out. As the saw wears down and becomes smaller in diameter, the brush should, at regular intervals, be moved up.

This will eventually result in cutting notches in the bristles. The brush is designed for endwise adjustment, therefore, after the bristles have become cut out, move the brush endwise one way, using the uncut portion of the bristle strip; after this new section has become cut out, move the brush again in the opposite direction until the remaining unworn portion is working on the saw. These three settings should enable one to



BRUSH CYLINDER

FIGURE NO.9

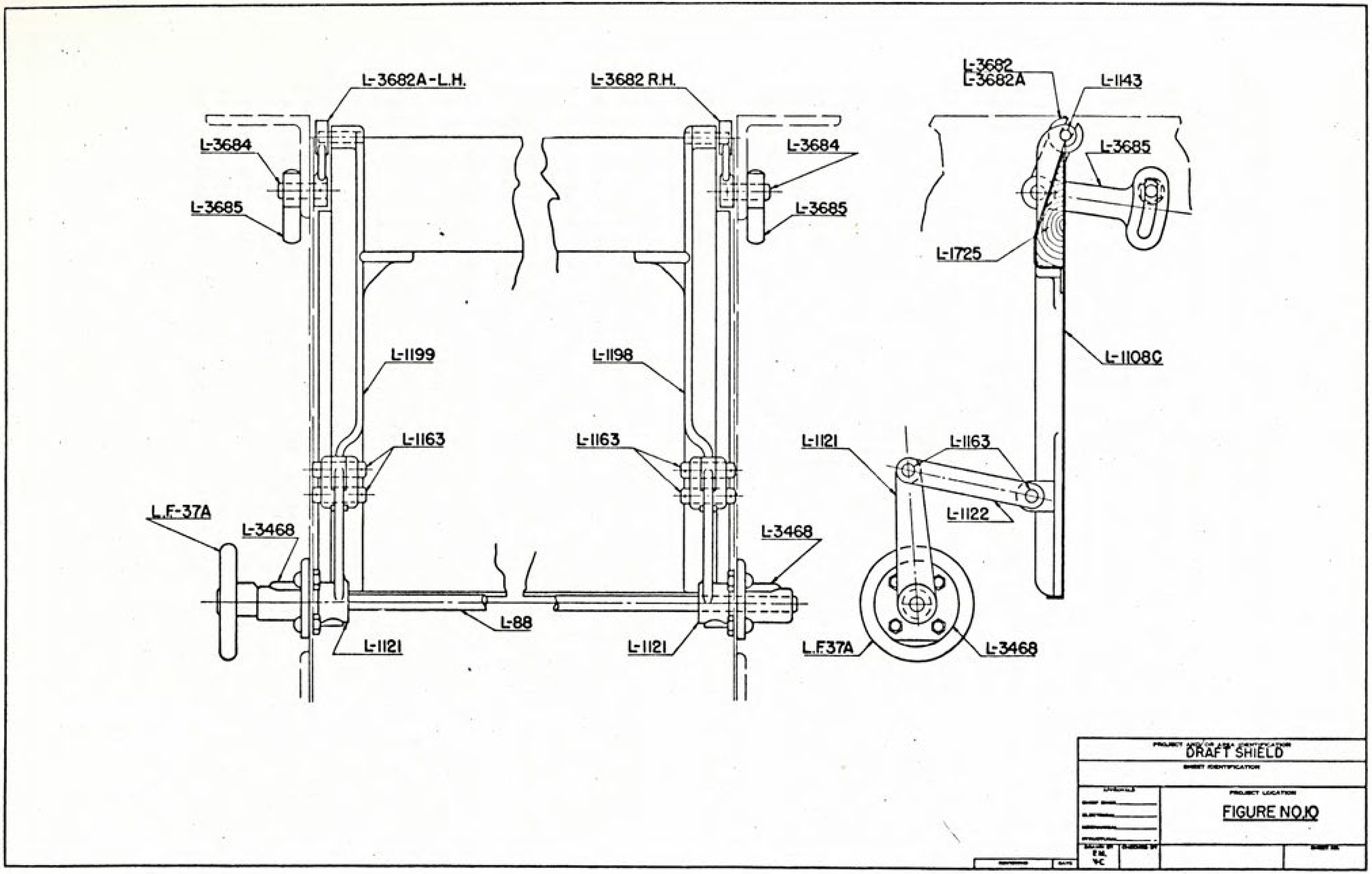
get very even wearing of the bristle strip. After several months of operation in this manner, the bristles will become notched and irregular and it is then advisable to trim them. If an electric bristle strip trimmer is available, it is a very simple matter to trim the bristles to the desired length, otherwise, the trimming must be done by hand, with a shear. If the brushes have been carefully handled, and the saws maintained at uniform diameters, the brushes will not be very irregular, and generally about 1/8" of trimming will be sufficient to give them a uniform surface. The brush can then be operated for several more months and again trimmed when necessary. Two trimmings of 1/8" each will bring the bristle down to 3/4" projection and they should not be cut any shorter, as this would reduce the volume of air from the brush and interfere with the moting.

After the brush has been trimmed down to approximately 3/4" the lags may be removed and the bristle strips taken off and moved out. It is possible, with the latest style brushes, to move the bristle strip out approximately 1/2"; however, if they have not been trimmed or damaged excessively, 3/8" will be sufficient to move them out, and it will then be possible to retrim them and obtain a full 1" projection. After this, the same trimming down operations can be repeated, as outlined above.

With careful attention, and never allowing the saw to cut too deep into the bristle strip, the bristles may be conserved for a long time and under proper conditions, a set of bristle strips should be operated for at least four or five years.

Aside from the high cost of bristle strips, it is important to keep the bristles in good condition for when the bristles become badly cut, it is difficult to properly adjust them to the Back lip Board and the Division Board, which will interfere with proper moting; it is also impossible to set the brush to the cylinder properly with the bristle strips in this condition.

After making adjustments to the brush it is important that the bearings be securely bolted down to the girt. On most Linters the girt is not finished to a true surface under the brush bearings and in bolting them down the bearings will frequently cock to one side and bind against the brush shaft. This should be closely watched and if the brush does not turn freely, the bearings should be examined, and if necessary a cardboard shim may be inserted under the base of the bearing,


L-3682A-L.H.
L-3682 R.H.
L-3682
L-3682A
L-1143
L-3684
L-3685
L-3684
L-3685
L-3685
L-1725
L-1199
L-1198
L-1108C
L-1163
L-1163
L-1121
L-1163
L-1122
L.F-37A
L-3468
L-3468
L-88
L-1121
L-1121
L.F.37A
L-3468
DRAFT SHIELD
FIGURE NO.10

in order to level it and prevent the housing rubbing the shaft. (See Sketch #4 of Brush Shaft.)

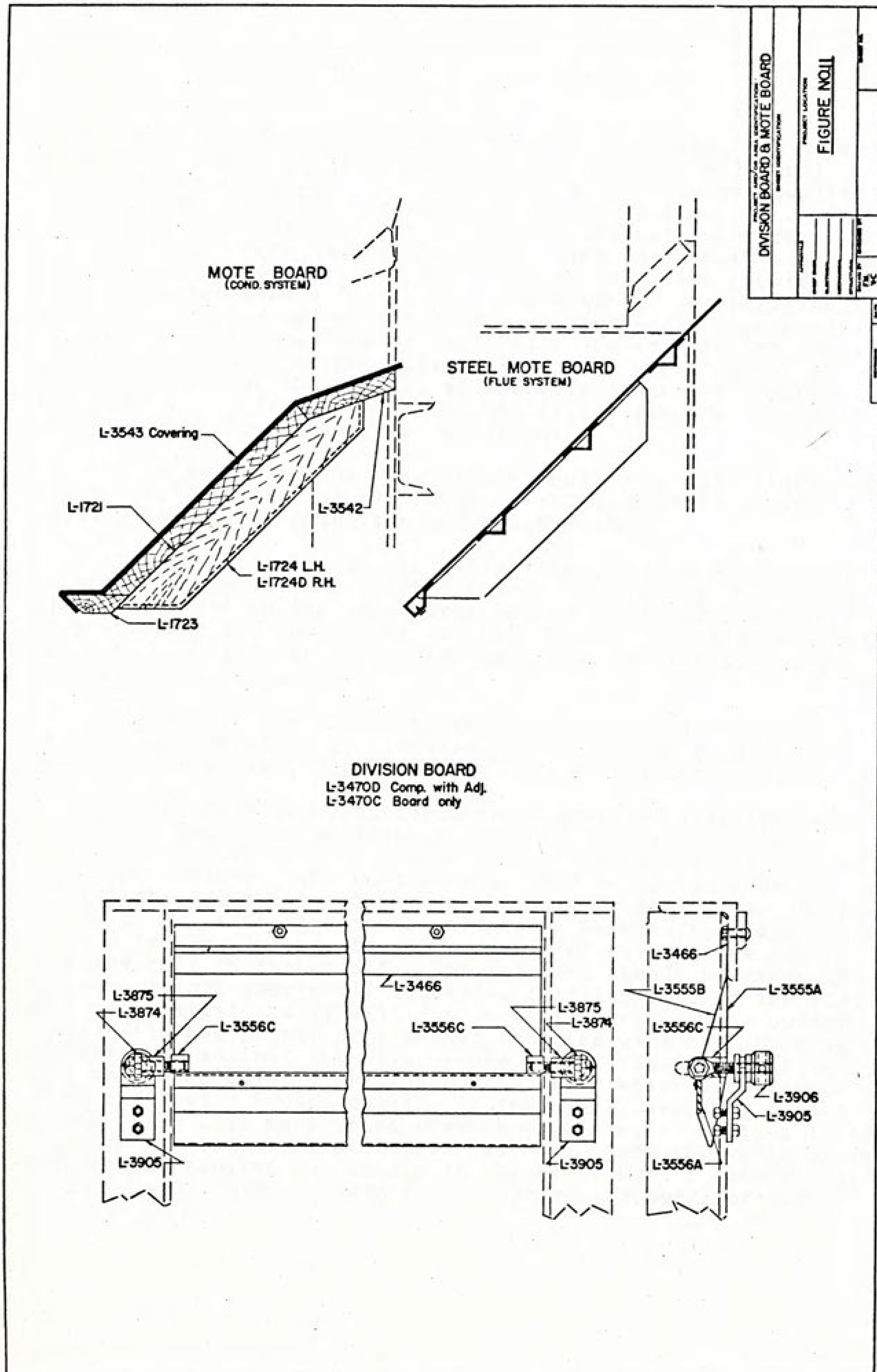
The latest Linter Brushes are always balanced before leaving the factory and the balancing weights are generally inserted on the under side of one of the brush lags. It is therefore necessary that the brush lags always be put back in their original place. Before removing the brush lags they should each be carefully numbered so that they may be put back in the proper place. If a brush should get out of balance it can generally be detected by the vibration of the machine, and it will then be necessary to put it in a balancing bar and rebalance it.

THE DRAFT SHIELD (Sketch #10) is rather fragile but ordinarily does not give any trouble unless accidentally adjusted too close to the saw, and becomes cut or bent. If the top edge of the Draft Shield is cut or bent, it should immediately be repaired or replaced or it will soon accumulate lint, and seriously interfere with the moting of the Linter. It is also important that the front surface of the Draft Shield be kept clean and free of rust, in order to prevent accumulation of lint.

It is also important that the adjustable mechanism of the Draft Shield be kept in good order so that it may be properly adjusted for good moting.

THE DIVISION BOARD AND MOTE BOARD are both covered with a sheet metal lining and it is desirable that they be kept clean and free of rust. The Division Board, if improperly adjusted, might be cut and damaged by the saw. Whenever this happens, the tin lining should immediately be replaced or it will accumulate lint and seriously interfere with the operation of the Linter. (Sketch #11).

MISCELLANEOUS MAINTENANCE AND REPAIRS can be taken care of by any fairly good mechanic. Most new mills and some of the old ones are now equipped with Individual Motor Drives, but for the benefit of those still operating Group drives we will offer a few suggestions for lining and leveling the Drive Shaft. The Drive Shaft, mounted on the back of the Linter, should be lined and levelled at regular intervals, and never allowed to vibrate and shake the Linter. After lining and levelling the "M" Shaft, if it still vibrates, the compression couplings should be checked as they are a frequent source of trouble, if not properly pulled up. Before assembling the compression coupling, the tapered sleeve should be rubbed with emery cloth so that the coupling will pull to-


DIVISION BOARD & MOTE BOARD
FIGURE NO.11
MOTE BOARD
(COND. SYSTEM)
L-3543 Covering
L-1721
L-3542
L-1724 L.H.
L-1724D R.H.
L-1723
STEEL MOTE BOARD
(FLUE SYSTEM)
DIVISION BOARD
L-3470D Comp. with Adj.
L-3470C Board only
L-3875
L-3874
L-3556C
L-3466
L-3905
L-3555B
L-3555A
L-3906
L-3556A

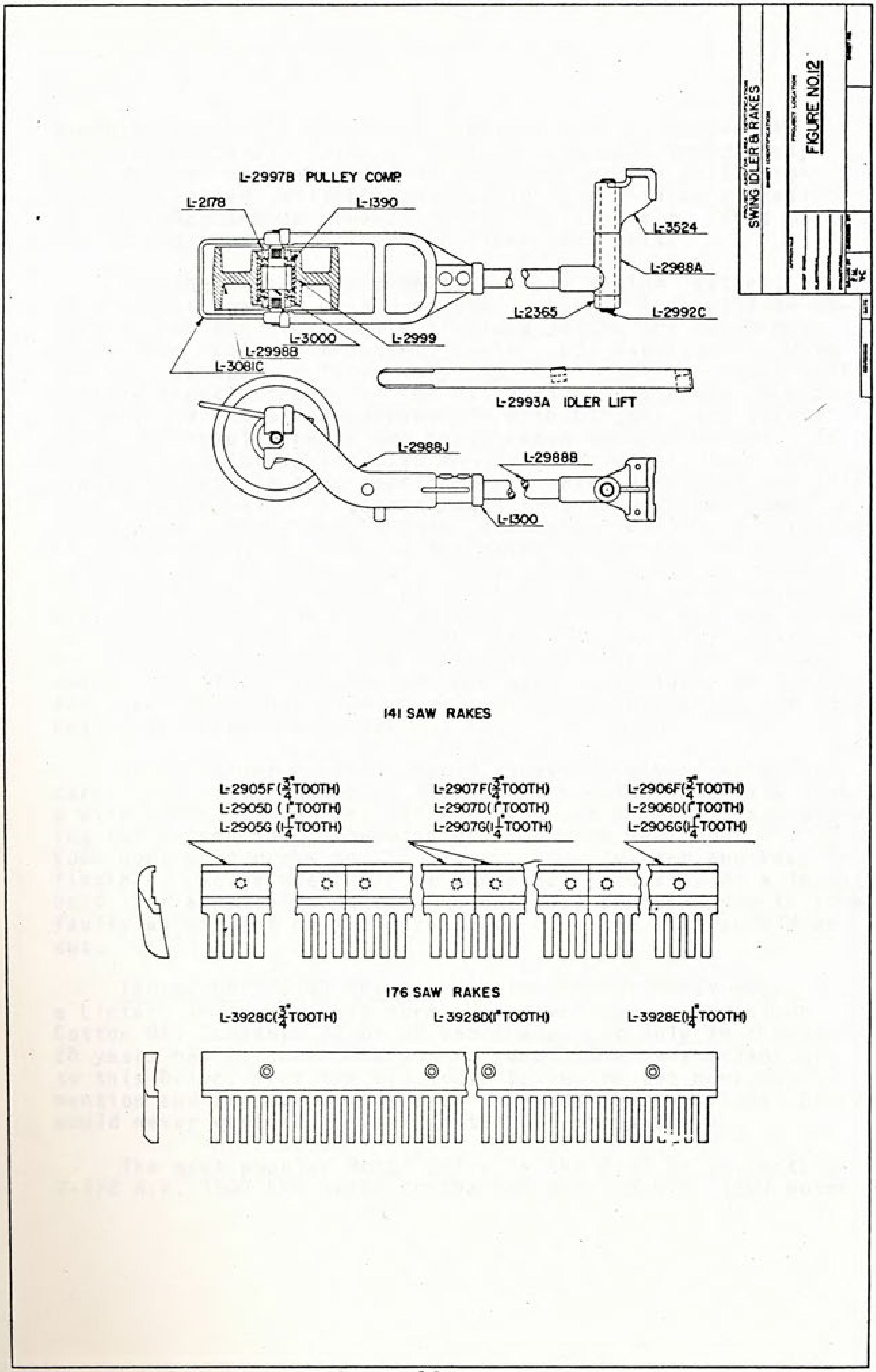
gether evenly. The bolts should then be tightened, a little at a time, and in rotation, so that the coupling will pull uniformly on all sides. In tightening a compression coupling it should be carefully centered, by holding a piece of chalk on a steady rest and placing it against the outside face of the coupling; then turning the shaft. The chalk mark will indicate the high side, and the bolts on this side should then be pulled down a little more. The centering operation should be started before the bolts are completely tightened, so they can all be pulled up uniformly. Do not tighten these compression couplings excessively and never use a hammer or long extension on the wrench, as there is danger of cracking the coupling. Firmly tightening the bolts with the standard coupling wrench, by hand, is sufficient.

It is important that the driving pulley be well tightened on the shaft so that it will never slip and that it always be exactly in line with the saw and brush pulley.

It is essential that the Swing Idler (Sketch #12) be kept in proper alignment and in good order. The Pulley Shaft should always be tight in the Idler Bracket and the Pivot Shaft kept in good order and lubricated so that it will not stick in the Pivot Box. The Idler pulley should always be in exact alignment with the saw pulley.

BELTING for the Linter is an item that should be given careful consideration and constant attention, as good drive belts and float belts are essential for efficient operation.

For the main drive on the Linters equipped with the Swing Idler a 6" 2-ply medium leather belt, of the best available quality, is recommended. The belt should be carefully spliced and glued endless. The belt should never be cut so short as to pull the Idler all the way up against the Saw Pulley. There should be at least four inches clearance between the Idler Pulley and the Saw Pulley, to allow space for raising the Idler when the belt is thrown off. Special care should be taken to have the joints absolutely square so that the edge of the belt will be straight and it will run perfectly true on the pulleys. A belt with bad joints or one that is laced will not run true and will rub against the Idler Frame. This causes excessive wear on the belt and vibration on the Idler which soon causes it to wear out. A good quality leather belt, properly maintained, will give many years service on a Linter. With a little practice the operators will soon learn to throw the belts on and off without causing any damage to the belt, but if this is not done properly there is danger of injuring the operator and


SWING IDLER & RAKES
FIGURE NO.12
L-2997B PULLEY COMP.
L-2178
L-1390
L-3524
L-2988A
L-2365
L-2992C
L-3000
L-2999
L-2988B
L-3081C
L-2993A IDLER LIFT
L-2988J
L-2988B
L-1300
141 SAW RAKES
L-2905F (3/4" TOOTH)
L-2905D (1" TOOTH)
L-2905G (1 1/4" TOOTH)
L-2907F (3/4" TOOTH)
L-2907D (1" TOOTH)
L-2907G (1 1/4" TOOTH)
L-2906F (3/4" TOOTH)
L-2906D (1" TOOTH)
L-2906G (1 1/4" TOOTH)
176 SAW RAKES
L-3928C (3/4" TOOTH)
L-3928D (1" TOOTH)
L-3928E (1 1/4" TOOTH)

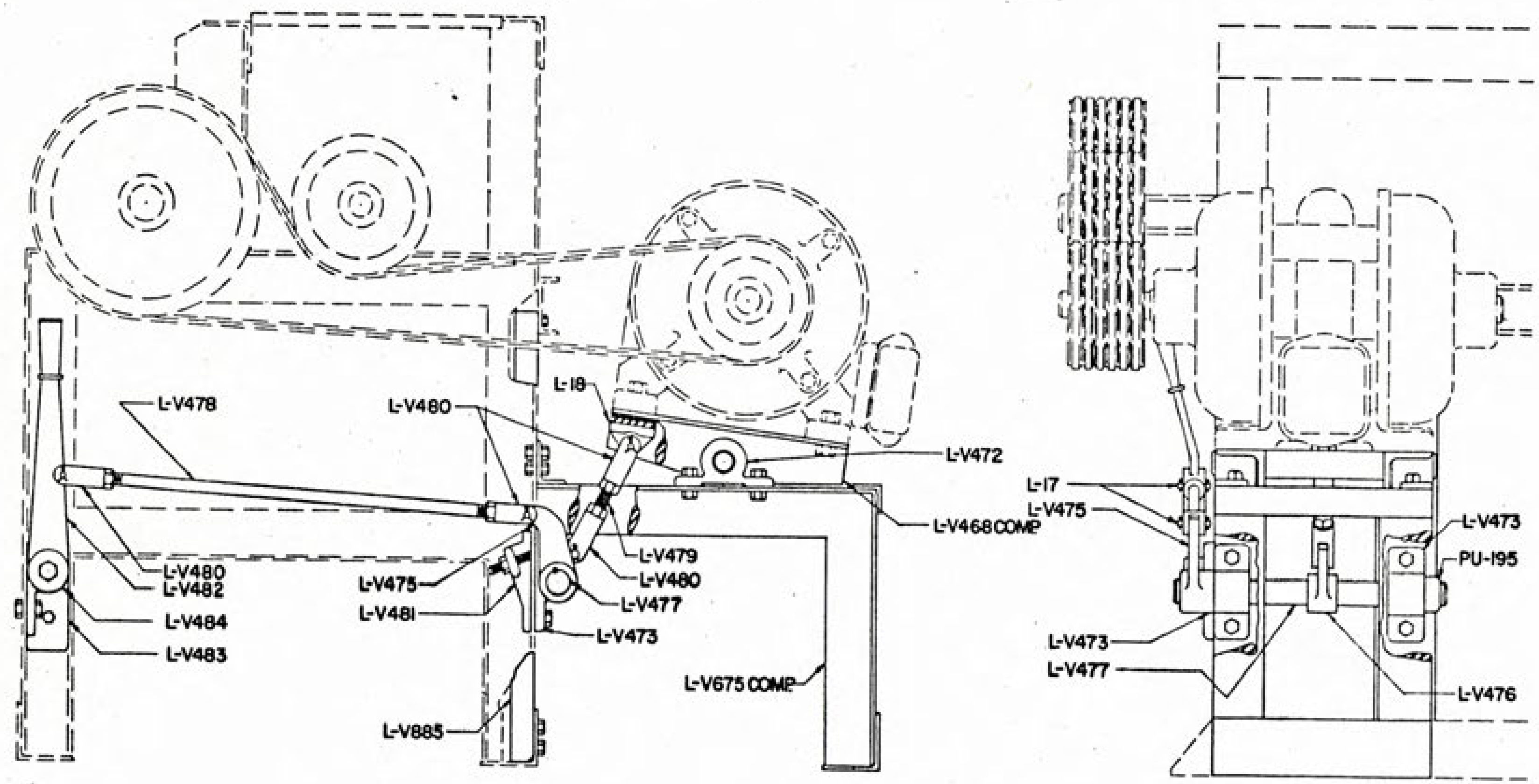
damaging the belt. The belt should always be thrown off with the Gratefall down, so that the saw will immediately stop and not wrap the belt in. A good quality belt, properly installed, will run absolutely true with no vibration of the Idler and no sideways motion of the belt. Some mills are having good success with endless cord belts.

For the Linter Float Belts a 2-ply medium leather, also of the best quality should be used. Longer life will be obtained from the Float Belts if glued joints are used; however, this requires frequent "taking up", particularly when the belt is new, as it is very important that the Float Belts be sufficiently tight. A few extra Float Belts may be kept on hand and installed temporarily with Clipper Lace joints, while the regular belts are being taken up or reworked. If Clipper Lace joints are used on the Float Belts, they should always be kept in good condition and never more than one joint used in each belt. A common fault around many Lint Rooms is loose Float Belts, and in some cases there will be a slippage of as much as 50%. This is not only hard on the belt, but causes a loss in production. Float Belts should be checked each day by the Linterman or the Belt man and taken up whenever necessary. The Float Belts should not be cut too short, as this will throw an excessive strain on the Float Shaft, and might even prevent the Gratefall from going all the way down. Adjustable V-belts are now used extensively on floats and are better than flat belts. Also see suggestion for float belt idler under Part #12.

Good leather belting should always be given the proper care. The belts should be cleaned at regular intervals with a wire brush, to remove lint and dirt and several times during the season they should be dressed with Neat Foot oil or some good belt dressing, to preserve the leather and keep it flexible. Never use resin or cheap belt dressing on a leather belt. If a belt is found slipping it is probably due to some faulty adjustment on the machine or else the belt should be cut.

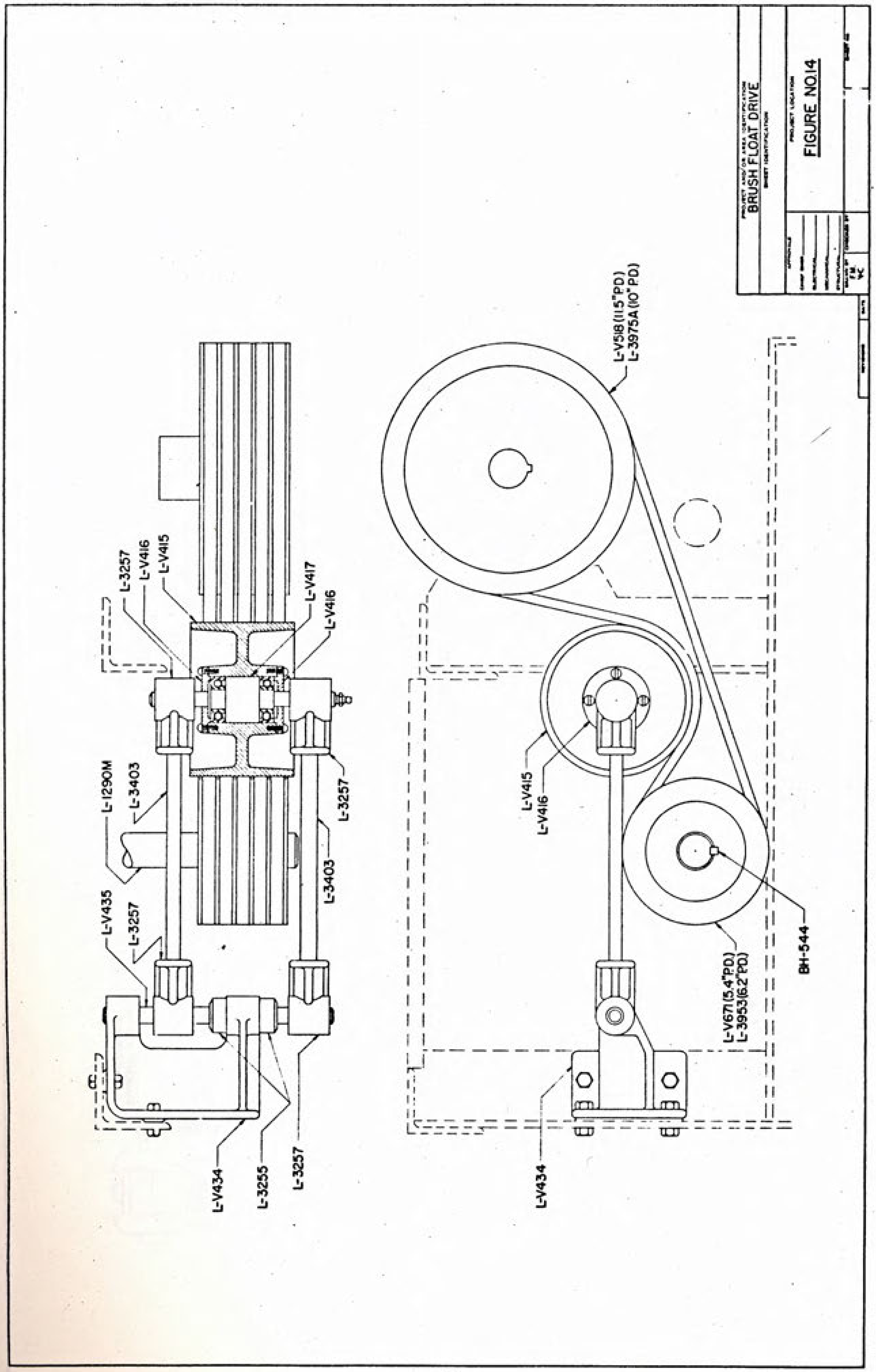
INDIVIDUAL MOTOR DRIVE. The Individual Motor Drive for a Linter, in its present form, was developed by Southland Cotton Oil Company, 30 or 35 years ago, but only in the past 20 years has it come into general use. The many advantages to this Drive, over the old Group Drive are too numerous to mention and anyone who has ever operated the Individual Drive would never want to go back to the Old Group Drive.

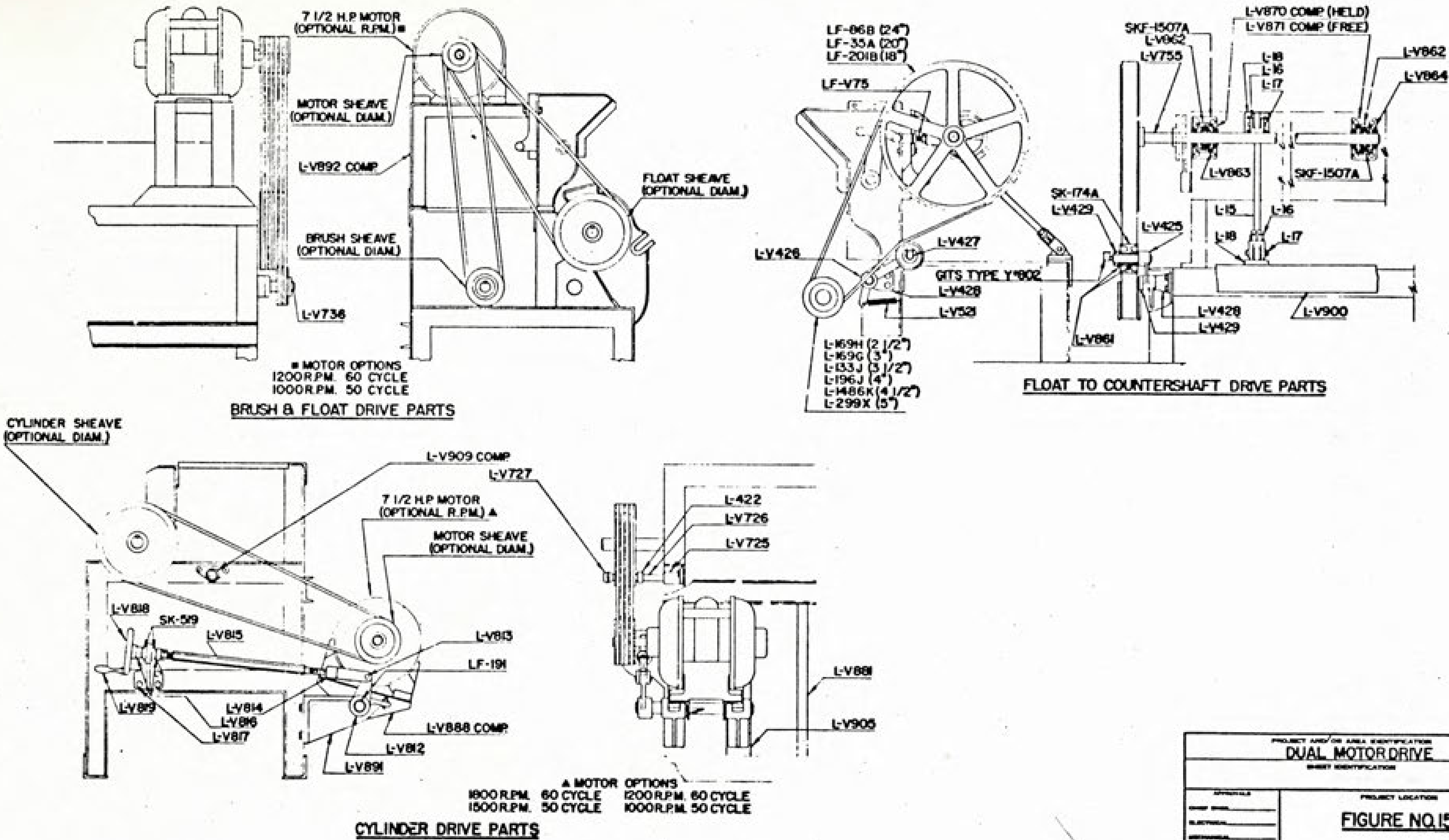
The most popular Motor Drive is the Dual Drive, with a 7-1/2 H.P. 1800 RPM motor on the saw and a 5 H.P. 1200 motor



INDIVIDUAL MOTOR DRIVE PARTS

FIGURE NO. 13

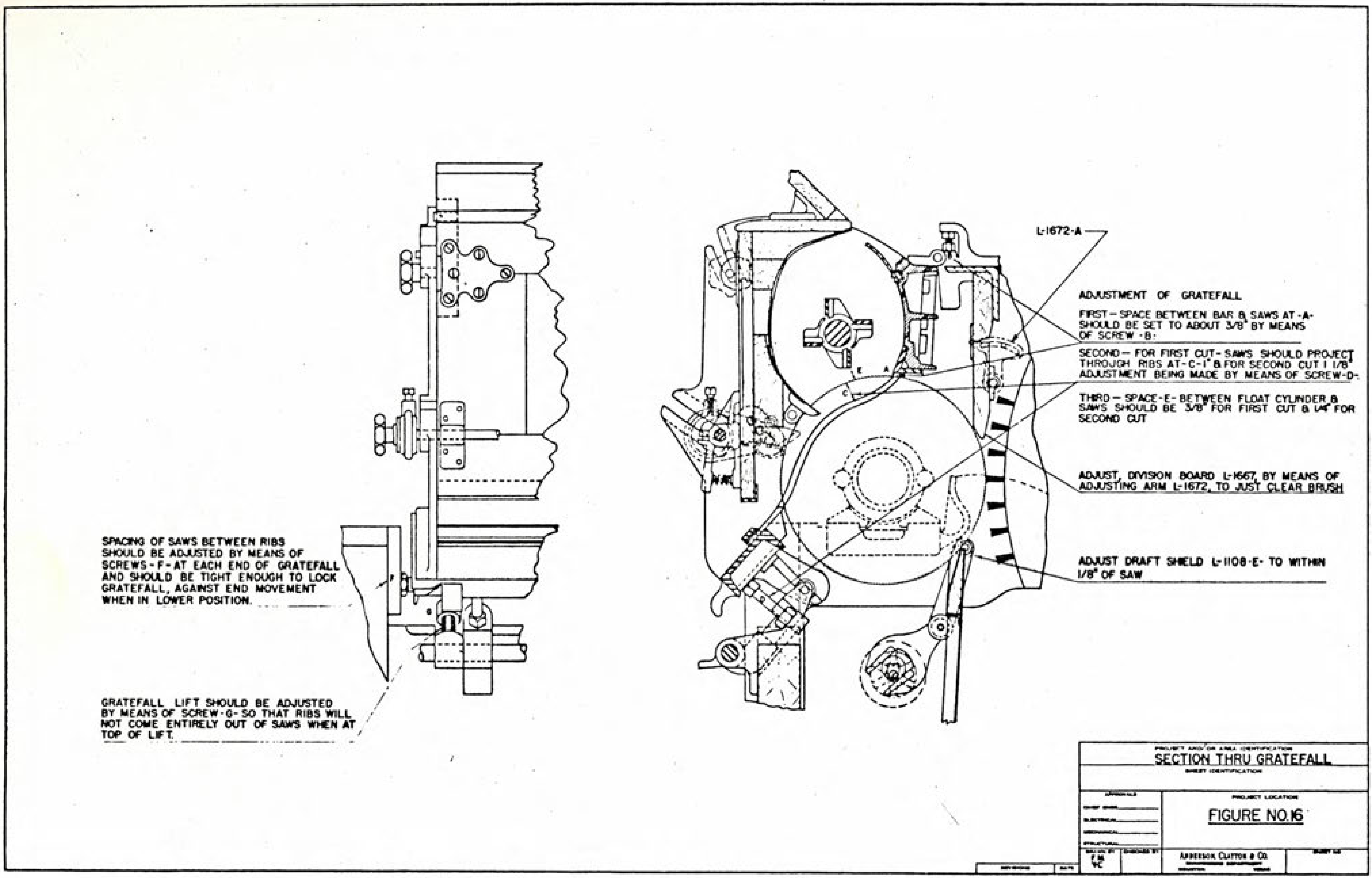

BRUSH FLOAT DRIVE
FIGURE NO.14
L-V518 (11.5"PD)
L-3975A (10"PD)
L-3257
L-V416
L-V415
L-V417
L-V416
L-1290M
L-3403
L-3257
L-3403
L-V435
L-3257
L-V434
L-3255
L-3257
L-V415
L-V416
BH-544
L-V671 (5.4"PD)
L-3953 (6.2"PD)
L-V434



DUAL MOTOR DRIVE

FIGURE NO.15

to the float. Many of the earlier installations used a 15 H.P. motor to the saw and brush, with serpentine belt, and a V-Belt Drive with Idler from Brush Shaft to Float. See Sketch #13 and #14 for Single Motor Drive and Sketch #15 for Dual Motor Drive.


L-1672-A
ADJUSTMENT OF GRATEFALL
FIRST – SPACE BETWEEN BAR & SAWS AT -A- SHOULD BE SET TO ABOUT 3/8" BY MEANS OF SCREW -B-
SECOND – FOR FIRST CUT - SAWS SHOULD PROJECT THROUGH RIBS AT-C-1" & FOR SECOND CUT 1 1/8" ADJUSTMENT BEING MADE BY MEANS OF SCREW-D-
THIRD – SPACE-E- BETWEEN FLOAT CYLINDER & SAWS SHOULD BE 3/8" FOR FIRST CUT & 1/4" FOR SECOND CUT
ADJUST, DIVISION BOARD L-1667, BY MEANS OF ADJUSTING ARM L-1672, TO JUST CLEAR BRUSH
ADJUST DRAFT SHIELD L-1108-E- TO WITHIN 1/8" OF SAW
SPACING OF SAWS BETWEEN RIBS SHOULD BE ADJUSTED BY MEANS OF SCREWS-F-AT EACH END OF GRATEFALL AND SHOULD BE TIGHT ENOUGH TO LOCK GRATEFALL, AGAINST END MOVEMENT WHEN IN LOWER POSITION.
GRATEFALL LIFT SHOULD BE ADJUSTED BY MEANS OF SCREW-G-SO THAT RIBS WILL NOT COME ENTIRELY OUT OF SAWS WHEN AT TOP OF LIFT.
SECTION THRU GRATEFALL
FIGURE NO.16
ANDERSON, CLAYTON & CO.

PART #3

Setting and Adjusting the Linters

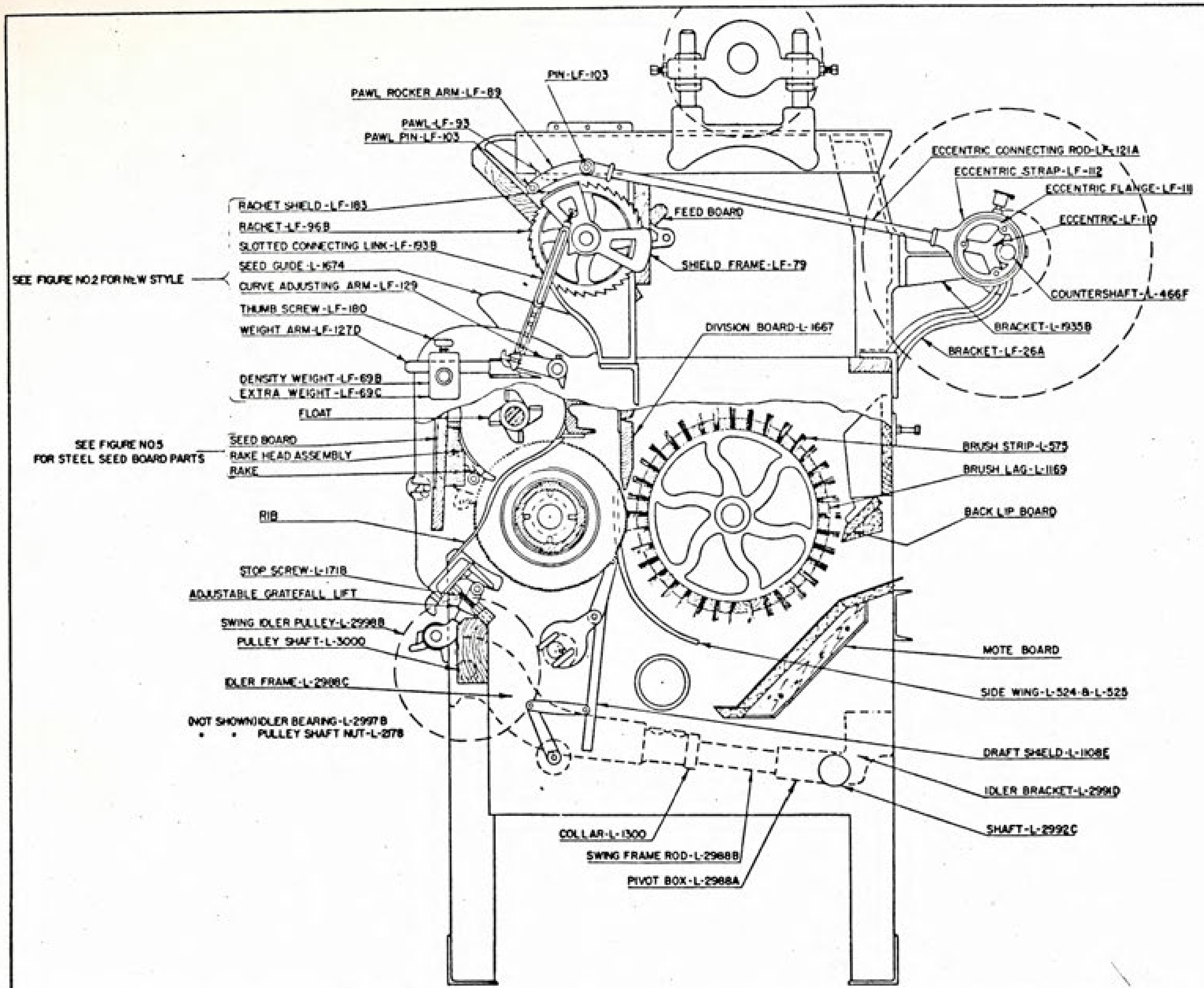
The various adjustments on the Linter are primarily to compensate for wear on the saws and allow the machine to continue operating efficiently as the diameter of the saws decreases. The principal adjustments are concerned with the location of the Gratefall with respect to the saw and other parts that are affected by these adjustments.

A cross section of the Gratefall is shown on Sketch #16, which also indicates the principal adjustments and how they should be made. Sketch #17 shows a cross section of the Linter and the names of the various parts have been indicated so there will be no misunderstanding as to the parts referred to in these instructions.

Sketch #17 also indicates some of the catalogue numbers of parts, particularly on the Feeder and the Swing Idler, for convenience in ordering replacements.

The first step in adjusting the Gratefall, is with the adjusting screw "B" (see Sketch #16), which takes care of the up and down adjustment at the top of the Gratefall by means of the adjustable butt hinge, which supports the top of the Gratefall from the top rail. On both first and second cut Linters, this first adjustment is the same, and there should be a clearance of approximately 1/4" to 3/8" between the top of the saw and the wear-strip, or bar, at Point A on the sketch. This clearance may be varied between the above limits but it is very important that it be exactly the same on each end of the Linter.

The second step is to adjust the Gratefall at the bottom, to get the proper projection of saw through the rib, and this is accomplished by means of the adjustable stop screw "D". On Sketch #16 the projection of saw through the rib is indicated at Point "C" as one inch for a first cut linter. This refers to average conditions and in some cases it might be desirable to deviate one way or the other from the average. For instance, if it is desired to produce a low yield of first-cut lint, and the machines are not crowded, it will be entirely satisfactory for the saw to project about 7/8" through the rib. On the other hand if it is desired to produce a heavy first-cut lint, and force the machine to its maximum capacity, it might be desirable for the saw to project as much as 1-1/8" through the rib; this, in most cases, will lower the quality of the lint, but will give a slight increase in capacity.



NOTE–
SEE INDIVIDUAL DETAILS FOR NEW STYLE LINTER PART NUMBERS.

CROSS SECTION THRU LINTER

FIGURE NO.17

F.M.
W.C.

For a second cut linter the projection of saw through the rib is indicated as 1-1/8" and this also applies to average conditions. When necessary to force the machine to its maximum capacity, it is sometimes desirable to increase this projection slightly.

In adjusting the Gratefall it will be helpful to use a wooden gauge. This gauge can be made from a piece of wood approximately 1/4" thick, so that it will slip between the saws, and of a width to correspond with the projection of saw desired. This gauge can be slipped between the saws and the Gratefall adjusted up or down, until the edge of the gauge is flush with the top of the saw. The gauge should be inserted at several points in order to be sure that it has not been placed on a low rib.

After the Gratefall has been adjusted, as outlined above, it can be rechecked by gauging the space "E" between the top of the saw and the Float Bar. This space should vary in proportion to the amount of saw through the rib, provided the float bars are straight, and should be exactly the same on each end. The space "E", between the float and the saw, should never be less than 3/16" on a second cut Linter, or there will be excessive hulling of seed, for most types of seed 1/4" is satisfactory. For a first cut Linter the space "E" should be approximately 3/8" and never less than 5/16".

After making the above adjustments, the Gratefall should be inspected to see if the saws are central between the ribs at the bottom. This may be regulated by the adjusting screw "F", which serves as a guide for the bottom of the Gratefall, and also gives it a slight endwise adjustment. By means of this adjustment the saws may be centered between the ribs at the bottom.

The purpose of the adjustment on the Gratefall Lift "F", is to prevent the ribs from lifting completely out of the saw when the Gratefall is in a raised position. If it were not for this adjustment, after the saws wore down to a smaller diameter, the Gratefall would lift completely out of the saws and if any of the saws were slightly bent, they would not re-enter the ribs when the Gratefall was lowered. This would cause considerable damage when the saws were running. As the saws wear down in diameter, the adjustable Gratefall Lift should be gradually shortened, so that the ribs will never lift completely out of the saws.

The next step is to adjust the brush to the saw; on a first cut linter the brush should be set so that the bristles lap the saws the depth of the saw tooth; that is enough to enable the bristles to remove the lint from the saw teeth and not enough to allow the teeth to cut into the bristles too deeply. Second cut lint is not quite so difficult for the brush to remove from the tooth and therefore, on a second cut Linter, the bristles should lap the saw to approximately one-half the depth of the saw tooth.

There are some who contend it is not necessary for the bristles to lap the tooth at all, and that they should barely touch the tip of the saw tooth. Theoretically, this might be true, but in actual practice, the bristles will not be cut in an absolutely straight line and it is therefore better that they lap slightly, in order to be sure they will contact on all saws.

After the saw wears down to where it has as much as 1/8" clearance from the bristle, the lint will not be completely removed from the saw tooth, and the Linter will not operate efficiently.

The reason for recommending a greater lap on a first cut Linter, is that the longer fiber is more difficult to remove from the saw tooth, and even if the bristle is cut out to the depth of the tooth, the additional lapping on the sides is helpful, in removing the longer fibers from the throat of the tooth.

After making the above adjustments to the saw and brush, the Division Board should be adjusted as shown on Sketch #16 to conform to the new location of the brush. The Division Board should be moved by means of the adjusting arm until it barely clears the bristle strips. In actual practice, there is very little clearance for the Division Board between the bristle and the saw tooth, particularly with a new saw, and therefore, when the Division Board is set to barely clear the bristle strip it will, at the same time, barely clear the saw. This setting should be carefully checked to be sure that the front side of the board does not touch the saw. It should also be checked on both ends, to be sure that it is parallel with the saw cylinder, and if it should be out of line, and touching one end, it may be lined up by adjusting one of the eccentrics that control the movement of the board.

After moving the brush forward to the saw, the Back Lip Board (shown on Sketch #12) should be moved forward to barely clear the bristle strip. It is very important that the Back Lip Board be adjusted very carefully for if it touches the bristles, it will pound and hammer when the brush is running, but if the clearance exceeds 1/16" it will break the air seal, at the back of the brush, and lint will be carried around by the brush. This will cut down on the capacity and interfere with the moting.

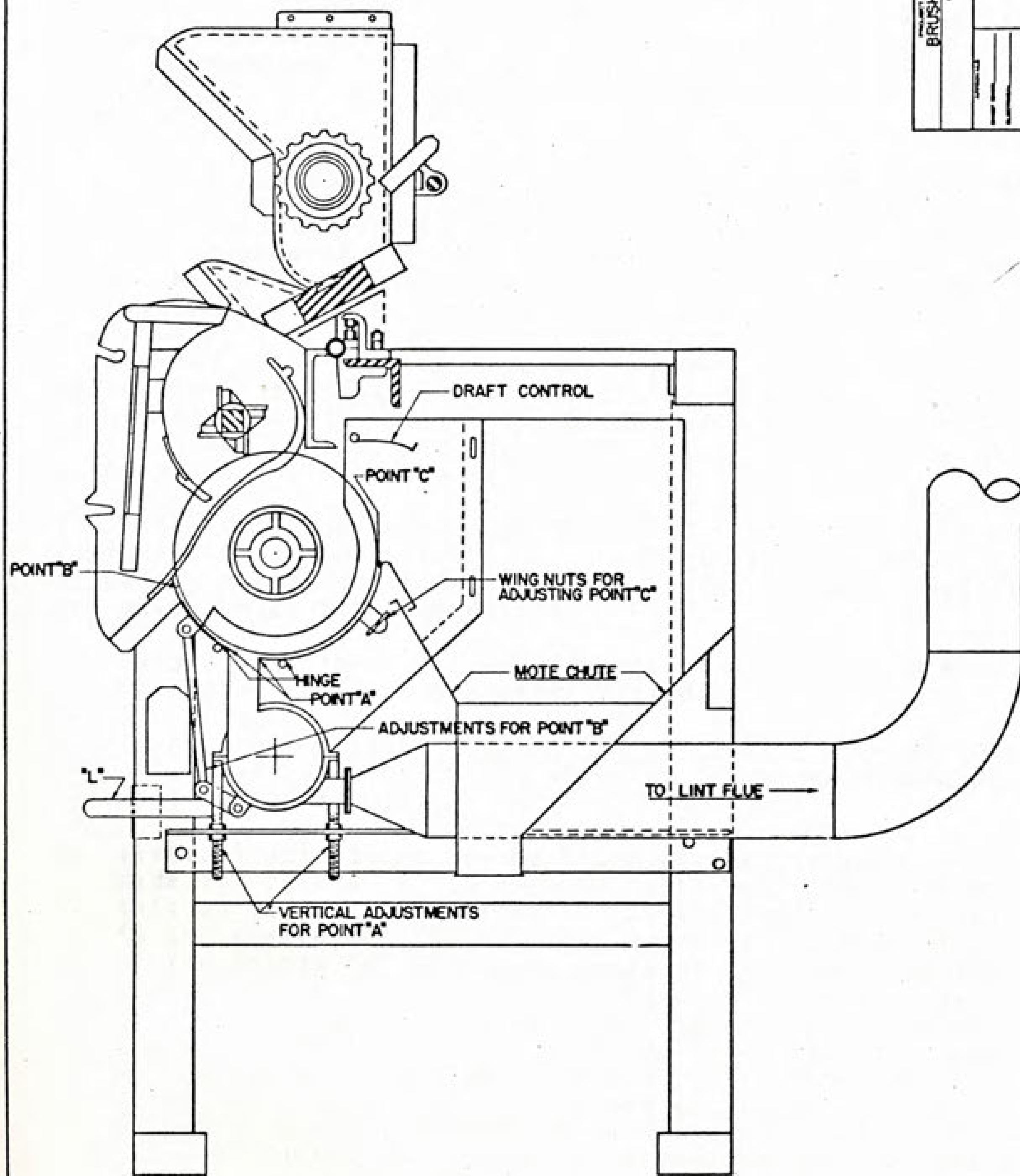
As the saw diminishes in diameter, the Draft Shield should be adjusted forward to clear the saw tooth by approximately 1/8" as shown on Sketch #16. If it is adjusted closer than 1/8" there is danger of vibration causing it to strike the saw tooth. The top edge of this Draft Shield should always be smooth and straight so that it will not accumulate lint.

The bottom of the Draft Shield may be adjusted while the machine is running, and this adjustment controls the moting of the Linter. Under ordinary operating conditions the bottom of the Draft Shield should be adjusted to within five or six inches of the lip of the Mote Board. Moving it closer to the Mote Board increases the velocity of the air going to the brush and decreases the moting. Moving it further away from the lip of the Mote Board reduces the velocity of the air and increases the moting. Ordinarily with the Draft Shield set within five inches of the lip of the Mote Board there will be a good moting action, which will pick up all lint and drop out motes and heavy trash. If it is found necessary to adjust the Draft Shield closer than five inches, to prevent dropping lint, there is evidently something wrong with the other adjustments, or with the lint flue system.

The Mote Board shown on Sketch #17 and #11, is rigidly installed in the Linter and no adjustment is necessary.

The side wings (L-524 and L-525) shown on Sketch #17 are also rigidly fastened in the machine and no adjustment is necessary. However, they should be frequently checked, particularly at the top, to see that they have not been mashed against the bristles when changing saws. The upper part of the side wings, just under the Division Board, should clear the bristles at least 1/2"; if they are bent in, against the bristles, it will cause the brush to blow down on the ends. These side wings should be inspected by the Linterman each time a saw is changed, and straightened when necessary.

The necessity and the time for making the above adjustments will depend entirely upon the saw filing schedule, which directly affects the life of the saw and the rate that its diameter will decrease. Under average saw sharpening conditions, there would hardly be enough change in the saw diameter to require moving the brush, or adjusting the Gratefall, more than every two weeks. A system should be arranged so that a certain number of linters may be inspected and adjusted at least every two or three



BRUSHLESS ATTACHMENT

FIGURE NO. 18

weeks. In this way, there will be no danger of a saw getting too far away from the brush.

In some of the most efficiently operated Lint Rooms, it is customary to make a quick inspection of all adjustments and settings each time the saw is changed, and corrections made as required; in this way there is no doubt about proper adjustments, and efficient operation can be expected at all times.

<u>THE FORT WORTH BRUSHLESS ATTACHMENT</u>. Sketch #18, showing a cross section of a linter, will clearly illustrate the principle of this device, which eliminates the brush. The design of this attachment utilizes the principle of "overhead moting" in which the trash and other foreign matter is thrown tangentially back from the saws and quickly separated from the lint. The "moting", or amount of lint passing out with the trash, is controlled altogether by adjusting the valve back of the linter, which controls the volume of air from each machine. This device, in addition to eliminating the brush, also eliminates the mote board, draft shield, division board and back lip board, and the necessary adjustment and maintenance of these items.

With the Brushless attachment, it is necessary to make occasional simple adjustments to compensate for saw wear. These adjusting points are illustrated on Sketch #18 and directions are given below for each point:

1. Before attempting the adjustments, the seed board should be removed and the Gratefall raised.

2. Lower front shield at point "B" by pushing down on lever "L"; move back the shield at point "C" after loosening the wing nuts indicated.

3. Vertical adjustment of the brushless device may now be made for points "A" to compensate for saw wear. In making this adjustment, the front and back threaded rods indicated in the sketch must be moved up together, as otherwise one of the points "A" will move ahead of the other and too much inequality in the movement of these points may cause distortion and damage. The clearnace between the points of the saw teeth and points "A", directly below the saw, should be be between 5/16" and 3/8"; this may best be established by inserting a gauge made of a piece of leather belting of the proper thickness, between the saw cylinder and the lips "A". Of course the points "A" should be the same distance from the points of the saw teeth at both ends of the linter and all the way across.

4. Adjustment "B" should be made only after the front shield has been "squared up" or trammed with respect to the saw cylinder. This is done by lengthening or shortening the tie-rods between lever "L" and the front shield. After this is done, with the Gratefall and lever "L" both in running position, the front shield should seal against the bottom rail of the Gratefall. If it does not, the extension lip of the shield should be set out to reach the Gratefall. If further adjustment is required to make the front shield seal against the bottom rail, this may be done by adjusting all the tie-rods, previously mentioned, or preferably by changing the position of lever "L" on its shaft, to which it is set-screwed. With adjustment "B" completed, the clearance at this point between the shield and saw teeth, in running position, should be 5/16" to 3/8".

5. Adjustment "C" is made simply by moving the back shield to within 5/16" to 3/8" of the saw teeth at point "C" and securing in place with the wing nuts indicated. The gauge used for points "A" should be used for "C".

6. When adjustments are completed, lower the Gratefall carefully and check to see that it lowers freely, and turn saw shaft by hand before placing the machine in operation.

The curve indicated in the sketch as "Draft Control" should usually be placed about as shown. Lowering this curve can easily result in deflecting heavy particles of trash back into the saw cylinder and the suction nozzle which carries the lint away from the machine. For this reason, most mills have removed this curve altogether, with no adverse results. Latest models do not include this curve.

In installing the brushless attachment on steel frame linters with new saws, it is found that the adjustable Gratefall lift lever (part number 731B in the catalogue) when pushed inward prior to removal of the saw cylinder, will not lean over far enough for the front shield of the brushless device to retract sufficiently to permit removal of the saw cylinder without some difficulty. <u>To correct this, the steel front rail on the linter should be notched with a cutting torch until the lift lever will lean over sufficiently</u>.

<u>DAVIS MOTING SLOT</u>. The Davis Moting Slot illustrated on Sketch #19 is an improvement developed and patented by Anderson Clayton's California organization for the Ft. Worth Brushless Attachment. This Slot renders a big improvement in moting out fine trash not removed by the overhead moting. New Brushless Attachments furnished Anderson, Clayton & Co. from Ft. Worth

DAVIS MOTING SLOT

FIGURE NO.19

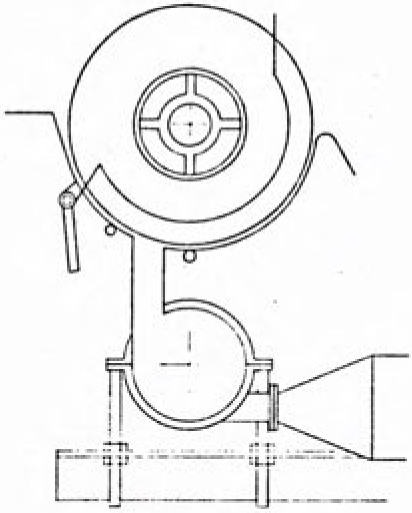


FIGURE "A"

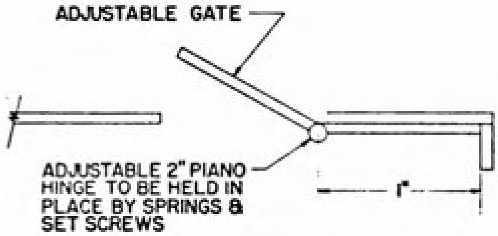


FIGURE "B"

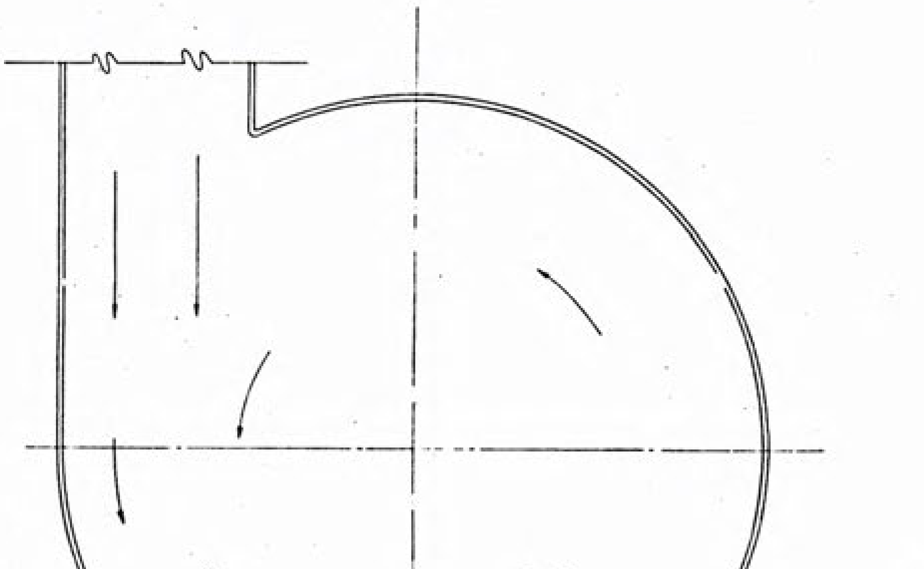
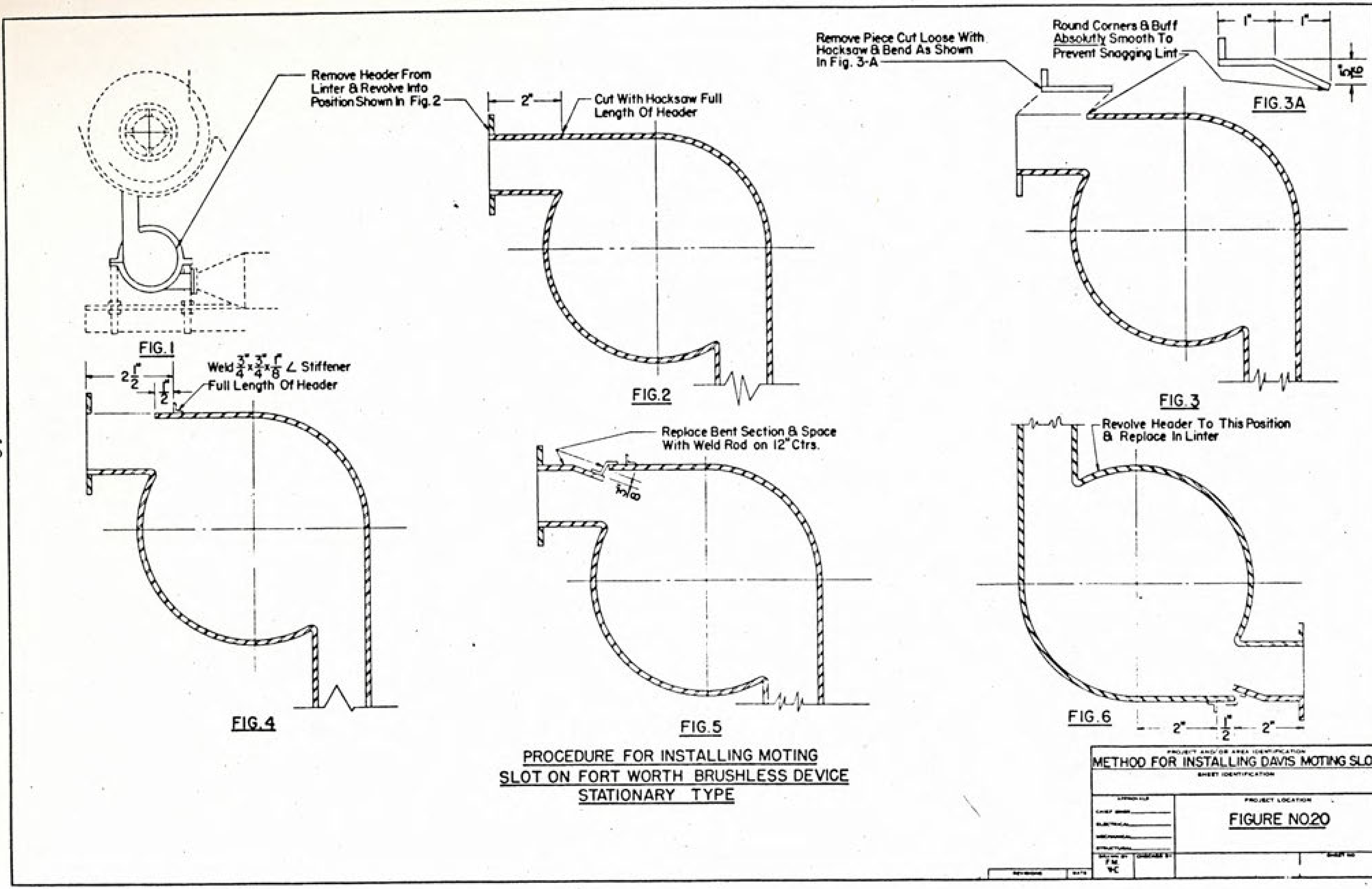


FIGURE "C"
HINGED TYPE



PROCEDURE FOR INSTALLING MOTING
SLOT ON FORT WORTH BRUSHLESS DEVICE
STATIONARY TYPE

Steel and Machinery Company are equipped with the Moting Slot. Old model Brushless Attachments may be modified and the Slot installed in accordance with Sketch #20, but permission should be obtained from Anderson Clayton.

Instructions for adjusting and operating the Carver Pneumatic Device may be obtained from the manufacturer.

Either the Carver or Fort Worth Brushless Device is highly recommended for second or third cut linters but they have not been successful on first cut or mill run.

PART #4

Regulating and Operating the Linters

Before giving any instructions for regulating the Linters for efficient operation, it must be assumed that they have been properly set and adjusted as outlined in Part #3 of these instructions, and that they are in good mechanical condition, in accordance with Part #2. If these instructions have not been carried out, it will be difficult to regulate the Linters and impossible to operate them efficiently.

It must be clearly understood that "Regulating the Linter" refers only to the adjustments that control the "Cut" (yield of lint per ton) tonnage, or tons of seed per day passing through the machine, and lint quality.

The "cut" is controlled entirely by adjusting the Breast (seed board) in or out. As the space between the rake and the rib is increased, by opening the Breast, the seed pass out more rapidly and less lint is removed. Sketch #17 shows the Breast in the extreme closed position, in which the seed will be held in the roll until almost completely delinted; the cut will be a maximum and the tonnage will be correspondingly small.

It will be noted from the above, that adjusting the Breast in or out, not only raises or lowers the cut, but at the same time decreases or increases the seed tonnage. A poorly informed Linterman, will unfortunately take advantage of this, and control the flow of seed through the Lint Room by constantly changing the seed board adjustment. This method of operation is inefficient and expensive; it results in various grades of lint being produced, a lower average production, and due to the constantly changing cut, it is impossible to control the protein in cake.

For efficient operation, the breast should be set for the desired cut, a record made of the exact setting, and never changed, until orders are issued for changing the lint yield. From time to time it might be necessary to make slight changes in the tonnage, to compensate for the different types of seed and fluctuations in the load, but these changes should always be made by adjusting the Roll Density.

The Roll Density controls the capacity of the Linter, and as long as the breast remains at a fixed setting, it controls only the tonnage. With the standard Density Regulating Mechanism, which has been used on all types of Linters for many years, the Roll Density not only depends upon but actually controls the rate of flow from the feeder, and the Regulating Mechanism may be adjusted to produce the desired Roll Density, which in turn, controls the tonnage passing through the Linter.

There are several ways of adjusting the Density Regulating Mechanism, and if all Lintermen realized the importance of this Mechanism and its effect on the operation of the machine, and knew exactly how to make these adjustments, there would be more efficiently operated Lint Rooms. To illustrate the importance of this mechanism, it can be easily changed one way or the other, so that the capacity of the machine will be increased or decreased as much as 50%.

The Density Regulator is a very simple mechanism and its operation will be clearly understood by referring to Sketch #17. The maximum rate of feed will of course depend upon the speed of the Countershaft which drives the eccentric, and also upon the adjustment of the feed board, which controls the opening in the back of the feeder; these things must be predetermined to suit the capacity of the machine. For instance, on a first cut Linter, which must usually handle more tonnage than a second cut, the Countershaft will run faster and the feed board will be adjusted for maximum opening. The Speed of the eccentric and the setting of the feed board must be arranged to take care of maximum tonnage, and a little to spare; then the Density Regulator can be adjusted to regulate the flow anywhere from the maximum on down to practically no flow at all. When the roll box is empty, or if the roll is very loose, the Density weight will drop to its lowest position, thereby pulling the Ratchet Shield forward, allowing the Pawl to contact several teeth on the ratchet wheel; at such times the Feeder will be turned at its maximum speed and a maximum flow of seed will be fed to the Linter. As the roll box fills up, the roll will get tighter, thereby raising the density curve and the density weight and allowing the ratchet shield to move back under the pawl. This gives the pawl contact with fewer teeth on the ratchet wheel, reducing the speed of the feeder and the flow of seed. As the roll gets tighter the density weight will be raised completely up and the pawl will finally be completely disengaged and the feeder will stop. As soon as the roll slackens the least bit, the density weight will drop slightly and the flow of seed will continue. In this way, the roll density is maintained more or less uniform, and the flow of seed will be uniform, so long as the density regulator adjustment is left undisturbed.

There are several ways of adjusting the density regulator to increase or decrease the feed, commonly referred to as tightening or loosening the roll. Actually, a tight roll means higher capacities and a loose roll results in less feed and lower capacity.

The simplest way to control the roll density, and the one most commonly used, is to slide the density weight forward or backward on the weight arm. Sliding it to the extreme end of the weight arm increases the leverage and the effective weight, and the roll must get tighter before it will raise it and cut off the feed. A similar effect will be obtained by adding more weights to the one on the weight arm. These weights may be added until the desired capacity is obtained, and then minor adjustments made by sliding the weight backward and forward as desired.

Another method of regulating the roll density is by adjusting the length of the Slotted Connecting Link. This changes the relative position of the ratchet shield and allows the pawl to get more or less contact with the teeth on the ratchet. Shortening the Slotted Connecting Link pulls the ratchet shield forward and increases the feed. There are two ways to make this adjustment, one is by means of the Curve Adjusting Arm, which is designed with an adjustable mechanism that may be moved up or down, automatically changing the effective length of the Link; the other by making minor adjustments in the length of the Connecting Link itself, by means of an adjusting screw in the upper end of the Link.

Some Lint Room Operators prefer to regulate roll density by adjusting the length of the Slotted Connecting Link, and within certain limits this method is entirely satisfactory; however, the length of the Link determines the operating position of the density curve and the weight arm, and to a certain extent affects the shape of the roll. For this reason, it is best to adjust all of the Connecting Links to a uniform length, and one which will give a uniform roll density and the best shaped roll. This can soon be determined by experimenting with the Curve Adjusting Arm in various positions and will generally result in a roll that does not boil up in the top of the Seed Board and at the same time one that is not forced down under the lip of the Seed Board. In other words, a more or less circular roll is desired. A good free running roll is usually obtained with the plunger of the Curve Adjusting Arm in the second hole from the top, however, on late model linters the Adjustable Curve Arm has been eliminated and all adjustments are made with the link or the weight. After adjusting the length of the Link as outlined above, it will be necessary to experiment to determine the amount of density weight required. Several extra weights are generally provided that can be bolted to the side of the main weight. For a second cut 176 Saw Linter, no extra weights are generally required but in extreme cases two or three weights may be used, in order to get maximum capacity. For a first cut Linter, the main weight is generally sufficient, but in some cases one extra weight may be required. After the proper amount of density weight has been determined to obtain the required capacity, minor adjustments may be taken care of by sliding the weight backward or forward on the weight arm. Where two or more extra density weights are being used, or appear necessary to get the required capacity, it is frequently an indication of dull or improperly sharpened saws.

The above two items, namely the adjustment of the density regulator for tonnage and the seed board for lint cut, are essentially the primary requirements in the operation of the lint room. The Linterman must be impressed with the idea that the primary objective of any oil mill is to produce oil, and therefore, the first consideration is to be sure that sufficient seed is passing through the Lint Room at all times to furnish the Press Room with the necessary supply of meats. If the Press Room is equipped with a Bin or Tank for unrolled meats, it should be carefully watched by the Linterman, and he should know definitely, at all times, the exact level of meats in the bin. By watching it carefully it will not be difficult to determine if the Press Room is gaining or losing meats and the Linters can be gradually adjusted by means of the Density Regulator to give a uniform flow to the Press Room. This is the first requirement of a good Linterman; and one that is continually allowing the meats bin to run empty, and the next day to overflow, is not attending to his job. This method of operation will seriously interfere with Press Room efficiency. Where a meats bin is not provided, the Linterman will have to watch the level of meats in the cooker and the overflow box.

After adjusting the second cut Linters to give a uniform flow to the Press Room, the first cut Linters must be adjusted to exactly take care of feeding the second cut Linters. In order to do this, it is necessary that a uniform flow of seed be provided to the first cut Linters. This is a simple matter if a mill supply bin has been provided, but if not, some means of communication with the seed Feeders must be arranged so that the spouts over the first cut Linters will always be filled. After being assured of an ample supply of seed to the first cut Linters, it is not difficult to regulate the roll density, as outlined above, to give the required flow of seed to the second cuts. When a mill supply bin has not been provided, an automatic tunnel Feeder, with remote control, is recommended as a means of controlling feed and saving labor.

After the proper amount of density weight has been arrived at, and the Connecting Links properly adjusted, it will be a simple matter of sliding the weights back and forth, as required, to obtain the flow of seed required from all machines. As long as the lint yield is satisfactory it should never be necessary to change the adjustment on the seed board, but when it is necessary to change the "cut" the seed board must be adjusted in or out. At such times it will be necessary to regulate the roll density to compensate for the change in tonnage. For instance, if the seed board has been closed to increase the "cut", the tonnage will automatically be reduced and it will be necessary to immediately increase the roll density and bring the tonnage back up to the required amount. If a radical increase in "cut" has been made and the tonnage reduced below the limits of the adjustments on the density regulator, then it might be necessary to add additional weights. Weights cannot continue to be added indefinitely, as eventually the limit of the capacity of the machine will be reached. On the other hand, if the Breast has been opened and the "cut" reduced, it will be easy to loosen the roll, by moving the weight in or taking off weights, until the desired tonnage is obtained.

There is another thing that the Linterman should observe very closely at all times, and that is to be sure that all Linters are delinting the seed uniformly. Theoretically, with the Eccentric Adjusting Seed Boards all set in the same position, with the dials on the same number, they should all be delinting uniformly. However, in actual practice, particularly on second cut Linters, the seed will not always be delinted uniformly when the dials are all on the same numbers. This is probably due to inaccuracies in adjustments of the Gratefall. In such cases the Linterman should take samples of the seed from all of the Linters and compare them carefully; if some are found to be leaving excessive lint on the seed, the seed boards on these machines should be closed, regardless of the dial numbers, until the machines are delinting uniformly with the others. If one of the Linters is found to be delinting too closely, it should be opened slightly and adjusted to correspond with the average. After making the above adjustments a record of all the dial settings should be made in the

Linterman's notebook, and these settings checked each day, as comparative samples are taken from each machine. However, it will greatly simplify the operation if all Seed Board dials, for each cut, can be set on the same number, and therefore they should be adjusted and calibrated, if necessary, so they will all delint uniformly at the same dial setting.

The Linterman should be provided with a sample type of first and second cut lint, that the management desires to produce, and should compare the production with the type several times each day. If the lint being produced does not compare favorably with the type, it might be necessary to change the cut, but this should never be done without consulting the mill superintendent. After the Seed Boards have been adjusted to conform to the type it will seldom be necessary to make any change in this adjustment.

From day to day, the lint yield will vary slightly up or down, depending upon the amount of lint on the seed, but as long as the Seed Boards remain on the same setting, the amount of lint left on the seed will be fairly consistent and the quality of the lint will remain uniform. With the quality of seed running fairly consistent, there is nothing except the Seed Board Adjustment that will change the staple and the color of the lint; however, improper adjustments and poor operation will result in trashy lint and rough nappy lint, and it is entirely up to the Linterman to watch out for things of this kind.

It would be difficult to enumerate all of the causes for off grade lint and the ingenuity of the Linterman must be relied upon to locate and remedy the many minor difficulties that will affect the quality of lint. In most cases off grade lint is due to the Linter not being properly adjusted as outlined in Parts #2 and #3 of these instructions, but for the convenience of the inexperienced operators, and as a matter of information, we will list a few of the most common difficulties and some suggested remedies.

ROUGH, NAPPY LINT is generally due to one of three things. First it might be due to the speed of the saw and the speed of the float not being in the proper ratio. This is particularly noticeable on first cut lint when the float is running too slow In most cases it must be assumed that the equipment has been furnished to operate at the proper speed and if so, there will be no trouble from this source, unless the float belt is too loose and is slipping. This frequently is a source of trouble and whenever nappy lint is noticeable, the float belts should immediately be checked.

The next item causing rough nappy lint is the brush not being adjusted to the saw and the bristles not removing the lint from the teeth. Therefore, in attempting to remedy this trouble, always check the setting of the brush.

The third cause for rough lint might be traced to Linter Saws that have not been properly side-filed. The proper meth- of of filing saws will be covered under another heading but it might be stated here that if the tooth is not well side-filed and pointed, and the burr completely removed, all the way down to the throat, rough lint will be produced. This applies parti- cularly to first cut lint.

TRASHY LINT might be due to several things and will, of course, depend on the type of trash that is found in the lint. It must be assumed that the seed cleaning machinery is opera- ting efficiently and that the cause of the trouble is due to faulty operation of the Linters.

Ordinary leaf trash and shale might be due to improper moting, and frequently it can be corrected by adjusting the Draft Shield and moting a little heavier. In some cases where extremely trashy seed are being worked it is necessary to adjust the Draft Shield in a wide open position, and even drop a little lint with the motes in order to be sure of mot- ing out a maximum amount of the trash. Trashy lint might also be due to poor operation, or improper adjustments to the Lint Flue System or Lint Beater and this will be covered under another heading.

Trashy lint due to Hull Particles can sometimes be cor- rected by remedying the moting as outlined above, but this should generally be corrected at its source. Hull particles in the lint indicates excessive hulling of the seed in the Breast, and might be due to worn out or broken ribs or to broken or bent saws. Hulling might also be caused by too much projection of saw through the rib, and the saws running too close to the float. Or it might be due to a bent or bro- ken float bar running too close to the saw. It might also be caused by a worn out or broken place on the lining of the Seed Board. Hull particles in the lint should be carefully investigated and can generally be traced back to one machine not operating properly. One Linter out of adjustment and cutting the seed will seriously damage the quality of all the lint.

Excessive hulling of seed is a very serious matter, and aside from damaging the quality of the lint it might actually result in excessive manufacturing losses. In order to deter- ming just which of the machines is hulling the seed a sample of lint should be taken from each linter. With a lint flue system this sample of lint will have to be taken from the linter hood, by inserting a little "lint catcher" in the hand hole back of each linter. The lint catch may be made from a piece of screen wire approximately 4" x 8" and attached to a handle. By catching a sample of the lint from each machine the source of the trouble may readily be located and all of the above items checked.

Excessive hulling of seed might also be caused by the density regulator getting out of adjustment and causing the roll to run too tight. Hulling might also be caused by ragged or irregular saw teeth, particularly when some of the teeth get too long, due to improper gumming. A special effort should be made to immediately determine the cause and correct excessive hulling.

HULL PEPPER in second cut lint is one of the most common complaints of the Linter Buyers, but in recent years this has been remedied and to a certain extent controlled by handling second cut lint in a Beater. Hull Pepper is generally associated with extremely heavy lint cuts and a certain amount of it must be expected with close linting; however, it can be relieved to a certain extent with proper saw filing which will be covered under another heading.

DIRT POCKETS in lint are very objectionable and will seriously affect the value of the product. Dirt Pockets are sometimes found in first cut lint and light second cuts, as well as in heavy cuts and are generally due to faulty methods of handling and conveying the lint. To remedy a trouble of this kind one should look for accumulations of lint or choke-ups in the lint flue or in the hood back of the linter. Rough or irregular places on the mote board will cause particles of lint to accumulate and these will finally break loose after having accumulated dirt and dust. Improper handling of the lint from the lint beater or the Condenser to the baling press will frequently cause Dirt Pockets and all rough spots or ledges that might accumulate lint and dirt should be eliminated. Improper operation of Lint Beaters is sometimes responsible for Dirt Pockets. Where lint is handled by a fan from the Lint Beaters to the baling press, an irregular discharge from a dust collector will frequently cause an accumulation of pepper on one side of the bale. Improperly designed slides or hoppers over the baling press sometimes allow settling of pepper and trash, so as to accumulate on one side of the bale or cause pockets. Uniform discharge of lint to the hopper will eliminate this trouble.

MOTING of the Linter is an item that should be watched and studied very carefully by the Linterman. Excessive moting or the dropping of lint with the motes can easily result in the loss of many pounds of lint, and therefore an efficient Linterman must watch the linters carefully at all times to see that they are moting properly. On the other hand, if the linter is not moting sufficiently and dropping out the trash it will result in trashy lint. All linters should be inspected at regular intervals, and if they are not moting properly, the cause of the trouble should be determined and the necessary adjustments made.

If all adjustments have been properly made as outlined in Part #3 of these instructions, and the brush is operating at the proper speed, and the lint flue system is properly regulated, there should be no difficulty in adjusting the Draft Shield to control the moting as desired.

If a Linter is found to be fogging or blowing down lint excessively, and all the other machines are operating properly, it might be due to the flue or hood being choked with lint, and this may easily be remedied by opening the inspection door and cleaning it out. At such times the hood should be carefully inspected to see if there are any rough spots that might accumulate lint and cause choking and also to be sure that the connection between the hood and the back of the linter is perfectly smooth. If no trouble of this kind is found, and if the hood continues to choke, it is no doubt due to improper adjustment of the lint flue system. The remedy for this will be covered under another heading.

Blowing down of lint at one end or both ends of a linter might be due to side wings being bent or pushed in too close to the brush.

Excessive dropping of lint might also be caused by the brush not being properly adjusted to the saw or the Back Lip Board not properly adjusted to the brush.

There must be ample space under the Linter for the brush to take air or else it will drop lint excessively. Where Cant Boards are installed to deflect the motes into a Conveyor, there should be at least 4" clearance between these boards and the bottom of the Mote Board.

PART #5

Multiple Lint Cuts

Multiple linting, in three or in a few cases, 4 cuts, rather than the conventional first and second cut, is being used successfully in many oil mills in recent years, and most operators believe this procedure greatly improves operating efficiency.

Theoretically there should be no difference in efficiency, average lint per Linter per day, or power per pound of lint, regardless of the number of cuts, but in practice there is a difference in that with only two cuts, it is difficult if not impossible, to adjust the seed boards or rakes, on all second cuts for uniform close linting, and therefore, some Linters will probably be set too close, with loss in capacity, and others not close enough, leaving excessive lint on seed. With three or four cuts, it is seldom necessary to make any adjustments to the last cut linters, after they are properly set, and minor differences in rake setting makes hardly any difference in the amount of lint left on seed.

The lint from second, third and fourth cut Linters may be handled in the same flue system or separate systems and then blended in a common beater, or in an auxiliary blending beater. When properly blended the lint has the same appearance as regular second cut and is usually sold as such.

A big majority of mills make no effort to segregate the lint from the multiple cuts, and produce only "second cuts" or a blend of their several cuts. Their primary objective is to obtain the more uniform delinting and it is believed that slightly higher yields and slightly increased capacity will be obtained with three or more cuts. In larger mills it is sometimes desirable to go to four or five cuts for greater flexibility and to tie in with the lint beater arrangement.

A few mills, with a higher percentage of lint on seed, have found it desirable and profitable to segregate and bale out three cuts. For example, after taking off a relatively light or medium first cut it is sometimes possible to then remove a 30 to 40-pound second cut which will have the appearance of a "mill run" lint which will bring a higher price than the chemical second cut. This procedure will naturally degrade the third cut to some extent but in some cases has resulted in a higher overall lint revenue. It also makes a flexible arrangement in that the second cut could be blended with the first cut if a heavy first cut is desired. Where the third cut is clean there is sometime a good market for it if baled separately. Or, by blending the second and third cut a conventional "second cut" may be produced.

How many Linters to use on third cut, or the ratio of second cut to third cut, makes very little difference. For example, if a mill with, say 16 second cut linters was desirous of going to three cuts, they could be divided equally and operate eight second cuts and eight third cuts. Or, they could just as well operate ten second cuts and six third cuts The writer would recommend the latter arrangement with a minimum of third cuts. Somewhere between 20 and 25 tons per linter is suggested for third cut.

PART #6

Saw Sharpening

Although listed under Part #6 of these instructions, saw sharpening is undoubtedly number one in importance for efficient lint room operation, and it is impossible to over emphasize the crucial part that Gumming and Filing have to do with lint production, power consumption and lint quality.

Statistics from all over the cotton belt indicate that some mills can produce lint for less than 20 H.P. hours per 100 pounds, whereas others require over 50 H.P. hours per 100 pounds of lint. This difference of more than 100% in power consumption cannot all be attributed to saw sharpening, as some have more efficient transmission, with less friction load and others are delinting closer and leaving less lint on the seed; but it may safely be said, that a difference of 30% in power consumption can easily be attributed to the filing and gumming of the linter saws. The average oil mill, today, will consume 40% to 50% of its power requirements in the Lint Room, therefore dull saws might easily mean a difference of 10% or 15% in total power cost.

At times when lint production has an important bearing on the total revenue from a ton of seed, and saw sharpening can easily mean a difference of 25% in lint production, it is even more necessary to stress the importance of proper sharpening of linter saws. It is not presuming too much to say that it could easily mean the difference between a profit and a loss from the season's operation.

All of the above is to stress the importance of saw sharpening, but unfortunately, it is difficult to give any set rules as to how to sharpen a saw, or an exact definition of a sharp saw. There is no fool-proof machinery for sharpening saws, and any superintendent who thinks he can have a man throw a cylinder in the machine, start it running, and expect to have a sharp saw and good teeth, is going to be sadly disappointed. There is more human element involved in saw sharpening than in any other oil mill operation, and to get good results, this operator must be intelligent and interested in his work; he must know what he is trying to do and realize its importance. In view of these conditions, and the importance of maintaining sharp saws, the Saw-Filer should be one of the most capable and intelligent operators in the mill. In addition to keeping the saws sharpened, which is the most important thing, a good Saw-Filer will more than pay the difference in wage over the ordinary laborer, by the saving in saws.

From the above it is clear that in order to be sure of having the linter saws properly sharpened, it is essential to obtain the services of a first class mechanic for operating the Saw Filing Machinery and maintaining the linter saws. The next step, is to be sure that this man keeps the machines in first class mechanical condition. Where the Lint Room is not absolutely clean and free of dust, the saw filing machinery should be located in a separate room where it will be away from the dust and may be kept absolutely clean at all times. The machine should be well lubricated and wiped clean. The use of compressed air is discouraged around the Gummer, due to the danger of blowing filings into the gears, bearings and motor. There should be plenty of light in the Filing Room and ample electric lights provided for good illumination at night.

THE OPERATION OF THE GUMMER is the most important step in maintaining sharp, uniform teeth on a saw. The Gummer, which is actually a circular file, cuts back the throat of the tooth, sharpens the under side, or cutting edge of the tooth, and actually reforms a new tooth.

Previous to the development of the Tru-Line Gummer it was considered necessary to side file second cut saws, so as to cut back the throat and allow the Gummer to cut into the steel more readily, and thereby maintain more uniform teeth. Side filing on second cut saws does not normally influence the quality, or increase capacity, and with the Tru-Line Gummer is not required. Side filing of first cut, or mill run saws, to remove the burr, is definitely recommended, and is essential for the production of best quality lint, although most mills today do not side file.

A big majority of mills use the Tru-Line Gummer for sharpening linter saws. If properly adjusted and operated it will maintain absolutely uniform teeth for the life of the saw. As most mills are now equipped with these machines the operating instructions for other types of equipment will not be included in these instructions. A copy of Carver's "Directions for Erecting and Operating the Tru-Line Gummer" should be attached to these instructions and carefully read by all Superintendents and Operators and the operating instructions given therein carefully complied with.

THE OPERATION OF THE SIDE FILING MACHINE has little bearing on linter capacity, but is important in maintaining the proper size and shape of tooth necessary for the production of best quality, first cut or mill run.

Most mills have discontinued side filing of both first and second cut saws, but for the benefit of those who still operate this machine the general instructions will be included below. Also note comments at the end of this discussion regarding the new rotary side filer which might conceivably encourage the use of the side filing procedure on first cut saws.

The general maintenance of the Filing Machine is not quite so difficult as on the Gummer but it is just as important that all of the wearing parts such as pins, bushings, eccentrics, and other parts be kept in good condition at all times. It is very important that the twisted file blades (F.M. 504D) be kept in good condition and immediately replaced or straightened if they become bent. The most important adjustment on the filing machine is the parallel alignment of the files. After all of the file blades are straight and level, the final adjustment is made by means of the swivel box eccentric which throws the swivel box from one side to the other. By means of this adjustment all of the file blades may be set parallel and absolutely central between the saws. If all of the files are not absolutely in line and properly spaced, unequal filing pressure will be applied and some saws will be filed more heqvily than others. If one of the files is slightly off center, it will result in one side of the saw being filed too heavily and the other side not being filed at all. The operator should carefully inspect all of the files on the filing machine several times during the day and if any of them are cutting too heavily, or not heavy enough, they should be adjusted by means of the swivel box eccentric.

Another important adjustment on the filing machine is to set the files at the proper angle to obtain the desired size and shape of saw tooth. This adjustment is one that requires the close personal attention of the operator and in order to get good results, he must use good judgment and common sense. The machine is equipped with index plates showing the various angles at which the files may be adjusted. The standard scale furnished with the machine allows the files to be set at an angle of 6°, 7°, or 8°. Under average conditions, an angle of 6°, will give good results. It is important that these markings be used or else it will be impossible to adjust the files at the same angle and obtain uniform filing on all saws. Under certain conditions, it might be necessary to vary the angle of the files and at such times, the ability of the operator must be relied upon. Careful observation by the operator from day to day might indicate that the filing angle of 6° is a little too much, and if he finds the teeth are becoming too pointed and too short, he should then adjust the filing angle to 5° or even 4°, as required. As the scale on the machine only goes down to 6°, he will then have to make a new mark so that the files may be accurately adjusted each time to this new setting. As stated above, the filing angle of 6° will generally give fairly good results, but in order to maintain a perfect tooth at all times and get the best results from the equipment the operator will have to use his own judgment and vary this angle from time to time, in an effort to maintain a tooth similar to that on a new saw.

In addition to the proper angle of filing, it is equally important that the operator adjust the machine to get the proper pressure of the files against the saws. This adjustment for pressure is made by means of a hand wheel at the end of the machine. In first starting up the machine the files should first be set at the proper angle and a very light pressure applied with the hand wheel. The machine should then be started up and additional pressure applied to the files as desired. An experienced operator can determine the pressure by the sound of the filing and can also check this pressure, by placing a finger behind several of the twisted blades and feeling the tension. He can also observe the amount of the filings being cut from the saw which will also indicate the amount of pressure. The amount of pressure to be applied will depend on the size and the shape of the tooth and whether or not it is a first cut or second cut saw, and will have to be varied from time to time. If the teeth appear to be blunt and square pointed, maximum pressure should be applied, but if the tooth is already sharply pointed and delicate, less pressure should be applied.

From the above, it will be observed that the angle of filing and the pressure to be applied, have a distinct relation to one another. For instance, if the filing operation is making the points of the teeth too sharp and actually cutting them off, it might be due to too much angle or too much pressure and if the operator is unable to decide this question, he should consult with the mill superintendent. After the proper angle of filing has been decided on, to suit local conditions, it can generally be maintained for a period of several weeks, if not indefinitely. It will then be up to the operator to apply the proper side pressure on the files to cut back the throat the desired amount and to properly point and remove the burr from the teeth.

In starting up the filing machine there is a certain amount of slack in the worm gears that revolve the cylinder and the files may continue to file in one spot for possibly 30 seconds before the cylinder starts to revolve. This excessive filing in one spot will damage the saws, and may be prevented by rolling the cylinder toward the files by hand, taking up the slack in the worm gear, before starting the machine.

GENERAL INFORMATION. When to change Gummers and side files is a question that should be given careful consideration by the mill superintendent. Naturally, they should both be used as long as it is economically possible, but when they begin to wear out and are not doing the proper job of filing, it is false economy to attempt to use them any longer. The number of cylinders that can be gummed with a set (36) of gummers will depend to a large extent upon the filing schedule. If each cylinder is gummed on a fast filing schedule, for instance, every eight hours, it will be possible to gum lightly, and under these conditions, they will last a long time and probably gum at least 100 cylinders. On the other hand, if the saws are being changed on a twenty-four hour schedule and are very dull when they come from the linters, heavy pressure will be necessary in order to sharpen them and the Gummers will wear out more rapidly. Under these conditions, a set of gummers might not be able to gum over 50 cylinders. It therefore appears that the quantity of gummer files consumed will depend entirely upon local conditions, and will have to be regulated accordingly. Under average operating conditions, and changing cylinders every 8 to 12 hours, a set of gummers should take care of somewhere between 75 and 100 cylinders. If this schedule of changing does not appear to keep the saw sharp, and if it is not possible to change them on a more rapid schedule, it might be worthwhile to try changing the Gummers more often.

When a new set of gummers is installed on the machine, a few drops of oil should be placed on each Gummer.

A set of triangular side files will ordinarily file about twice as many cylinders as a set of gummers, due to the fact that the files can be reversed in the holders and used on both ends. The side files should be watched just as closely as the Gummers and reversed, or replaced, when they become worn. No oil should be applied to the triangular files as this interferes with the cutting.

The principal object in sharpening saws is to maintain a tooth that will produce a maximum amount of lint for a minimum amount of horsepower, but unfortunately it is difficult to say just when a saw is sharp. Most experienced operators believe that they can tell a sharp saw by looking at it and placing their hand on the teeth and in most cases this is fairly reliable. However, in inspecting the same saws from day to day, it is difficult to detect a gradual change in the sharpness.

One thing is certain, and that is, if the operator can place his hand on the saw teeth, and pull it backwards across the surface of the teeth, the saw is obviously dull. Round pointed teeth, known as "white caps" are a sure sign of dull saws, and indicates that more sharpening, or better sharpening, is required.

Some operators believe that the amount of gumming and filing or the filing schedule, should be governed by the lint cut desired, and as long as they are producing the desired amount of lint, they are entirely satisfied with dull saws. They do not realize that a dull saw requires more horsepower and that they might be consuming 25% or 30% more horsepower than necessary, even though they are getting all the lint wanted.

Many mills are today operating their second cut linters at maximum capacity, and in so doing have found it practical to change the cylinders every eight hours. This is the fastest schedule considered practical at this time. One mill that had for years changed the second cut cylinders every 18 hours increased this schedule to 12 hours and immediately increased the production of second cut lint 20 pounds per ton. This is just an example of the difference between a dull saw and a sharp saw.

Under average operating conditions and where a maximum yield of lint is desired, the second cut cylinders should be changed at least every 12 hours. The first cut cylinders do not ordinarily dull so rapidly and a changing schedule of 18 to 24 hours is generally sufficient; however, if a higher yield of first cut lint is desired, it can be obtained by gumming and filing the saws more often and keeping them sharp.

A system of changing saw cylinders must be arranged at each oil mill to suit local conditions and this system should be so arranged as to make the change as rapidly as possible so that the Linter will be idle a minimum length of time. It should also be arranged so that the saw filing machinery will be able to operate constantly and with no lost time.

Changing the cylinders rapidly depends on experience and also on a system in which there will be no lost time. Saw cylinder trucks should be available, a trolley system is better, and the sharp saw should be rolled up conveniently to the linter. The belt should then be thrown off, the breast dumped, the gratefall raised and the old cylinder immediately rolled out and placed on its truck. The Linter should then be thoroughly, but rapidly cleaned and the new cylinder installed, checked to see that it is running free in the ribs and the belt again thrown on. This saw changing operation, with experienced operators and with the proper system, can be taken care of in five minutes, and even less with Individual Motor Drives.

In many oil mills where only two or three extra cylinders are available, the Gummer or Filer must stand idle until the dull cylinder is removed from the Linter and returned to the filing room. This results in a loss of valuable time, and in some cases cuts down the filing capacity as much as 20%. In a lint room with 20 or more Linters, and where it is necessary to operate the filing machinery to its maximum capacity, there should be at least five or six extra saw cylinders. In this way there will be no lost motion in changing saws, and as soon as one cylinder is removed from the Gummers, or the Filer, there will be another cylinder ready and the machine can continue to operate. If there are not sufficient saw trucks available for all of the extra cylinders, a special bench or rack should be provided for the sharp saws and another for the dull saws. In this way the saw changers will never have to wait for a sharp saw and the Saw-Filer will never have to wait for a dull saw.

Another advantage of having a large number of spare cylinders is that if one cylinder is damaged, it can be repaired without interfering with the filing schedule. Also, as the saws wear down in diameter, and the time comes to change to new saws, one of the cylinders may be stripped at a time and renewed without interrupting production.

As stated in the beginning of Part #6, it is practically impossible to give complete and definite instructions for filing saws. This discussion is only an attempt to bring out the importance of sharp saws, and offer a few suggestions for the operation of the Filer and Gummer. If any mill is unable to maintain sharp saws and uniform teeth, it should make a vigorous effort to find someone who can assist or bring it to the attention of the management.

In connection with the Tru-Line Gummer, the flat file is preferable to the conventional triangular file for side filing of first cut saws. The flat file attachment for the filing machine may be obtained from the manufacturer at a reasonable cost and is easily installed.

In recent years most mills have discontinued side filing second cut saws and very few side file first cuts. Mississippi Valley and other mills producing best quality first cuts have continued to side file and it is pretty well agreed that proper side filing is desirable for best quality lint.

Carver has a new Rotary Side Filer that is fully automatic, which will file a 176 saw cylinder in three or four minutes. This machine is so much easier to operate than the old Filer that many mills that had discontinued filing first cuts will wish to investigate the economics of this operation and possibly some will consider it for second cuts.

Several mills have established a system of changing or replacing saws on a staggered schedule, which in some cases has some merit. Where the mill is operating two or more Tru-Line Gummers, and as certain saws must be suitably marked and always returned to the same Gummer, it is feasible to operate two or more "sets" of saws of different diameters. Naturally, each group of saws must then go to a certain group of Linters, and that is the principal objection to the system, but it does have merit in that by changing two or more groups of saws alternately, or on a staggered schedule, the changing problem is minimized and a more or less average saw diameter is maintained at all times.

SAW USAGE. As mentioned above the saw usage or "Linter Saw Cost" is to a large extent dependent on the saw sharpening schedule and other factors in connection with the sharpening of the saws and for that reason this important problem of saw usage will be discussed briefly in connection with saw sharpening.

One complete turn of the crank on the Tru-Line Gummer moves the saw .008" into the Gummer and therefore would require 70 turns of the crank to cut and reduce the diameter of the saw .56" on each side. This would mean a total reduction in diameter of 1-1/8" and would reduce a new 12-5/8" diameter saw to approximately 11-1/2". It is not usually economical to operate a saw less than 11-1/2" diameter. Usually the crank is moved one-quarter turn, each time the saws are sharpened and on this basis a set of saws would be worn down to 11-1/2" after sharpening 280 times. Some mills operating on 8-hour saw changing schedules are able to maintain sharp saws with 1/8th turn of crank setup and on this basis would sharpen saws 560 times before wearing them out. With the usual 1/4th turn of crank setup, and operating on a 12-hour schedule of saw changing, a set of saws would last 140 days. On an 8-hour schedule, or three times per day, they would last 93 days. However, if on the 8-hour schedule, they could maintain sharp saws with 1/8th turn of crank setup a set of saws would last 186 days. When labor rates are high it is sometimes desirable to change saws every 24 hours, but this usually requires 1/2 turn of crank setup to maintain sharp saws and overall saw usage will be approximately the same as for mills on a faster schedule. Each mill must study their own local conditions and balance lint yields and power against saw usage and labor and attempt to set up the most economical schedule of sharpening saws. In practically all cases it pays to maintain sharp saws, and for second cuts (also third and fourth) an 8-hour or 12-hour sharpening schedule is recommended. Each operator must determine the amount of setup required to maintain sharp saws, and by holding it to the minimum will obtain maximum saw usage.

No Setup is required when new Gummer files are installed, as the difference in diameter of the new gummer is usually equivalent to 1/4th turn of crank. In some cases where the Gummer Files are badly worn it is possible to "back up" 1/2 turn when new Gummers are installed.

A good method of comparing saw usage is to calculate the tons of seed worked per saw cylinder during the life of a set of saws. Several years ago quite a few mills maintained records of saw usage on this basis and something between 800 and 1000 tons of seed per cylinder was considered excellent and economical usage. These figures were probably based on 106 or 141 saw linters but it is not believed there would be any great difference with 176 saws in that the production would be proportionally higher. On the other hand, in recent years there has been a trend toward faster saw sharpening schedules which offhand would tend to increase saw usage and decrease the tons worked per cylinder.

In order to accurately calculate saw usage on the above basis both first and second cut cylinders should be included. Where second cut cylinders are being circulated into the first cut linters and all saws maintained at the same diameter, they will all wear out at the same time, and it will be a simple matter to divide the total tonnage crushed by the total number of saw cylinders in use and arrive at the tons crushed per cylinder. Where the first cut cylinders are handled independently and sharpened on a slower schedule there will usually be less usage of saws on the first cut Linters and this will have to be calculated on a proportional basis. For example, a mill with 20 second cut cylinders and 8 first cut cylinders might conceivably change second cut saws when the first cut are only approximately half worn out. It could, therefore, be said that this mill had consumed 24 cylinders and if during this time they had crushed 24,000 tons of seed, they would have handled an average of 1,000 tons per cylinder.

Some California mills, due to high labor rates, change their second cut saws on a 24-hour schedule. In order to to maintain reasonably sharp saws they find it necessary to set up the Tru-Line Gummer an average of 5/8th of a round on the crank. However, when new Gummer files are installed, every other day, it is not necessary to set up on the Gummers at all, for the reasons outlined above, and therefore their effective setup is only 5/8th round in 48 hours and on this basis a set of saws would last 218 days. In this particular case, with 40 second cut Linters handling 330 tons per day, they would crush 71,940 tons of seed or approximately 1798 tons per second cut cylinder. No records are available on their first cut saw usage but on an average basis their overall would probably average somewhere between 1200 and 1500 tons per cylinder, which is very good.

There is no accurate information as to the power consumption at the above California mill but they have been producing something in the neighborhood of 1700 lbs. of lint per Linter per day, from which it is hard to believe that the saws could be dull. It should be pointed out that the California seed are usually clean and dry and all mills cannot anticipate this good production or saw life.

Most mills checked recently have been getting from 1000 to 1200 tons of seed per cylinder which is certainly average and reasonable. Less sharpening of saws, in an effort to economize on saw usage is not recommended, as this could easily result in false economy but in view of the considerable difference in saw usage it is again urged that all mills investigate this matter carefully and be sure that their operators are not setting up on the Gummers excessively and that they take advantage of not setting up at all when new Gummers are installed. The main consideration is to maintain sharp saws.

SAW SHARPENING. To insure good saw sharpening results, the following procedure should be followed:

1. Bottoms of saw cylinder bearings and base plates on filing machine upon which they rest, must be wiped clean between each saw sharpening.

2. Dowel holes in saw cylinder shaft must be cleaned out to permit the pointed set screw in the turning gear to screw down and correctly position the turning gear on the shaft. Failure to comply with either of the above rules will cause the machine to file off saw teeth until machine is stopped and trouble corrected.

3. When the saw cylinder has been placed in the machine, the cylinder hold down bolts nearest the gummer head must be tightened first. This is in order to make the boss on the bottom of the saw cylinder bearing housing rest firmly against the wear plates provided for that purpose. Failure to do this will cause the machine to take a heavier cut than intended, due to the tolerances allowed for the easy placing and removal of the saw cylinders from the bearing blocks.

4. The handle which shifts saw cylinder into filing position, must be pushed "COMPLETELY IN" before starting filing machine. It may be necessary to go behind the machine to the drive and back the machine up a bit before it can be pushed completely in, depending on the type drive and the flywheel effect of pulleys or rotor of electric motor which tends to coast until the gummers strike the saw on the first tooth of the saw, which would be starting on another round. Failure to do this will cause an egg-shaped saw cylinder which will take considerable time to correct when discovered.

5. Operator should check position of setup mechanism before setting machine up on setup cylinder. Operators have been known to become confused and back the machine off, start the machine and pass several teeth before noticing that he had backed off instead of setting up. This will, also, cause egg-shaped saws unless the operator takes the additional time to refile the cylinder and cut the few teeth down to size.

6. Saw cylinders must be filed and changed in numerical order. Failure to comply with this rule will result in broken off teeth, broken gummers or both, when the oversize saw comes back to the machine.

7. Place one drop of oil on each new gummer installed, before throwing it into the saw.

Close observance of the above rules will result in cylinders which will operate at peak efficiency. The saw filer, however careful he may be, cannot maintain cylinders properly without the cooperation of the saw changers. The changers must handle them carefully or they will bend and mash down teeth placing them in and taking them out of the linters.

PART #7

The Lint Flue System

The development of the modern Lint Beater, for both first and second cut lint, has eliminated the use of a condenser, thereby simplifying and improving the Lint Flue System. It has also standardized the flue system, to where it is nothing more than a simple pneumatic handling problem. All of the lint is collected in a common trunk line, from branches to each Linter, passes through the fan and is discharged into a collector or cyclone, and dropped into the Lint Beater. When it is not convenient to locate the collector over the Beater, or where more than one system and collector are used, the lint may be "robbed" from the discharge of the main collectors and handled pneumatically to the beater. An auxiliary system of this kind is known as a "pickup" or "robber" system.

The first consideration in the design of a Lint Flue System is to establish the volume of air to be handled, and, theoretically, this should conform to the output of air from the linter brushes. Experience has demonstrated that a flue system should be designed to handle from 1350 to 1500 C.F.M. from each Linter, and allowances made for additional air that might be handled from other openings in the trunk line, where by-products from the beater are returned to the system. As will be noted in PART #9, the "Big Linter" requires 2000 to 2200 C.F.M.

The next step is to calculate the trunk line diameters to maintain velocities between 2200 and 2400 F.P.M. Minimum safe velocity for handling lint is about 2200 F.P.M., and naturally, minimum velocity will result in minimum horsepower requirements.

The selection of the proper fan is simply a matter of checking the fan performance table and determining the most efficient fan to handle the required amount of air at the estimated static.

For the past twenty years or more, a good lint flue system design would call the the largest practical dust collectors, so as to operate with minimum discharge pressure between fan and collector, and correspondingly lower power requirements. The collector size was restricted only by the stack velocity which was established at somewhere between 450 and 550 F.P.M. Dimensions of the standard collector is shown on Sketch No. 21 and many of them are still operating satsifactorily. In recent years the trend has been toward the "high velocity" collector which is much more efficient, from a separation standpoint, but does require more horsepower. Most mills are willing to spend 20% to 50% more power on lint flue systems in order to have less lint and dust discharging from collectors. Dimensions of the high velocity collector are shown in Sketch No. 23. A typical example of the difference between a standard collector and the high velocity is that the 11'-2" diameter standard collector, handling seven Linters may be replaced with one high velocity collector of 5'-2-3/4" diameter, or two smaller collectors. Theoretically the high velocity collector 7-Linter system would require 20.2 H.P. on the lint flue system as compared to 12.5 H.P. with the standard collector. In some cases no change in motor would be required but in this case the high velocity system requires a 20 H.P. or 25 H.P. motor while the old conventional collector could use a 15 H.P. motor.

Most oil mills today will certainly comply with manufacturers' recommendations for high velocity collectors on new installations, and will gradually replace old collectors as they wear out. A very high velocity system for maximum separation efficiency as outlined above takes 60% more power than the old system, or a compromise would be 25% to 50% more power and corresponding improvement in efficiency.

Total static pressure with the proposed high velocity collector on a 7-Linter system, handling 9170 C.F.M. would be 5.29" of water. The old low velocity collector system would require only 2.34" static. The above static pressures are based on ideal conditions, with minimum velocities in the trunk line, but many systems are operating with not over 3" total static on the low velocity collector systems and about 6" on the high velocity.

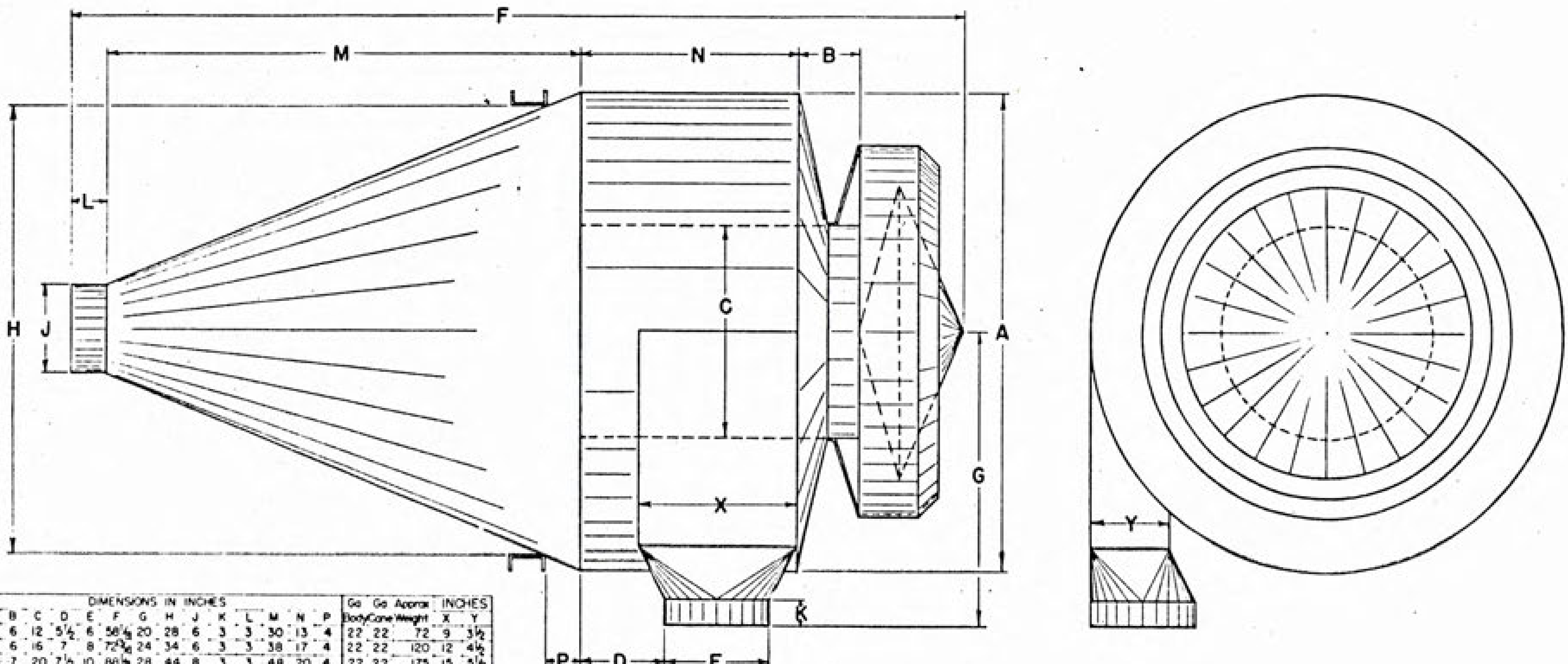
It is not the author's intent that the limited information contained in this manual will be sufficient for the average oil miller to build his own flue system or become a pneumatic expert. It is hoped that this information will be helpful in operating and making adjustments to existing systems.

The principal difficulty to be anticipated in operating any lint flue system will probably be due to improper distribution of air. In order to be sure of getting exactly the same amount of air from each Linter, it is necessary to check the pressure and this may be done by inserting the draft gauge tube in a 1/4" hole drilled just above each Linter hood. Old lint flue systems have a 12" pipe to each Linter hood and on these at a point just above the hood there should be a negative pressure of approximately .2 of water. Where a 10" pipe is used, which is now standard, there should be a negative pressure of approximately .35" of water. With the brushless attachment the negative pressure should normally be set at .60" to .80" but will operate as low as .40". If the system has never been regulated and checked with a draft gauge, there will be a vast difference in pressures from one machine to the other and it will usually be necessary to adjust all of the valves until the pressures back of all the machines are equalized. After adjusting several of the valves the pressures on the others will be affected, and it will be necessary to re-check the entire system, three or four times, before all Linters can be uniformly regulated.

There have been cases where brush Linters would operate satisfactorily, and mote satisfactorily, with less than .2" negative pressure just above the hoods, and the important thing is to be sure that they are all regulated uniformly and each machine getting the same amount of air. After regulating all of the air valves and getting equal pressures, if it is found that all of these pressures are less than that indicated above, it is generally an indication that the fan is not handling sufficient air to properly operate the system. Of course, if the Linters are moting properly and not blowing down or dropping lint excessively, it does not matter what the pressures are, so long as they are uniform; however, if they are all in excess of .4" on a 10" line to each Linter it is an indication that the fan is running too fast and consuming excessive power. If the pressures are less than the required amount, the volume of air handled by the fan should be measured with a Pitot Tube to see if it is handling sufficient air to properly operate the Linters.

A simpler approach, rather than taking Pitot Tube readings, would be to take static pressure readings on the inlet and outlet side of the fan. The total of these two readings would give the total static on the system. This information along with the fan speed applied to the Fan Manufacturer's preformance table would give the cubic feet of air per minute (C.F.M.) under those conditions and would indicate what speed the fan should run to give the desired volume of air. After speeding up the fan to where it is delivering the required volume of air, i.e., 1250 to 1500 C.F.M. per Linter, and if the Lint Flue System is properly designed, it should be possible to get the required static pressure at each Linter Hood for good performance. If not, it may be necessary to increase fan speed again and install a larger motor, but there must be proper static pressure at each Linter.

Most engineers design the flue system for the brushless attachment for the same air volume as for a brush Linter, i.e., 1250 to 1500 C.F.M. per Linter. This operates satisfactorily and gives a reasonable range of adjustment. As indicated



Size	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Ga Body	Ga Cone	Approx Weight	X	Y
	DIMENSIONS IN INCHES																	INCHES	
6	30	6	12	5½	6	58⅛	20	28	6	3	3	30	13	4	22	22	72	9	3½
8	38	6	16	7	8	72⅜	24	34	6	3	3	38	17	4	22	22	120	12	4½
10	48	7	20	7½	10	88⅝	28	44	8	3	3	48	20	4	22	22	175	15	5½
12	54	7	24	8	12	101⅞	33	50	10	3	4	54	24½	4	22	22	244	20	6
14	62	8	28	8½	14	105	40	57	10	3	4	62	27	6	22	20	355	23	7
16	72	8	32	10	16	133	44½	66	12	3¼	4	72	32	6	22	20	494	28	7½
18	80	11	36	11	18	148¾	46½	74	12	3½	4	80	35	7	20	18	683	30	8½
20	90	13	40	11½	20	167	52½	84	12	3½	4	90	39	7	20	18	945	35	9
22	98	14	44	12	22	183½	53½	92	14	3½	6	98	42	7	18	16	1244	38	10
24	108	15	48	15	24	212½	58½	101	14	3½	6	108	48	7	18	16	1404	42	11
26	116	16	52	15	26	217½	60½	109	14	3½	6	116	52	7	18	16	1800	48	11
28	124	17	56	16	28	234½	64½	116	16	3½	6	124	55	9	18	16	2045	50	12½
30	134	18	60	16¼	30	247½	66½	126	16	3½	6	134	58	9	18	16	2334	53½	13½
32	144	22	64	16	32	265½	76½	136	16	3½	6	144	60	9	18	16	2472	56	14½
34	153	24	68	30½	34	294¾	77	145	16	3½	6	153	76	9	18	16	2991	57	16
36	161	24	72	32	36	306¾	81½	152	18	3½	6	161	79	10	18	16	3295	58	17½
40	178	24	80	37	40	338¾	88½	167	20	3½	6	178	89	11	18	16	5259	64	20
42	189	26	84	41	42	358	96	178	20	3½	6	189	95	11	18	16	5082	66	21
44	198	26	88	40	44	370¾	99¾	187	24	3½	6	198	96	12	18	16	5327	68	22½

PROJECT AND/OR AREA IDENTIFICATION
TYPICAL CYCLONE
SHEET IDENTIFICATION
APPROVALS
CHIEF ENGR.
ELECTRICAL
MECHANICAL
STRUCTURAL
DRAWN BY: V-C
CHECKED BY
PROJECT LOCATION

FIGURE NO. 21

REVISIONS
DATE
SHEET OF

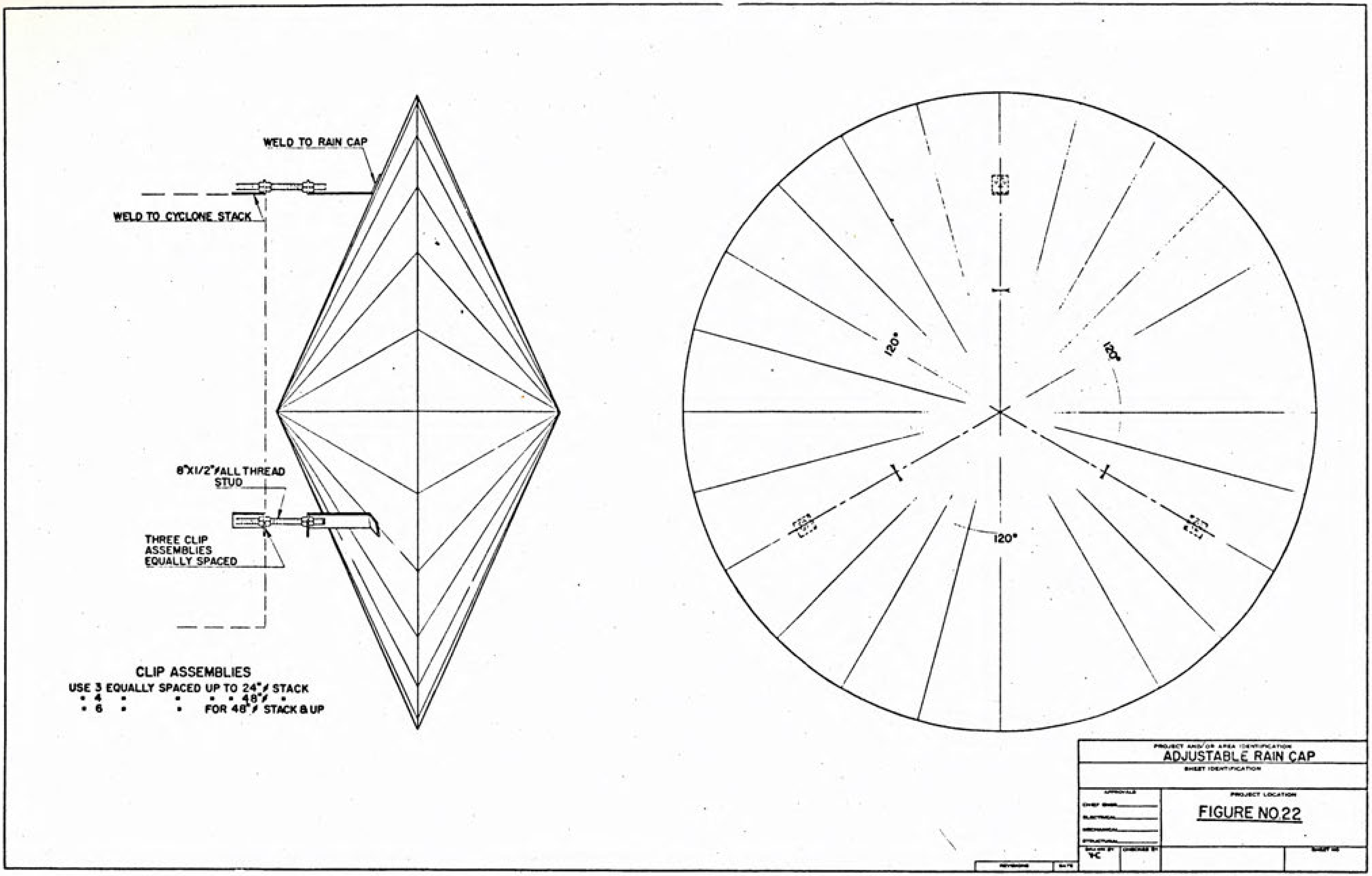
above, negative pressure of .35" of water should be maintained in the 10" line directly over each Linter hood on the brush Linter, with the brush running. This pressure will increase slightly if the brush is stopped. With the Brushless Attachment, it is desirable, for best operation, to maintain a negative pressure back of each Linter of .60" to .80" of water. This reading should be taken with an accurate draft gauge, through a 1/4" hole, drilled in the transition just under the valve, i.e., between the valve and Linter. Where there is any indication of lint dropping with the seed or accumulating at the bottom of the ribs, a slightly higher pressure should be used, although with minimum pressures a maximum amount of fine trash will be "moted out".

THE LINT FLUE CYCLONE. A properly designed Lint Flue Cyclone, of ample capacity and with the adjustable rain cap properly set, will normally operate with very little, if any, trouble and with no "spitting" or excessive discharge of lint from the discharge stack. As mentioned above there will always be some discharge of fine dust particles with the air from the discharge stack but this can be greatly minimized with the High Velocity Collector.

It has been determined by experience that a cyclone of proper body and stack diameter to obtain a stack velocity of approximately 500 F.P.M. will operate satisfactorily and result in minimum back pressure on the system and corresponding economical power requirements.

Sketch #21 illustrates the design and dimensions of cyclones most generally used for lint flue work. An absolutely straight stack with no flared or choked bottom is recommended. Some of the manufacturers normally furnish an adjustable disc below the stack but due to the interior bracing required to support this apparatus it is not recommended for pneumatic systems handling lint. It is important that the stack inside of the cyclone be designed sufficiently rigid to support itself without any interior braces as any obstructions within the collector will accumulate lint and result in spitting from the stack.

Most of the manufacturers standard cyclone designs specify certain diameter inlet pipes for corresponding diameter outlet stack and other collector dimensions. Therefore, in order to obtain the desired low stack velocity, they will sometimes furnish a larger than necessary inlet transition. With excessive area at the cyclone inlet the velocity will diminish and the


WELD TO RAIN CAP
WELD TO CYCLONE STACK
8"X1/2"⌀ ALL THREAD STUD
THREE CLIP ASSEMBLIES EQUALLY SPACED
CLIP ASSEMBLIES
USE 3 EQUALLY SPACED UP TO 24"⌀ STACK
" 4 " " " 48"⌀ "
" 6 " " FOR 48"⌀ STACK & UP
120°
120°
120°
PROJECT AND/OR AREA IDENTIFICATION
ADJUSTABLE RAIN CAP
SHEET IDENTIFICATION
PROJECT LOCATION
FIGURE NO.22

cyclone will not function properly. Even if the inlet pipe is of proper diameter to maintain the required velocity an excessively large inlet transition will cause trouble. It is therefore necessary to specify not only the inlet pipe sizes but also the correct rectangular dimensions of the inlet transition.

With a cyclone properly sized to obtain the required low stack velocity and with the proper inlet transition area to maintain the velocity of the inlet pipe it is possible, by making minor adjustments to the adjustable rain cap, to obtain good results with the lint flue cyclone.

With the cyclone sized, to obtain the above mentioned low stack velocities, the collector itself is actually oversized according to most manufacturer's standards and with normal rain cap adjustment will result in a suction at the collector discharge. This not only interferes with normal discharge of lint from the collector but results in an updraft through the collector which frequently causes spitting of lint from the discharge stack. This may readily be corrected by lowering the rain cap and controlling the discharge of air from the outlet stack. This is a relatively sensitive adjustment and requires a special adjustable rain cap as shown on Sketch #22. By gradually lowering the rain cap, not more than 1/16" at the time, and at the same time taking readings of the pressure at the fan discharge or collector inlet, the air may be accurately balanced, and the cap adjusted to a point where the collector operates most efficiently. Just as soon as the rain cap is lowered to a point that it begins to choke the discharge and build up the pressure, in the line between the fan and the collector, it should be set and secured. In other words, it should be lowered to a point that is just beginning to build up back pressure and still does not build it up appreciably. At this point there will be no appreciable build up in power and any suction in the collector discharge pipe will be eliminated or greatly minimized.

Quite a few of the old collectors still continue to give some trouble and occasionally spit lint and where this occurs they should be modified as outlined above. Very definitely, any braces and interior obstructions should be removed and if at all possible the inlet transition should be properly sized and the adjustable feature installed on the rain cap. Various gadgets and trick devices have been installed on old cyclones, such as the adjustable gate in the inlet transition. This particular device is, of course, helpful where

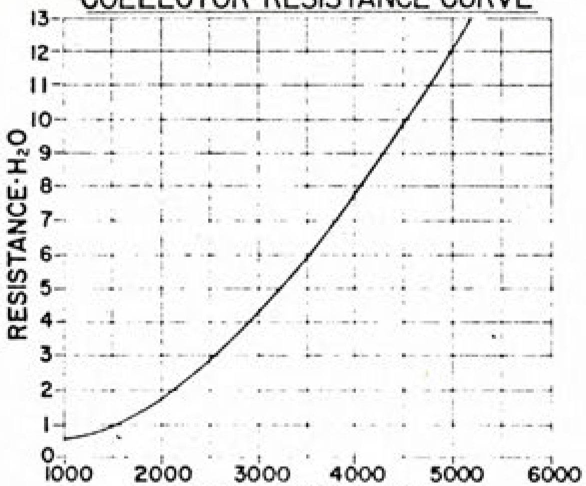
HIGH VELOCITY (H-V) COLLECTOR

FIGURE NO. 23

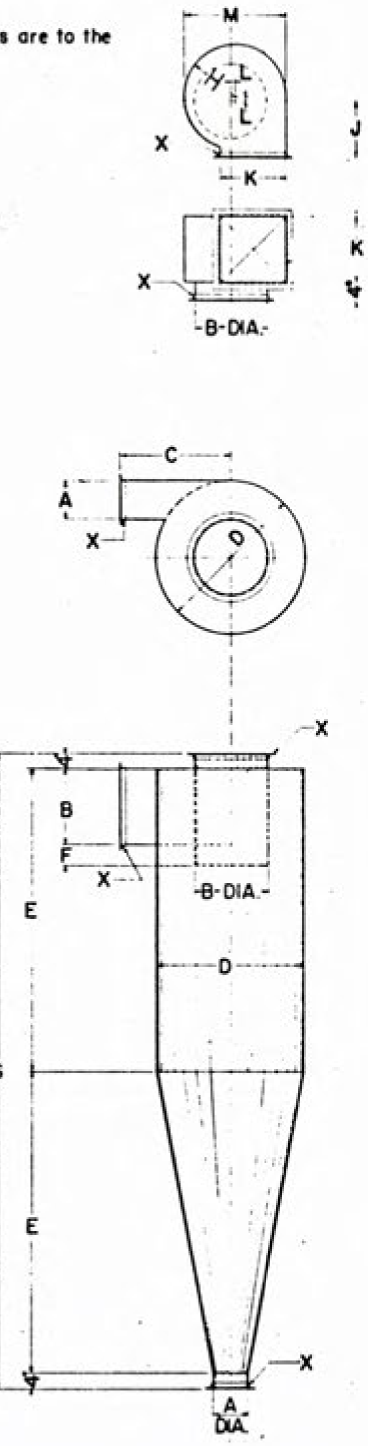
STANDARDS

SIZE	INLET AREA SQ. FT.	CAPACITY C.F.M.	SIZE	INLET AREA SQ. FT.	CAPACITY C.F.M.
1	.052	121 - 175	11	.656	1532-2202
2	.067	155 - 223	12	.917	2140-3080
3	.087	203 - 292	13	1.188	2775-3990
4	.115	268 - 386	14	1.566	3660-5260
5	.147	342 - 493	15	2.00	4675-6720
6	.189	441 - 634	16	2.626	6130-8825
7	.244	568 - 818	17	3.415	7970-11470
8	.322	751 - 1080	18	4.430	10370-14900
9	.420	980-1410	19	5.770	13460-19370
10	.543	1268-1825	20	7.510	17510-25200

COLLECTOR RESISTANCE CURVE



NOTE: All dimensions are to the inside.



DIMENSIONS

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	X	HEAVY SERVICE GA.	HEAVY SERVICE WT.	MEDIUM SERVICE GA.	MEDIUM SERVICE WT.	LIGHT SERVICE GA.	LIGHT SERVICE WT.
1	1 15/16"	3 7/8"	5 13/16"	7 3/4"	1'-3 1/2"	1"	3'-3"	2 11/16"	4"	3 7/16"	1/4"	5 3/8"	1"x1/8"	14	20	16	17	20	11
2	2 3/16"	4 3/8"	6 9/16"	8 3/4"	1'-5 1/2"	1 1/8"	3'-7"	3"	4"	3 11/16"	1/4"	6"	1"x1/8"	14	25	16	21	20	14
3	2 1/2"	5"	7 1/2"	10"	1'-8"	1 1/4"	4'-0"	3 7/16"	4 1/2"	4 7/16"	5/16"	6 7/8"	1"x1/8"	14	32	16	27	20	17
4	2 7/8"	5 3/4"	8 5/8"	11 1/2"	1'-11"	1 7/16"	4'-6"	3 15/16"	5"	5 1/8"	3/8"	7 7/8"	1"x1/8"	14	42	16	34	20	22
5	3 1/4"	6 1/2"	9 3/4"	1'-1"	2'-2"	1 5/8"	5'-0"	4 1/2"	5 1/2"	5 13/16"	7/16"	9"	1"x1/8"	14	53	16	43	20	27
6	3 11/16"	7 3/8"	11 1/16"	1'-2 3/4"	2'-5 1/2"	1 7/8"	5'-7"	5 1/16"	6"	6 9/16"	7/16"	10 1/8"	1"x1/8"	14	67	16	54	20	34
7	4 3/16"	8 3/8"	1'-0 9/16"	1'-4 3/4"	2'-9 1/2"	2 1/8"	6'-3"	5 3/4"	6 3/4"	7 7/16"	1/2"	11 1/2"	1"x1/8"	14	85	16	69	20	43
8	4 13/16"	9 5/8"	1'-2 7/16"	1'-7 1/4"	3'-2 1/2"	2 7/16"	7'-1"	6 5/8"	8"	8 9/16"	5/8"	13 1/4"	1 1/2"x1/8"	12	156	14	113	18	76
9	5 1/2"	11"	1'-4 1/2"	1'-10"	3'-8"	2 3/4"	8'-0"	7 1/16"	8 1/2"	9 13/16"	11/16"	14 1/8"	1 1/2"x1/8"	12	201	14	146	18	97
10	6 1/4"	1'-0 1/2"	1'-6 3/4"	2'-1"	4'-2"	3 1/8"	9'-0"	8 1/16"	9 1/2"	11 1/8"	3/4"	16 1/8"	1 1/2"x1/8"	12	257	14	187	18	123
11	7 1/8"	1'-2 1/4"	1'-9 3/8"	2'-4 1/2"	4'-9"	3 9/16"	10'-2"	9 13/16"	10 3/4"	12 11/16"	7/8"	19 5/8"	1 1/2"x3/16"	12	336	14	245	18	163
12	8 1/8"	1'-4 1/4"	2'-0 3/8"	2'-8 1/2"	5'-5"	4 1/16"	11'-6"	11 3/16"	12 1/4"	14 7/16"	1"	22 3/8"	1 1/2"x3/16"	12	432	14	314	18	208
13	9 1/4"	1'-6 1/2"	2'-3 3/4"	3'-1"	6'-2"	4 5/8"	13'-0"	12 1/2"	14"	16 7/16"	1 1/8"	25"	1 1/2"x3/16"	10	709	12	556	16	327
14	10 5/8"	1'-9 1/4"	2'-7 7/8"	3'-6 1/2"	7'-1"	5 5/16"	14'-10"	14 5/8"	16"	18 7/8"	1 3/8"	29 1/4"	1 1/2"x3/16"	10	928	12	726	16	427
15	1'-0"	2'-0"	3'-0"	4'-0"	8'-0"	6"	16'-8"	16 1/2"	18"	19 5/8"	1 1/2"	33"	1 1/2"x3/16"	10	1175	12	928	16	539
16	1'-1 3/4"	2'-3 1/2"	3'-5 1/4"	4'-7"	9'-2"	6 7/8"	19'-0"	18 15/16"	21"	24 1/2"	1 11/16"	37 7/8"	1 1/2"x3/16"	10	1534	12	1202	16	700
17	1'-3 11/16"	2'-7 3/8"	3'-11 1/16"	5'-2 3/4"	10'-5 1/2"	7 7/8"	21'-7"	22 15/16"	23 1/2"	27 15/16"	1 5/16"	45 7/8"	1 1/2"x3/16"	10	1987	12	1557	16	905
18	1'-5 7/8"	2'-11 3/4"	4'-5 5/8"	5'-11 1/2"	11'-11"	8 15/16"	24'-6"	24 5/8"	27"	31 13/16"	2 1/4"	49 1/4"	2"x3/16"	3/16"	3507	10	2587	14	1467
19	1'-8 3/8"	3'-4 3/4"	5'-1 1/8"	6'-9 1/2"	13'-7"	10 3/16"	27'-10"	28"	30"	36 1/4"	2 9/16"	56"	2"x3/16"	3/16"	4534	10	3344	14	1891
20	1'-11 1/4"	3'-10 1/2"	5'-9 3/4"	7'-9"	15'-6"	11 5/8"	31'-8"	32"	35"	41 3/8"	2 5/16"	64"	2"x3/16"	3/16"	5908	10	4353	14	2460

the inlet transition is too large but if the collector continues to give trouble it should be corrected and modified as outlined above.

THE HIGH VELOCITY COLLECTOR. Sketch and Tables on Figure 23 gives information for selecting the proper collector for a given volume of air and complete dimensions. The discussion above gives a typical example of the increase in static and horsepower, all of which, may be calculated from the Resistance Curve on Fig. 23. The adjustable rain cap, similar to that on Sketch 22 is also recommended for the High Velocity Collector.

SOCK FILTERS. As mentioned in PART #1, in order to obtain the ultimate in cleanliness around an oil mill, practically all cyclones or dust collectors must eventually be equipped with sock filters to filter all air from the discharge stacks.

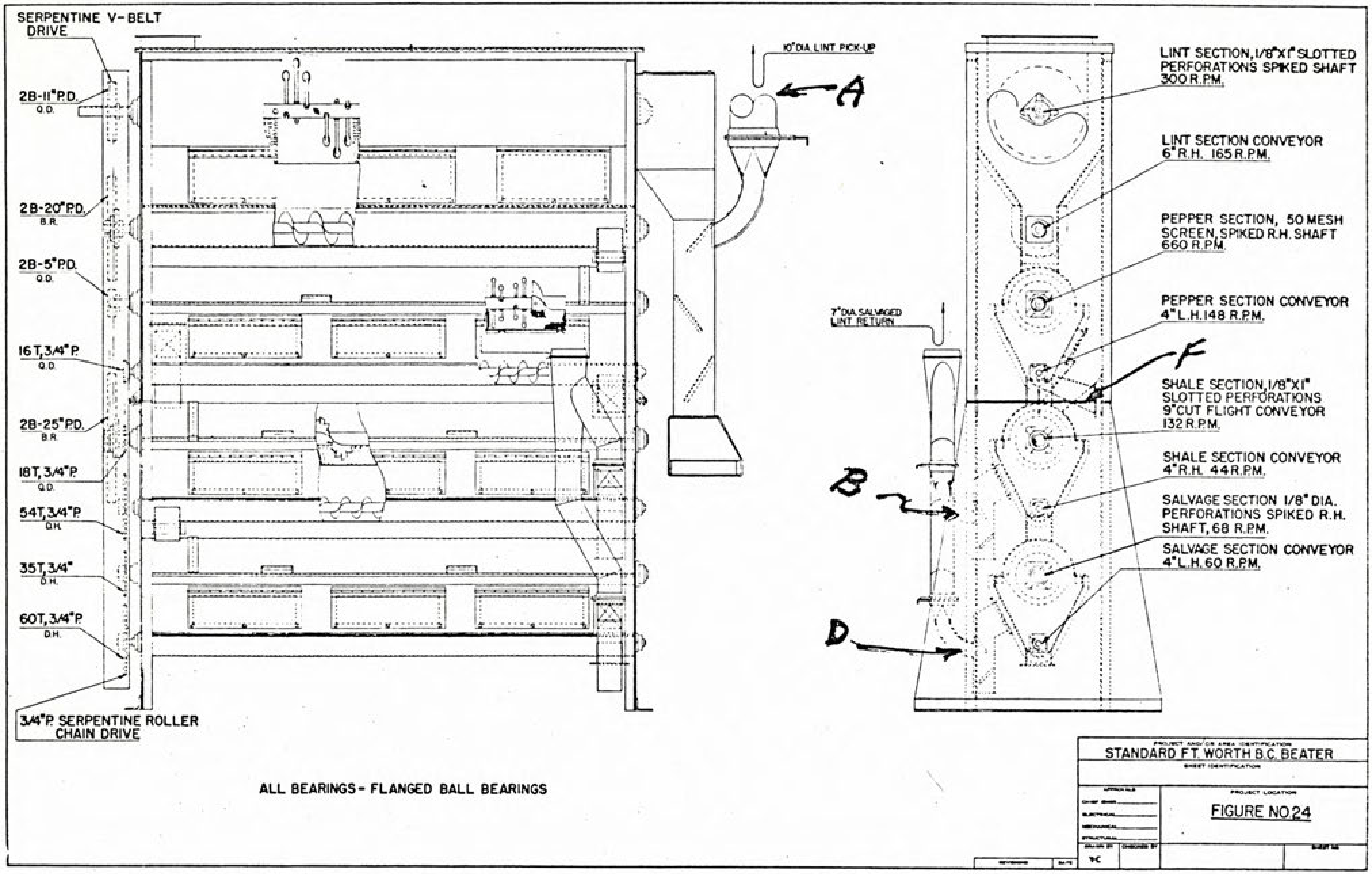
Quite a few mills are using sock filters on pneumatic systems handling solvent extracted meal and several experiments are now under way with these devices on pneumatic systems handling lint. So far as is known they have not yet been tried on a complete lint flue system.

Probably the reason the sock filters have not been used more extensively around oil mills is due to their relatively high cost. It has been estimated that this equipment will cost about $1.00 per C.F.M. of air handled, which would mean about $1,500.00 per Linter. A mill with 30 linters could spend $45,000 and the installed cost for the entire mill could very well run $75,000 to $100,000.

One means of substantially reducing this cost would be to recycle 60% to 70% of the air and filter only 30% to 40%, thereby reducing the cost accordingly. This would be a simple matter on a pneumatic system handling lint from beaters to baling press, etc., but would be more difficult on the lint flue systems. This would require some experimenting to get the return air back to the linter, but it can and, eventually will be done.

Several companies in Texas and Arizona are testing various types of sock filters and claim they can build them for much less than $1.00 per C.F.M.

With the interest now being shown by oil mills and manufacturers it will not be long before some mill is completely equipped with sock filters, and eventually the old saying that "an oil mill is not supposed to be clean" will be dispelled.


SERPENTINE V-BELT DRIVE
2B-11" P.D. Q.D.
2B-20" P.D. B.R.
2B-5" P.D. Q.D.
16T, 3/4" P. Q.D.
2B-25" P.D. B.R.
18T, 3/4" P. Q.D.
54T, 3/4" P. D.H.
35T, 3/4" D.H.
60T, 3/4" P. D.H.
3/4" P. SERPENTINE ROLLER CHAIN DRIVE
10" DIA. LINT PICK-UP
A
7" DIA. SALVAGED LINT RETURN
B
D
F
LINT SECTION, 1/8"X1" SLOTTED PERFORATIONS SPIKED SHAFT 300 R.P.M.
LINT SECTION CONVEYOR 6" R.H. 165 R.P.M.
PEPPER SECTION, 50 MESH SCREEN, SPIKED R.H. SHAFT 660 R.P.M.
PEPPER SECTION CONVEYOR 4" L.H. 148 R.P.M.
SHALE SECTION, 1/8"X1" SLOTTED PERFORATIONS 9" CUT FLIGHT CONVEYOR 132 R.P.M.
SHALE SECTION CONVEYOR 4" R.H. 44 R.P.M.
SALVAGE SECTION 1/8" DIA. PERFORATIONS SPIKED R.H. SHAFT, 68 R.P.M.
SALVAGE SECTION CONVEYOR 4" L.H. 60 R.P.M.
ALL BEARINGS - FLANGED BALL BEARINGS
STANDARD FT. WORTH B.C. BEATER
FIGURE NO. 24

PART #8

The Lint Beater

As mentioned in Part #7, one of the features of the Lint Beater is that it eliminates the condenser from the Lint Flue System, allowing the fan to operate at lower pressure, thereby saving considerable power. However, the principal purpose of the Lint Beater is to clean the lint, and within certain limits, control the cellulose.

The Fort Worth B. C. Lint Beater is simple and compact and the standard four section unit, as shown on Sketch #24 is used at most mills for first cut, second cut and motes. In some cases the lower or salvage section may be eliminated in handling motes.

Sketch #24 shows the general arrangement and gives perforated metal, screen size and recommended speeds. These specifications have been developed during a period of relatively high lint cuts and some variations might be indicated if radical changes in lint quality become necessary. For example, some mills have improved first cut quality by using 3/16" x 1" slotted metal on the top section for first cut, or 3/8" round perforation, instead of the standard 1/8" x 1". The larger perforations remove more short fiber, which may be reclaimed in the second cut, and results in a corresponding reduction in first cut yield. However, it is not normally necessary to change screens or speeds as considerable range in yield and quality may be obtained by simply re-routing the fractions of lint from the shale and salvage sections of the Beaters or adjusting the Beater spikes.

The various arrangements for handling and treating the recycle fractions for both first and second cuts will be discussed below and in all cases references are made to Sketch #24.

a. The conventional arrangement, used by most mills, allows only the main bulk of lint, passing through the top section, to go on to the baling press (Point A). Reclaimed fractions from the shale section (Point B) and salvage section (Point D) are combined and recyclea to the second cut trunk line.

b. On multiple cut systems, where separate beaters are provided for each cut the reclaim lint from the first cut beater (Points B & D) may be returned to the second cut flue system, second cut beater fractions to the third cut, etc.

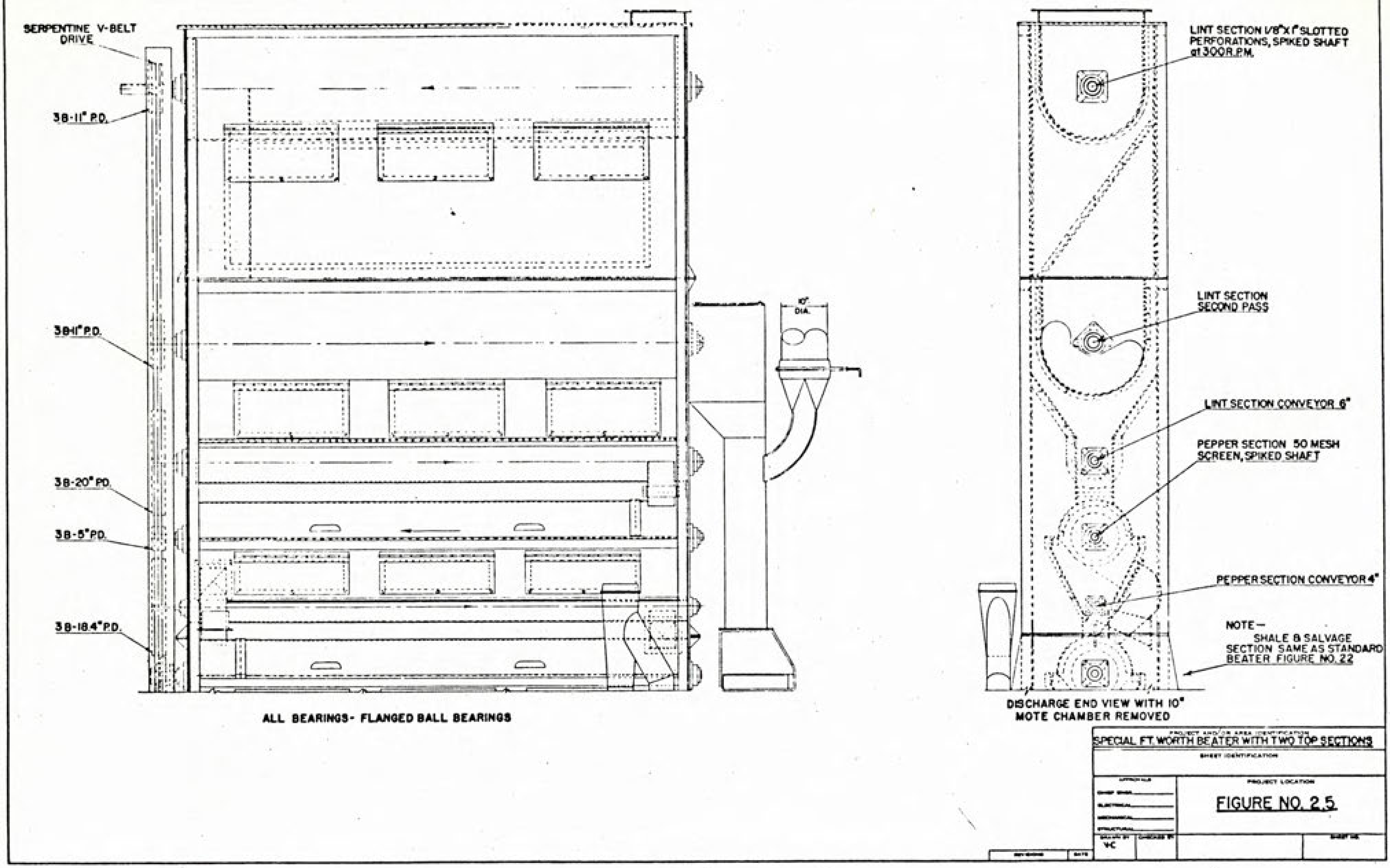
c. In larger mills and particularly with trashy seed, it is desirable to provide special treatment for the recycle or reclaim material. Instead of returning this material to the second or third cut flue systems it may be passed through an auxiliary Reclaim Beater and then returned to the second cut flue system or in the case of multiple cuts to the third or fourth cut flue systems. Naturally, the ideal arrangement would be to clean these fractions of lint sufficiently in the Recycle Beater, to inject them directly into the finished lint at Point A, but this is not usually possible. On extremely trashy seed, where the Recycle Beater does not remove sufficient foreign matter from the Reclaim Lint a further pneumatic cleaning, with a Whirligig or Super-Jet, is frequently desirable before returning this material to the last cut flue system.

The operation of both the first and second cut beater is relatively simple and, after proper adjustment, requires only normal maintenance and attention. The moting chambers on the various sections of the beater are essential features and if properly adjusted, will remove considerable trash, hull particles and seed that would otherwise go out with the finished lint. The moting chambers should be checked each day and adjusted by means of the valve to drop a maximum of trash. An adjustment to occasionally drop a small particle of lint assures maximum removal of foreign matter. Where the fan on the main moting chamber is used to convey the lint a considerable distance to the baling press, it is sometimes not possible to close the valve sufficiently to obtain proper moting. This situation may be remedied by installing a bleeder valve, just above the control valve, and bleeding in sufficient air to handle the lint. The control valve may then be adjusted as necessary to obtain proper moting.

The Lint Beater, or the moting chambers, are not intended to compensate for poor lint room operation, and where off quality or trashy lint is indicated the moting of the linters, other linter adjustment, and the Lint Flue System should also be carefully checked.

Helpful operating suggestions in connection with the Lint Beater are listed as follows:

a. Several times each day, the operator should open the inspection doors, under each section, to see that there is no accumulation of lint between the screen and the housing.


SERPENTINE V-BELT DRIVE
3B-11" P.D.
3B-11" P.D.
3B-20" P.D.
3B-5" P.D.
3B-18.4" P.D.
ALL BEARINGS- FLANGED BALL BEARINGS
10" DIA.
LINT SECTION 1/8"x1" SLOTTED PERFORATIONS, SPIKED SHAFT at 300 R.P.M.
LINT SECTION SECOND PASS
LINT SECTION CONVEYOR 6"
PEPPER SECTION 50 MESH SCREEN, SPIKED SHAFT
PEPPER SECTION CONVEYOR 4"
NOTE— SHALE & SALVAGE SECTION SAME AS STANDARD BEATER FIGURE NO. 22
DISCHARGE END VIEW WITH 10" MOTE CHAMBER REMOVED
SPECIAL FT. WORTH BEATER WITH TWO TOP SECTIONS
FIGURE NO. 2.5

b. The pepper, from under the pepper section (Point F., Sketch #24) should frequently be inspected to see that it does not contain excess lint, which indicated a hole in the screen.

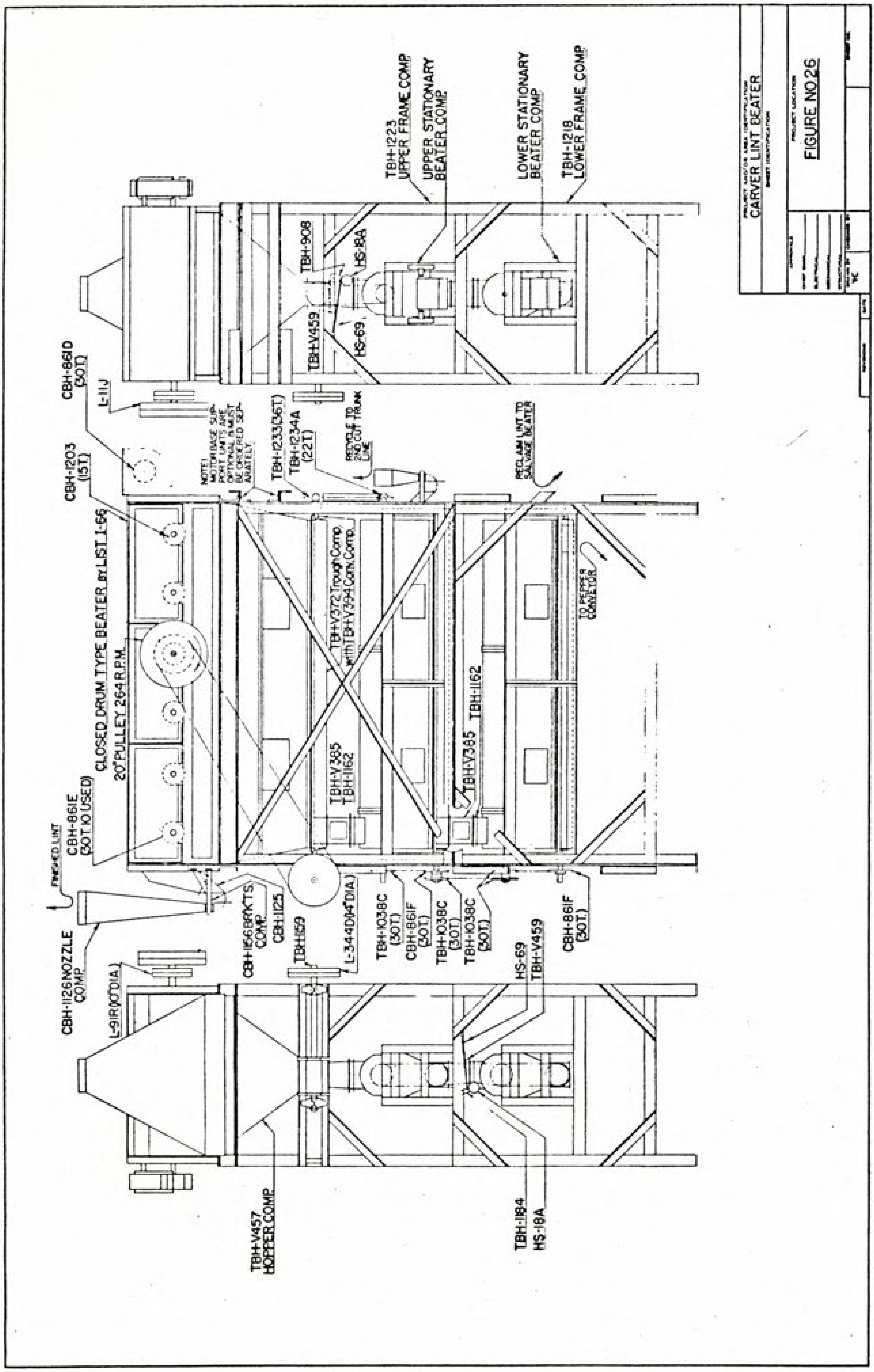
c. During each shutdown period, or approximately once each week, the cover should be removed from each section of the beater, and the interior and screens thoroughly cleaned and inspected. This is particularly important in the pepper section, where the 50 mesh screen is subject to matting over or rusting, from dampness or rain leaking through the cyclone. All spikes should be adjusted to the proper angle, generally more than 45°, and set to barely clear the screen. A flatter angle of 60° to 80°, to slow the travel through the pepper section, will beat out more pepper and increase cellulose.

<u>BEATER CAPACITY AND ARRANGEMENT</u>. In some cases the standard four section beater has been known to handle the lint from fifteen or more Linters but for best results it is not recommended for more than eight or ten Linters, i.e., in the neighborhood of 500 to 600 pounds of Lint per hour.

Where greater capacities are required and where it might not be convenient to install an additional beater the special Fort Worth Beater with two top sections in series may be obtained. A beater of this type is shown on Sketch #25 and is being used successfully handling the lint from 18 Linters or approximately 800 pounds of Lint per hour.

The load on Lint Beaters will vary from mill to mill perhaps more than any other equipment in the plant. Beater capacity will depend on the type seed being worked and the trash and foreign matter in the lint. On clean, hand-picked cotton, and where the Linters are efficiently operated, it is possible to operate up to 15 Linters or 600 pounds of lint per hour through a Fort Worth BC-4 beater. On trashy seed and to produce best quality lint, it would be well to handle only 7 or 8 linters or approximately 300 pounds of lint per hour.

The Fort Worth BC-5 has two top sections, Fig. #25, in series and therefore doubles the capacity of the top or primary section, but it has no more capacity than the BC-4 for pepper, shale and salvage. Therefore, if higher cellulose is required and shale is a problem, then 2 BC-4 beaters in series would be



CARVER LINT BEATER
FIGURE NO.26
TBH-1223 UPPER FRAME COMP.
UPPER STATIONARY BEATER COMP.
LOWER STATIONARY BEATER COMP.
TBH-1218 LOWER FRAME COMP.
TBH-908
HS-18A
TBH-V459
HS-69
CBH-861D (30T.)
L-11J
CBH-1203 (15T.)
NOTE! MOTOR BASE SUPPORT UNITS ARE OPTIONAL & MUST BE ORDERED SEPARATELY.
TBH-1233(36T.)
TBH-1234A (22T.)
RECYCLE TO 2ND CUT TRUNK LINE
RECLAIM LINT TO SALVAGE BEATER
CLOSED DRUM TYPE BEATER BY LIST 1-66
20" PULLEY 264 R.P.M.
TBH-V372 Trough Comp. with TBH-V394 Conv. Comp.
TO PEPPER CONVEYOR
TBH-1162
TBH-V385
TBH-V385 TBH-1162
FINISHED LINT
CBH-861E (30T. 10 USED)
CBH-1126 NOZZLE COMP.
L-91R(10"DIA.)
CBH-1156 BRKTS. COMP.
CBH-1125
TBH-1159
L-344D(14"DIA.)
TBH-1038C (30T.)
CBH-861F (30T.)
TBH-1038C (30T.)
TBH-1038C (30T.)
CBH-861F (30T.)
HS-69
TBH-V459
TBH-V457 HOPPER COMP.
TBH-1184
HS-18A

indicated, rather than one BC-5, handling up to 18 Linters, or the BC-5 could be followed with a recycle or tailings beater for further treatment of tailings fractions. In this connection, two BC-4s will do a better job, operating in series with up to 18 Linters, than in parallel, and only nine Linters per beater.

The Carver beater, like the Fort Worth BC-5, has double top section capacity but is limited in pepper and shale capacity. Therefore, for maximum capacity more auxiliary beater capacity is required. Doubling the pepper and shale section capacity on Carver beaters would make it possible to increase cellulose with a minimum of lint loss. This is often done by installing a recycle or tailings beater for further treatment of the tailings fractions, rather than recycling them back to the flue system. (See Carver Beater, Sketch 26)

The treatment of tailings fractions and method of handling them is the most important part of a beater system. After arriving at adequate primary beater capacity, as outlined above, all tailings fractions, i.e., all material passing through the screen on the top section, should be weighed. This can best be done by weighing first the pepper from the pepper section, second the clean overs from the shale section, third the overs and thrus from the salvage section. The total of these four fractions, which constitute the thrus from the top section will usually average 35 to 40% of the uncleaned lint going to the beaters. This will vary up or down, depending on type of lint and yields; as well as perforated metal used. On first cut Linters with standard 1/8" x 1" slotted metal it may run only 10%, or with larger metal probably not over 20%. On normal second cuts a good average of thrus would run 35 to 40% and on third cuts may very well go up to 55%. This would certainly put an excessive load on the beaters where all tailings are returned to the flue system and recycled to the beaters. Therefore, every operator should know just how much lint is being recycled and make an effort to mainimize it.

If it should be decided that a "reclaim or recycle" beater is desirable to handle all tailings now being returned to the system, the total quantity to be handled should be determined. This material is trashier and more difficult to handle than second cut lint and the BC-4 beater should not be forced to handle over 300 pounds/beater/hour, preferably less. If more than 300 pounds/beater is being produced, consider a BC-5 with two top sections. After putting the recycle beater in operation the reclaimed lint from the primary section should be good enough to go direct to the press with the lint from the primary beaters. In some cases the overs from the shale section may also go direct to the press, but the overs from the salvage section will usually require further treatment or recycling to the system. Screen or perforated metal sizes on lint beaters used for recycle purposes, must be adjusted to suit the material being handled. For example, the standard 1/8" x 1" slotted metal on the top section of a BC-4 or 5 beater, will usually have to be reduced to 3/32" or even 1/16" in handling the finer tailings fractions. Some adjustment can be made by reducing speed and angle of paddles, but these items must be checked and determined on the job.

It is hoped that the above suggestions and ideas will be helpful in allowing each superintendent to select the equipment and arrangement best suited for his particular problem.

MOTES. The standard B. C. Beater, same as used on first cut lint, is now being used very effectively as a Mote Beater. The perforated metal on the top section should be replaced with 3/8" or 1/2" round perforated metal, or a combination of the two. The cut flight conveyor on the shale section (#3) should be replaced with spikes, same as on the pepper section No. 2, and speeded to about 200 RPM. It is desirable to increase the size of the perforations on the shale section No. 3, from 1/8" x 1" to 3/16" x 1", for removing large trash or meats. Reclaimed lint from the shale section is returned to the mote handling system and recycled. Trash, dirt and seed are segregated and practically all lint is reclaimed. In most cases the mote yield is increased, due to the amount reclaimed, and the quality greatly improved over that of the regular mote beater.

Where the quality of the finished motes is compatible, many mills are now blending motes with second cut lint, by injecting into the second cut trunk line or the robber line handling the lint to the Beater. If the Motes contain any long stringy fibers it is objectional to some of the chemical lint buyers. Good quality, clean Motes are sometimes blended with first cut lint, or mill run.

HULL PEPPER. The handling and disposal of hull pepper, sometimes referred to as flue bran, is usually quite a problem which each mill must work out to best advantage and to conform to local conditions.

The quantity and quality of hull pepper from each mill will vary over a wide range depending on lint cut, saw sharpening procedure, type of seed, lint beating procedure, etc. With the standard 50 mesh screen on the pepper section of the beater the pepper should not contain an excessive quantity of fiber but this material should be checked at least once each day, by the lint room operator, to be sure that there are no holes in the screen which will allow excess fiber to get in with the pepper.

Oil content of the hull pepper will vary over a wide range depending on lint cut, roll tightness, etc. With moderate lint cuts and medium or loose rolls the oil in pepper will run less than 2% but in other cases, with the linters forced to maximum capacity, the pepper might run as high as 5% oil. Quantity of pepper produced will vary anywhere from 12 pounds per ton of seed up to as high as 40 pounds per ton under extreme conditions. Naturally, the quantity of pepper will also increase if larger screen openings are used on the pepper section and with 30 or 40 mesh screens the pepper will also contain a higher percentage of fiber. The speed and adjustment of the spikes in the beater section will directly affect the amount of pepper produced and where the hull beater is adjusted to produce maximum cellulose in second cut lint the production of pepper will increase proportionally.

The most common methods of disposing of hull pepper are as follows:

a. <u>Convey from beater and introduce directly into meats going to press room</u>. This method is probably the most commonly used and does not appear to have any detrimental effect on extraction in connection with hydraulic presses, expellers or prepress solvent extraction. It is possible that there might be some unusual acid condition, or other condition, in connection with hull pepper that might be detrimental to oil quality, particularly color, but this has not been definitely proven. Naturally, the quantity of hull pepper introduced into the meats will lower the protein proportionally and in extreme cases, where it is not possible to maintain the desired protein in cake, the hull pepper must be disposed of elsewhere, even though it might be less economical.

b. <u>Convey and introduce the pepper into the delinted seed going to the Hullers</u>. This procedure is used by a few mills and actually accomplishes about the same purpose as Arrangement "A" above, in that most of the pepper is screened out on the safety shaker ahead of the Huller and finds its way into the meats. One advantage to this system is that any large hull particles or fiber will be screened from the pepper, on the safety shaker, and only the fine pepper will go to the meats. Objection to this system is that it creates a dusty condition on the safety shaker and there is a possibility that any sand in the pepper might be detrimental to huller knives. Unfortunately, either of the above systems would result in excessive wear on rolls, Expellers, and other press room equipment if the pepper contains an excessive quantity of sand.

c. Convey and introduce pepper directly into finished hulls. This procedure has been discontinued by most mills in that the hull pepper segregates from the hulls and gives them a very bad dirty appearance that is objectionable to most customers. Actually, the pepper, if uniformly distributed, would not affect the quality of cottonseed hulls but does result in a bad appearance and therefore it is impossible to utilize it in this manner at most mills.

d. The most logical method of disposing of hull pepper is to collect it in tanks or bins and blend it back with finished meal, as required, to control protein. This procedure is used by quite a few mills where equipment is available for checking and controlling protein in meal but unfortunately, some mills do not have the necessary blending equipment or means of holding back cake or meal to check protein before blending. We believe that any mill would find it profitable to provide adequate facilities for blending hull pepper with the finished meal or pellets, at least to the extent of utilizing their production of hull pepper.

As mentioned above the normal hull pepper production with properly maintained screen on the pepper section of the beater will produce a reasonably clean pepper but as this screen is difficult to maintain and as a very small hole in the screen will allow considerable lint to get in with the pepper, some mills use a Ro-Ball sifter or some similar device for screening hull pepper, regardless of how it is disposed of. This will not only result in a clean pepper, free of loose lint, but will automatically reclaim any lint that might accidentally get into the pepper due to broken screens.

Where the hull pepper is introduced into the meats at hydraulic or expeller mills there should be no overall difference in extraction results or "press room standard" in that the hull pepper simply replaces hulls for controlling protein. In fact, there might be some slight gain in oil yield as the pepper will probably contain a higher percentage of oil to begin with than the normal hulls. In connection with solvent extraction it is conceivable that some oil is reclaimed from the pepper, in that the hull pepper will normally contain a higher percentage of oil than the finished extracted meal.

PART #9

Theory & Engineering Data

For many years, all Linters were equipped with 106 saws, but in the early part of 1920, experiments were conducted with 140 saws and it was found that extra capacity and more uniform delinting could be obtained with the additional saws. Later on, this spacing was changed to 141 saws in order to conform to the spacing of the conventional 36 head gummer. By 1940, probably 75% of the old linters in the cotton belt had been converted to 141 saws.

In the early part of 1942, a carefully planned series of tests were conducted, with a Linter equipped with 176 saws to compare its performance to that of the 141 and 106 Saw Linter.

Earlier experiments with the 141 Saw Linter had indicated that a closer spacing and more saws would give more capacity, but it had also been determined that extremely close spacing of the saws, which would not allow the delinted seed to pass between saws, was not practical. It was then calculated that something in the vicinity of the 176 saw spacing would be the optimum to allow passage of delinted seed between saws. The actual selection of 176 saws was for the same reason that 141 saws was selected to succeed the 106 saw, i.e., the normal spaces between saws (105-140-175) are all multiples of a common number (35) and therefore, may use the same spindle spacing on the gummer. With the 106 Saw Linter, the 36 head gummer contacts every third saw, with the 141 every fourth saw and with the 176 every fifth saw. This allows a mill to change its Linter saw spacing with a minimum of alterations to the gummer.

A summary of the extensive experiments clearly demonstrating the superiority of the 176 saw equipment, is given below.

SUMMARY AND CONCLUSIONS OF COMPARATIVE TESTS ON 106, 141 AND 176 SAW LINTERS

1. These tests indicated that on heavy lint cuts the 141 saw linter will give 25% or 30% more capacity than the 106 saw. The 176 Saw Linter is even better on closer cuts and appears to have 45% more capacity than the 106 saw.

2. The 141 saw linter, on heavy cuts, produces lint for 10% less power per pound of lint than the 106, and the 176 requires 10% less power than the 141. Many tests showed even greater savings in power with the additional saws. Under present conditions, this would mean that a mill with 176 saws could crush seed for $0.10 per ton less power cost than with 106 saws.

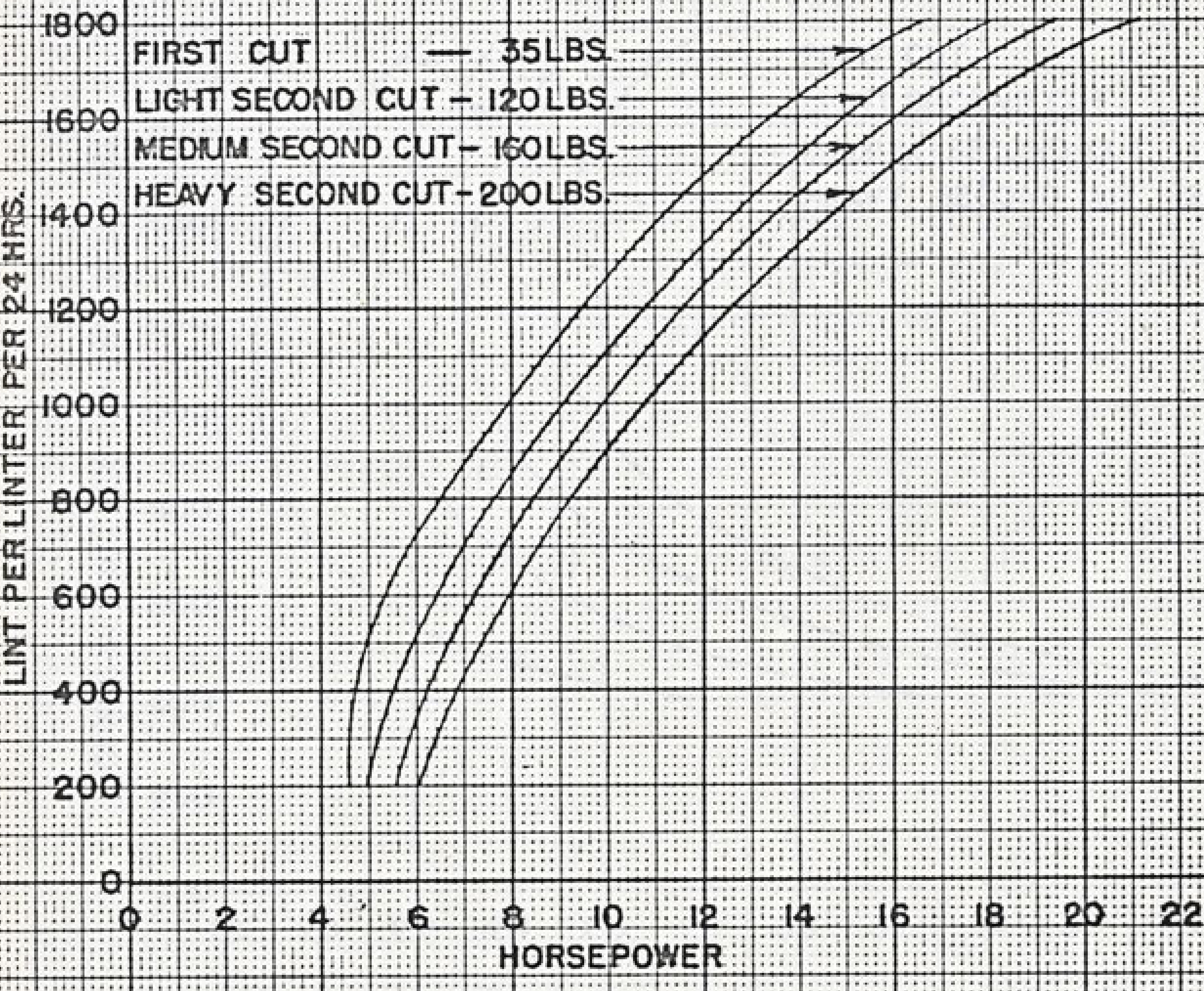
3. Due to the more uniform linting with the closer spacing of saws, it is believed that the 176 saw equipment will actually obtain 5# to 10# more lint per ton, than it would be possible under any conditions, to obtain with the 106 saw linter.

So far as is known, 176 is the greatest number of saws and the closest spacing ever successfully used on a Linter. Practically all mills in this country have converted their equipment to this spacing and most domestic and foreign mills are now equipped with 176 saw linters. A few operators prefer 141 saws on first cut and some think there is less hulling of seed with 141 saws -- but in this writer's opinion the greater capacity and improved efficiency more than offsets any hulling of seed with the 176 saw linter. Actually just as good quality lint may be produced with 176 saws, if the operator does not operate saws at excessive speeds in an effort to obtain more than rated capacity.

The overall length of the Carver 176 saw cylinder is identical to that of the 106 and 141 saw, i.e., 61.1625". This results in a center to center spacing of saws of .5825", .436875" and .3495" respectively for the 106, 141 and 176 saw cylinders. With the standard .035 gauge saw the space block thickness is .5475", .401875" and .3145" respectively. The above dimensions also apply to the 176 saw Big Linter.

The 141 saws are approximately 33% more than 106 saws and 176 saws approximately 25% more than 141 saws. Theoretically, the increase in capacity should be approximately proportional to the additional saws. Most of the available data, particularly on heavy cuts, did indicate the increase in capacity would be in line with the additional saws, but for practical purposes, it is now estimated 20% increase in capacity with the 141 saw over the 106 and 15% increase with the 176 saw over the 141 saw, and at this rating good quality lint may be anticipated.

The horsepower requirements of the 141 and the 176 saw linter do not increase directly in proportion to the increase in capacity. This is due to the fact that the power required



HORSEPOWER—LINT PER LINTER PER 24 HRS.
AT VARIOUS LINT CUTS

FIGURE NO. 27

CHART NO. I

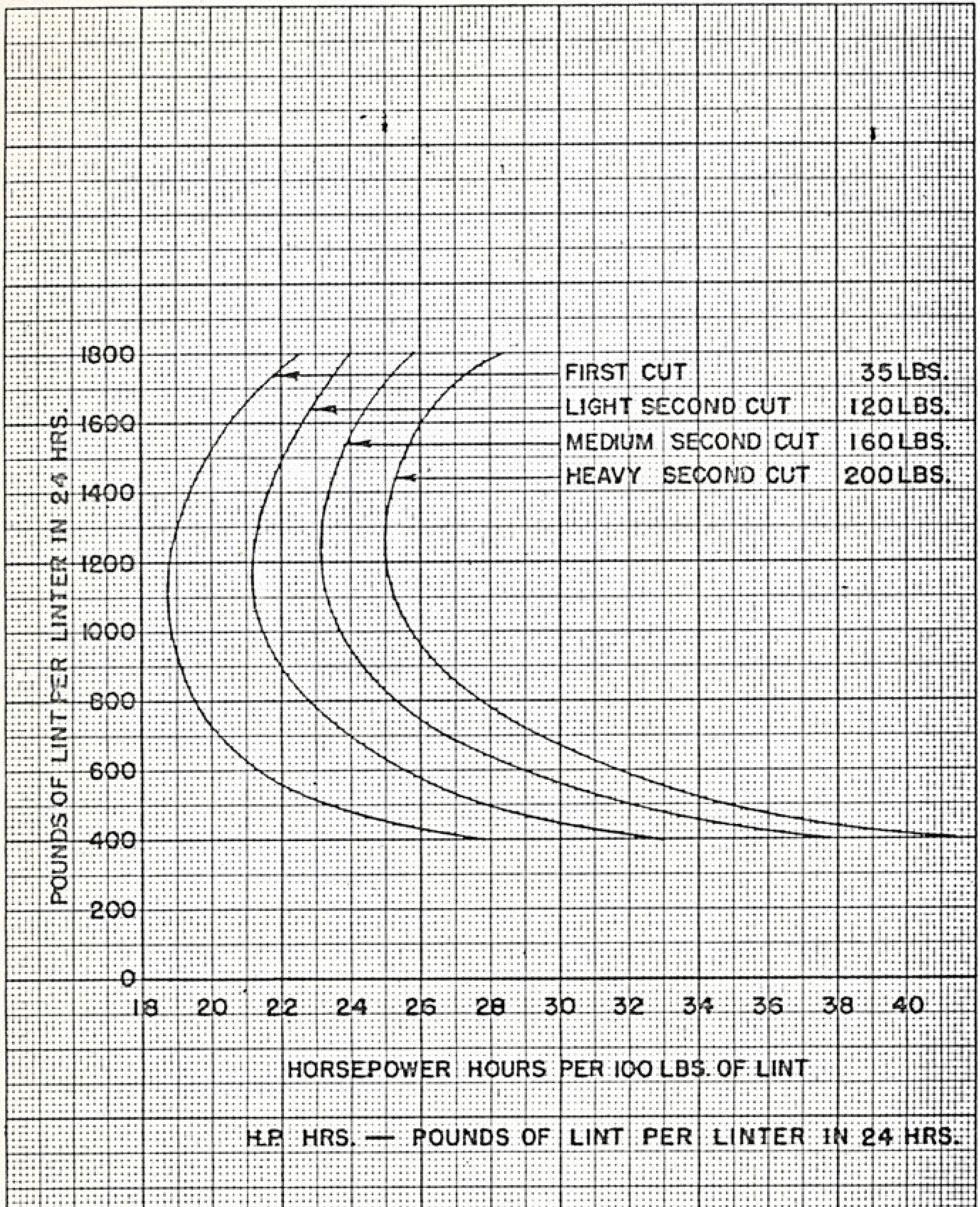


FIGURE NO. 28

CHART NO. 2

by the brush and the friction load on both machines is the same, and in actual practice, the 141 saw machine is about 5% more efficient than the 106 saw and the 176 saw reduces the power requirement per pound of lint another 5%.

It is difficult to state, within close limits, the horsepower requirements of a Linter as it is very much dependent on the mechanical condition of the equipment, the type of cottonseed, and very much on the sharpness of the saw. The horsepower requirement will also increase directly in proportion to the lint yield and in attempting to delint to less than 1-1/2% lint left on seed, the power requirement often becomes prohibitive for practical purposes. Under average conditions, a second cut 176 saw linter will require about 1 H.P. per 100 pounds of lint per 24 hours. In other words, with the linter producing 1200 pounds of lint per 24 hours, delinting to approximately 2% lint on seed, it will require approximately 12 H.P. Referring to Sketch #27 it will be noted that to produce 1200 pounds of lint per Linter per 24 hours, the machine will require slightly under 12 H.P. for a medium or normal second cut and slightly over 12 H.P. for an extremely heavy second cut. From Sketch #27 it will also be noted that in producing 1000 pounds of first cut lint per Linter the machine will require only 8 H.P. The curves shown on this Chart are based on 176 saw linter performance and the power requirements for the 106 and 141 saw linter will be slightly greater.

Sketch #28, based on normal operating conditions for the 176 saw linter, shows the horsepower hours per pound of lint plotted against pounds of lint per Linter per 24 hours at various lint yields. From this Graph it will be noted that the power required to produce a pound of lint decreases as the Linter capacity is increased up to approximately 1300 pounds of lint per Linter per 24 hours. From this Graph it is clear that from a horsepower standpoint, the most efficient point to operate a second cut Linter would be between 1200 and 1300 pounds of lint per Linter per 24 hours. In actual practice, it is normally somewhat difficult to force the Linter in excess of 1250 pounds of lint per 24 hours (without excess saw speeds which are detrimental to lint quality), and therefore it is generally advisable to operate just under this point of maximum efficiency. For normal second cut production, the capacity has been established at approximately 1200 pounds of lint per Linter per 24 hours. At this point a good grade of lint may be produced, and the efficiency of the machine is almost at a maximum. Due to slower saw speeds required to produce top quality first cut lint, the normal capacity of a first cut 176 saw linter has been established at approximately 1000 lbs.

of Lint per Linter per 24 hours. With some types of seed much higher capacities are possible.

The speed of the Linter saw has an important bearing on the capacity of the Linter and also on the quality of the lint, but it cannot always be operated at maximum speeds and at the same time produce the best grades of lint. Best quality first cut lint, or fancy Mill Run, will be produced with the saw running approximately 400 RPM. At this speed the capacity of the machine is somewhat under normal and for average conditions it has been found practical to operate the first cut saw from 500 to 550 RPM. As stated above, where further improvement in quality is desired, it might be necessary to reduce this speed to 400 or 450 RPM, with a corresponding reduction in capacity.

In producing second cut lint the capacity of the Linter may be increased in proportion to the speed of the saw up to 800 RPM; however, at speeds in excess of 725 RPM there are indications of excess hulling of seed, and the quality of the lint will begin to drop off. During the war, when maximum second cut yields were considered necessary, and where Linter capacity was limited, many mills increased their saw speeds up to 800 RPM and were able to produce as much as 1500 pounds of lint per Linter per day with 141 saws. In all such cases there was indication of excess hulling, and now that quality requirements are more rigid, most of these mills have reduced saw speeds to 725 RPM or less. For normal second cut production, a saw speed of 725 RPM is recommended, and for extra good quality and minimum hulling, it is sometimes desirable to reduce to as low as 600 RPM.

The speed of the float, or to be more explicit, the ratio of the float speed to the saw speed, has a very important bearing on the quality of the lint, particularly on first cut, and also has a slight effect on the capacity of the Linter. For best quality first cut lint, it is recommended that the float run between 90% and 100% of the saw speed. Some operators recommend float speeds in excess of 100% on first cut lint, but it is doubtful that any improvement in quality is obtained after exceeding the above limits and there are indications that the higher float ratio decreases the capacity of the Linter.

For second cut lint a float ratio of 75% to 85% is usually recommended. A few operators have attempted higher ratios with some indication of increased capacity. Something between 80% and 90% is being used on most new installations but there is not sufficient proof available to justify changing floats now operating in excess of 75%.

The ratio between the brush speed and the saw speed has no particular bearing upon the operation of the Linter and it is recommended that the brush be operated at the slowest possible speed at which good moting may be obtained regardless of the saw speed. Where individual condensers were operated, in which the brush must operate against a back pressure, it was necessary for it to run between 1000 RPM and 1100 RPM. With the Lint Flue System, in which the back pressure is relieved, the brush will operate satisfactorily at speed as low as 800 RPM. For average operating conditions, with the Lint Flue System, the brush should run somewhere between 850 and 900 RPM.

Some years ago, there were conflicting opinions as to the most efficient number of teeth on a Linter Saw and saws could be obtained with 300, 315, or 330 teeth. Later on, some of the mills experimented with 365 and even 400 tooth saws. With the larger number of teeth, it was assumed that some additional capacity might be obtained and due to the tooth's being shorter, a slightly better grade of lint might be produced; however, with the old types of saw sharpening equipment, it was difficult to maintain a large number of teeth, and this disadvantage offset the advantage. A happy medium was arrived at and the 330 tooth saw was, and is now, considered standard equipment for practically all linters.

With the Tru-Line Gummer, it is possible to cut and maintain any reasonable number of teeth on a saw, and with a view of increasing capacity and improving quality, a series of tests were conducted with 396, 462 and 528 teeth, as compared with the standard 330 teeth. Although the smaller teeth were beautifully cut and apparently just as sharp as the standard tooth, the capacity of the Linter decreased and the power increased in proportion to the additional teeth. Although there was obviously less hulling with the smaller teeth, there was no appreciable improvement in the quality of the lint. This test was made on second cut lint, and demonstrated conclusively that normally there was no advantage in increasing the number of teeth. Where excessive hulling is encountered or on third or fourth cut Linters, some mills are now using 365 or 396 tooth saws.

THE BIG LINTER. The first 18" diameter saw linter was tested by Carver at a mill in Helena, Arkansas in 1962. A complete installation of 45 linters was made in 1965 at Greenwood, Mississippi and has been very successful. Since then, many of these new delinting machines have been installed all over the world. A German company is also manufacturing the 18" diameter saw linter but no information is available as to preformance or capacity.

Carver has advertised extensively that their big linter has at least twice the capacity of a standard linter and this has been confirmed from actual operating results of two mills in this country. No accurate test data is available for the Big Linter, such as that oulined above for the 141 saw and 176 saw, but all reports from new installations are favorable.

Theoretically, the added capacity of the 18" diameter saw as compared to the 12-1/2" should be about 44%, if based entirely on the circumference or additional teeth, and assuming the same peripheral speed. The speed of second cut saws on the Big Linter has been established at 650 RPM which gives a peripheral speed of 3055 FPM, as compared to 2370 FPM on the 12-1/2" saw at 725 RPM. This adds another 30% capacity for a total increase of 74% on a theoretical basis.

This will immediately bring up the question of "Why not increase the speed of the 12-1/2" saws to obtain the same peripheral speed as the 18" saw and get corresponding increase in capacity?" Unfortunately, this has been tried and results in excessive hulling. For some unknown reason excessive hulling is not encountered with the 18" saw with the higher rim speed. Evidently, there must be something inherent in the design of the 18" saw linter that allows the higher rim speed and results in the increase in capacity of 74% to 100%.

In stating or claiming a given increase in capacity over the 12-1/2" saw linter the question arises as to what is the capacity of the older linter. This is difficult to answer when across the cotton belt the 176 saw linter capacities will range from 700 to 1700 lbs. of lint/linter/day. This wide range is due to maintenance, saw sharpening and type of seed. A fair estimate, as outlined above, would be from 1100 to 1200 lbs/linter/day and would mean that the Big Linter should produce from 2000 to 2200 lbs/day.

Most of the instructions in PARTS #2, #3 and #4, covering the 12-1/2" saw linter, will apply to the Big Linter but there are some differences due to the larger saw that will be discussed briefly below.

Any mills operating the Big Linter will no doubt have a copy of Carver's Erecting and Operating Instructions, and these instructions should be carefully studied by the Mill Superintendent and Linterman. The main difference in adjusting the Big Linter is the projection of saw through the rib which with the larger diameter saw is naturally greater. A special gauge is furnished with the Big Linter for adjusting the gratefall for proper saw projection. One gauge for first cut with a projection of 1-1/2" and another for second cut with 1-5/8" projection. The gauge also has blocks at the upper end to adjust the clearance from top of saws to the throat of ribs. This gauged distance is 3/4" on first cut and 5/8" on second cut. All of the gratefall adjusting, with the Big Linters, may be done with the single point adjusting mechanism at the top of the gratefall, which makes this adjustment easier and simpler than on the old linters that require adjusting top and bottom.

The brush on the Big Linter is the same diameter as the brush on the 12-1/2" saw linter. With 44% more peripheral speed on the larger saw, it would seem that the brush should run proportionally faster. Experience has demonstrated this to be true and a speed of 1220 R.P.M. is now recommended for the Big Linter Brush as compared to about 850 R.P.M. on the old linters.

This higher brush speed will naturally develop more air and the lint flue system for the Big Linter should be designed to handle 2000 to 2200 C.F.M. per linter, compared to 1300 to 1500 C.F.M. on the old linter.

As of this writing, no brushless device has been built for the Big Linter, but test work is now under way, and they should be available within the near future. As pointed out in PART #3, the brushless device is highly desirable for second or third cut linters.

Other than the saw projection through the rib, the higher brush speed and the additional air on the flue system, the adjustments and general operation of the Big Linter should be essentially the same as outlined throughout this manual for the old linter.

It is doubtful that, at present lint prices, the replacement of the 12-1/2" saw linters by Big Linters could be justified, but where the old linters are worn out and extensive repairs are needed, they should be considered.

For a complete new Lint Room, the Big Linter is more economical in all respects. Cost of the equipment would be less and only half as much building space required. Also, the cost for the lint flue system, conveyors and spouts would be proportionally less.

Where an existing mill needs additional linter capacity they may use existing equipment for first and second cuts, and install Big Linters on third cut. On this basis the Big Linter will handle up to 60 tons each with as much as 4-1/2% lint left on seed.

Although the manufacturer has not yet offered a conversion job to rebuild the 12-1/2 saw linters to the 18" saw, it is believed it could be done with reasonable modifications to the steel frame linter, and by purchasing gratefall, seed board and saw cylinder. If a conversion of this kind could be obtained at a reasonable price, it might be interesting to mills with crowded conditions in the lint room or others needing added capacity and no space for more linters.

While it is true that the principle of the modern delinting machine has changed very little, from the original model, it must be admitted that considerable increase in capacity has been developed and the Big Linter will do the work of at least four of the early 106 saw linters.

PART #10

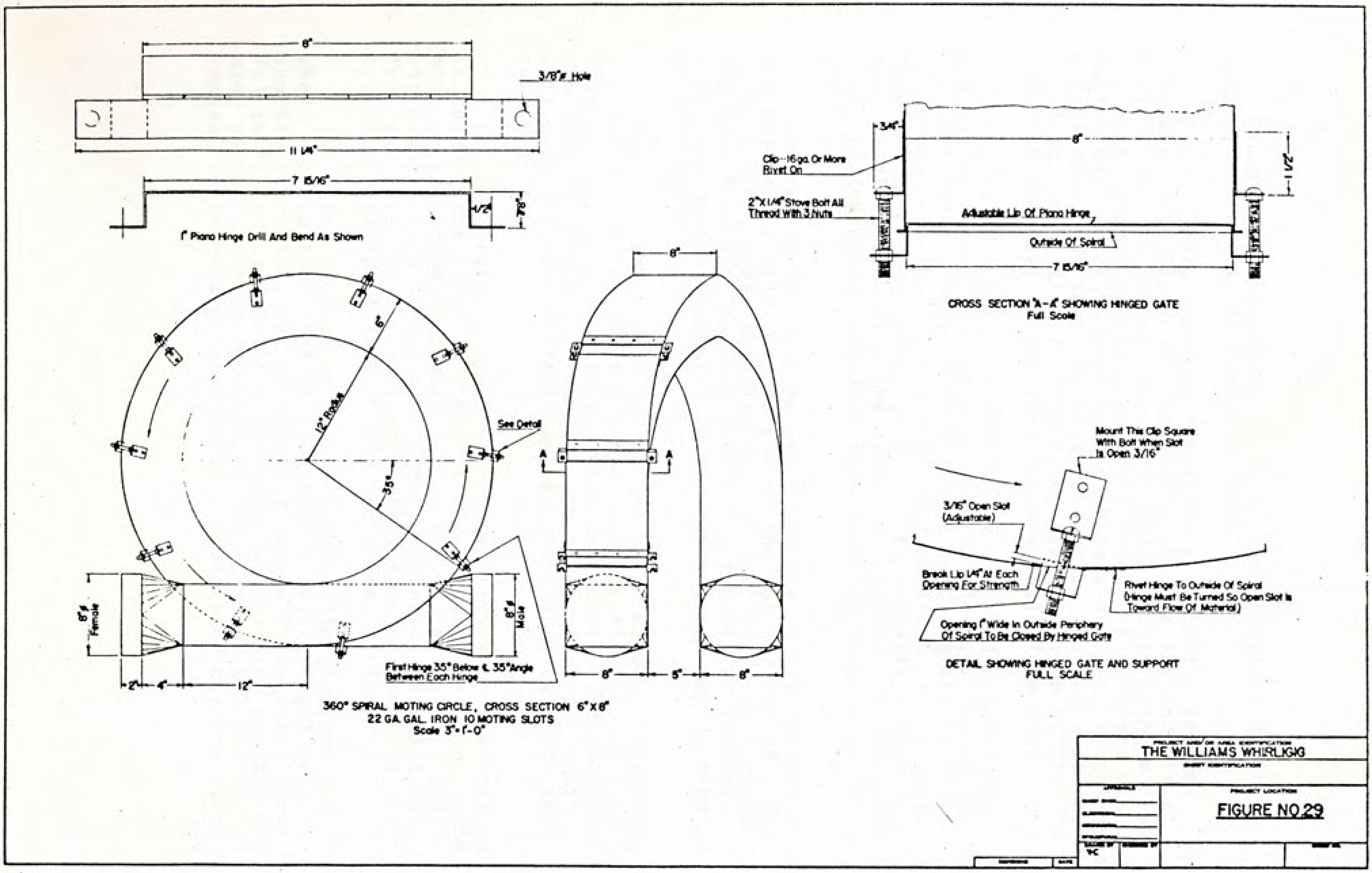
Pneumatic Lint Cleaners

For the past twenty years with more emphasis on the necessity of producing cleaner lint, many mills have been forced to develop auxiliary pneumatic devices to remove shale and trash that the Lint Beaters would not remove. This problem is, of course, more difficult in West Texas and similar areas that encounter the "Bollie Seed" with higher percentages of trash and foreign matter. Many areas now using the Mechanical Cotton Picker will also encounter higher percentages of foreign matter in seed and are encountering problems in producing clean lint. In general, it might be stated that where the foreign matter in seed exceeds 1% it is usually necessary to resort to some kind of pneumatic cleaning to supplement the lint beater.

The most popular pneumatic device, generally referred to as the "Whirligig", is simple and inexpensive and one or more of these devices is being used by most mills in the U.S.A. The design shown on Sketch No. 29 will illustrate the principle of this device. This model has been made with a section of rectangular pipe for better distribution of the lint around the periphery and the slots where the trash is thrown out are adjustable for better air control. A simple design can be constructed by forming a 360° bend in a pipe line and cutting slots around the periphery. As the lint flows around the bend, the centrifugal force throws the trash through the slots. The incoming air prevents the lint from going out through the slots with the heavier trash.

Where one of these devices is installed in an existing pneumatic system, it is usually necessary to speed up the fan to make up for the air induced through the slots and maintain velosity on the downstream side of the system.

The idea for the Whirligig was first conceived when a linterman noticed particles of trash being ejected from a hole in the lint flue elbow back of a linter. This ingenious operator proceeded to cut several slots around the outside of the elbow and found that considerable trash could be removed from the lint in this manner. Many oil mills have now slotted the elbows back of each linter where the flue system connects to the Carver or Fort Worth brushless attachment and remove quite a bit of trash at this point.



8"
3/8" ⌀ Hole
11 1/4"
7 15/16"
1/2"
7/8"
1" Piano Hinge Drill And Bend As Shown
3/4"
8"
1 1/2"
Clip–16 ga. Or More Rivet On
2" X 1/4" Stove Bolt All Thread With 3 Nuts
Adjustable Lip Of Piano Hinge
Outside Of Spiral
7 15/16"
CROSS SECTION "A-A" SHOWING HINGED GATE
Full Scale
6"
12" Radius
35°
See Detail
8" ⌀ Female
8" ⌀ Male
2"
4"
12"
First Hinge 35° Below ℄ 35° Angle Between Each Hinge
360° SPIRAL MOTING CIRCLE, CROSS SECTION 6" X 8"
22 GA. GAL. IRON 10 MOTING SLOTS
Scale 3" = 1'-0"
8"
A
A
8"
5"
8"
Mount This Clip Square With Bolt When Slot Is Open 3/16"
3/16" Open Slot (Adjustable)
Break Lip 1/4" At Each Opening For Strength
Rivet Hinge To Outside Of Spiral (Hinge Must Be Turned So Open Slot Is Toward Flow Of Material)
Opening 1" Wide In Outside Periphery Of Spiral To Be Closed By Hinged Gate
DETAIL SHOWING HINGED GATE AND SUPPORT
FULL SCALE
THE WILLIAMS WHIRLIGIG
FIGURE NO.29

Of course, the moting slots on the brushless devices are more effective in removing trash.

Several larger and more elaborate pneumatic devices have been developed over the years, such as the Industrial Cleaner and the Lummus Super Jet Cleaner, both using a similar principle of discharging trash from an air stream by centrifugal force. These more elaborate devices are not used extensively, but from the test data to be tabulated below, it would appear that in some cases they would be helpful in removing the last traces of trash and shale from Lint.

As stated above, the Whirligigs are used extensively and may be used effectively in several places. One of the most effective places is in the line handling the reclaim fractions from the shale and salvage sections of the beaters. They are also used extensively in the pneumatic robber system, handling lint from the lint flue cyclones to the beaters. Also, in the system handling lint from the beaters to baling press.

Another device that is very effective is to install a moting chamber, similar to the one on the top section of a Fort Worth beater, under the discharge of the lint flue cyclone. The pipe line handling the lint on to the beater connects into this moting chamber. Considerable trash may be removed at this point.

Another very simple device can be be made by installing a piece of 1/4" perforated metal in the bottom of the lint flue cyclone discharge pipe. With the robber line sucking the lint tangentially from this discharge pipe, the trash will drop thru the perforations as the lint flows into the robber line.

The Whirligig is usually enclosed with a conical bottom to collect the trash in a bag or box. Naturally, this trash must be inspected at regular intervals to see that it does not contain excessive lint. After regulating the slot openings and arriving at the proper air volume in the pipe the trash is usually clean and relatively free of lint.

The first inspection of a sizeable pile of trash and shale removed from lint by a pneumatic device might be a shocking surprise, but it does not mean a thing until careful tests and calculations are made to determine exactly how many pounds is being removed per ton of seed and how much removal is necessary in order to produce good quality lint.

It is a well known fact that the best available seed cleaning machinery will not remove more than 50% to 60% of the trash and foreign matter from cottonseed, so if with reasonably clean seed there is 1% or less F.M. in seed there will be 1/2% or less going to the linters and there is a good chance of making clean lint with normal equipment. Where the foreign matter in seed exceeds 1%, and sometimes goes up to 2% or 3% then more and better seed cleaning is necessary and additional lint beater capacity, and several pneumatic cleaners and other gadgets are advisable in order to produce saleable lint.

At times when the chemical lint buyers are very discriminating and will not accept second cuts if they can see a speck of trash or a sliver of shale, it was estimated that one teaspoon of such trash in a bale of lint would throw it below acceptable limits. On another occasion when they were not so discriminating and would accept lint in which a few specks of shale or trash was acceptable, an effort was made to determine just how much trash was being left in the lint. This was done by having the chemist carefully and laborously pick out every single speck of trash in a representative 1/2 pound sample of lint and then weighing this trash on the laboratory scale. This test indicated that a 600-pound bale would contain about six pounds of trash. Other analysis of better grades of chemical lint indicated it would contain two to four pounds of fine trash per bale, or about one-half of 1%.

Careful weighing of the trash from several pneumatic devices at a West Texas mill revealed the following information:

	LBS/TON SEED	LBS/BALE LINT
Moting Slots on Brushless Attachment	24	112
Whirligigs on Robber Lines	5.9	27
Industrial Cleaner	5.7	27
Super Jet Cleaner	1.2	5
TOTAL REMOVAL	36.8	171

The above was an extreme case with very trashy seed but without the considerable removal of trash by the pneumatic devices their lint would not have been saleable.

Another test at a mill working slightly better seed revealed the following:

	#/Ton Seed	#/Bale/Lint
1st Cut Whirligig	.31	1.5
3rd Cut Moting Slots	3.1	14.5
4th Cut Moting Slots	1.7	8.2
2nd Cut Ind'r Cleaner	.8	3.8
3rd Cut Ind'r Cleaner	1.1	5.2
4th Cut Ind'r Cleaner	1.3	6.4
Reclaim Lint Ind'r Cleaner	3.1	14.6
Finished Lint Super Jet	.6	2.9
Total	12.01	57.10

From the above tabulations it is obvious that the moting slots are doing an excellent job. The other pneumatic devices, with the exception of the Super Jet, are all located ahead of the beaters, and it must be pointed out that some of the trash they are removing would have been removed by the beaters. With the extremely trashy seed, removal at all possible points is necessary in order to produce saleable lint. At first glance it might seem that the Super Jet Cleaner, handling all of the lint before it goes to the press, is not removing much trash. However, when two to four pounds or less trash is the total in one bale, the 2.9 pounds removed by this pneumatic cleaner becomes appreciable.

All of the figures and data outlined above apply to extremely trashy seed and would not apply to seed with 1% or less foreign matter. Each mill must evaluate its own situation and make tests to determine its particular requirements. The above information should be helpful in planning a program and offers suggestions for various pneumatic devices supplementing the lint beaters.

PART #11

Economics & Production Cost

This discussion of delinting of cottonseed will be confined to existing methods now in use by practically all cottonseed oil mills.

Most oil millers, who have been in the business for many years, have dreamed of some greatly improved process, such as chemical delinting, that would be to the Lint Room what solvent extraction has been to the hydraulic press but so far there is no immediate prospect for any such improvement.

Over the years, there have been several attempts at carding cloth or wire brush delinting devices but none have been successful.

So, all cottonseed oil mills must continue with the saw-linter which is almost identical in principle to the delinting machinery used in the first oil mill. Of course, from time to time, there have been improvements, both mechanically and in design, which makes the equipment easier to operate, produces a better quality lint, operates more efficiently and at higher capacity, but the process is essentially the same.

Now to get back to the evaluation and attempt to see if mechanical delinting is profitable or if it can be made more profitable.

Most oil millers who attempt to evaluate the cost and/or profits from delinting will agree that Linters are a by-product of the cottonseed and whatever revenue can be recovered, over and above the direct cost for delinting and the value of hulls, is a net profit. It is generally agreed that some lint must be removed from the seed to facilitate hulling and separating, regardless of lint value or delinting cost. There might be some controversy or difference of opinion as to how much lint could be left on the seed and still do a reasonable job of hulling and separating or disposal of the hulls and most operators today would probably agree that anything in excess of 4% lint left on seed would be difficult to process. Certainly this is true with most hulling and separating equipment. If lint should ever drop in price to a point where it was not profitable to remove it from the seed someone would devise some means of efficiently hulling and separating seed with perhaps 6% or 8% lint left on. Mills in East Africa do not delint and one manufacturer in this country has a machine for decorticating linty seed. However, there has been no such problem to resolve during the past 20 years or more and even with second cut lint at 2-1/2¢ per pound there would not be many mills who could afford to leave more than 3% lint on seed and most would still be attempting to hold it to at least 2%. With present second cut lint prices running in excess of 2-1/2¢ per pound most mills will attempt to hold the lint on seed to 2% or 2-1/2%.

This brings up a point that might be interesting to evaluate here, as to how far it pays to go in getting the last few pounds and what, if any, is the extra cost for this last 5 to 10 pounds of second cut lint. There is no clear cut yes or no answer to this question. It depends on local and market conditions and each case must be appraised individually. There will definitely be some cases where the extreme maximum cut, say up to 1.6 or 1.7% left on seed, will not reduce the value of the lint or appreciably increase the production cost. In such cases it is certainly profitable. In other cases it might reduce the quality or cellulose or reduce tonnage through the mill, to where it will more than offset the slight gain in yield.

Some mills will consistently leave less lint on seed than others. Five reasons for this difference will be tabulated below:

A. 176-Saw Linters will do a more uniform job of delinting than 106 or 141 and make it possible to leave less lint on seed and at the same time maintain capacity.

B. Routine careful adjustment and maintenance of Linters, particularly ribs and rake heads, to maintain uniform space between ribs and rakes.

C. Three or more cuts of lint will facilitate more uniform delinting and maximum yields.

D. Adequate Linter capacity is, of course, necessary to maintain maximum yields and good quality.

E. Good supervision of saw sharpening and adequate saw sharpening schedule. An 8-hour schedule is usually necessary for maximum second cut yields but in a few cases with clean, dry seed 12 hours may be satisfactory.

Some varieties of seed, such as the Delta Pine, and also extremely high moisture seed, are more difficult to delint than others, so no attempt will be made to fix an exact minimum percent lint left on seed. However, with adequate equipment, properly maintained and operated, as outlined above, it should be possible to maintain 2% to 2-1/2% left on and in some cases to do even better.

Per cent lint left on seed is a good criterion of linting efficiency but it should be checked periodically and compared with analysis of total lint on seed so as to determine the expected yields. Where the actual lint yields do not equal the expected, after adjusting for cellulose, it is a good indication of excessive losses from Lint Beaters. There is certainly no need of cutting these last few pounds of lint from the seed and then putting it back into the hulls or trash with inefficient Lint Beater operation. Excessive moting under the Linters sometimes results in similar losses and all of these things must be carefully checked in order to maintain maximum yields. In this connection, a pneumatic device, such as the Carver or Fort Worth Brushless device will do a better job of moting than brush linter and tend to reduce lint losses.

The attached tabulation of average second cut lint prices from 1940 through 1970, which range from 2.15¢ per pound in 1958 to 14.19¢ per pound in 1950, clearly shows the problem confronting the mills from year to year, in attempting to evaluate the economics of delinting operations. Actual prices at some mills are sometimes quite a bit under the average price which means that on several occasions many mills have sold their second cut lint for less than 2¢ per pound. At these extremely low prices the mills are sometimes confronted with the problem as to whether it is profitable to cut lint and are they making any money by cutting it. Under these conditions it is most important to make a careful and accurate calculation to determine the exact production cost at each mill. This cost will vary quite a bit from mill to mill and there might be some mills actually losing money by producing it.

There are so many ways of calculating lint production costs that probably no two men will come up with the same answer but most millers will agree that at least 7 items; i.e., bagging and ties, saws, gummer files, power, labor, maintenance and storage or handling; go to make up the direct cost of production. Sample calculations will be given below.

In addition to the direct production cost of lint the market price of hulls must also be considered in order to arrive at the total production cost of the lint. For example, with hulls at $20.00 per ton or 1¢ per pound and with the direct production cost running, say, 1¢ per pound we arrive at a total production cost for the lint of 2¢ per pound. On the other hand, with hulls at $10.00 per ton the total production cost comes down to 1.5¢ per pound.

There are some who contend that the interest and depreciation on delinting machinery should be added to the direct production cost and the value of hulls to arrive at the total production cost and, from strictly an accounting point of view, this might be correct. To add the interest and depreciation for Lint Room equipment on to the cost of production would add something like .5¢ to 1¢ per pound and could conceivably run the total production cost up to something between 3¢ to 3-1/2¢ per pound. Under these conditions it might be concluded that it is not profitable to produce the second cut and decide to make drastic reductions in yields. However, this might be a serious mistake, in that the investment for the equipment has been made and at least part of the depreciation and interest would continue. Therefore, interest and depreciation on machinery should not always be considered in comparing production costs with lint prices and making a decision as to whether to maintain maximum yields or make drastic reductions in yields. In building a new mill or installing new linters, it should be considered.

Likewise, do not let this thinking about interest and depreciation, as applied to lint production costs, affect decisions as to maintaining equipment in the Lint Room. The history of the chemical linter market, as shown on the attached tabulation, indicates definite highs and lows in the market from year to year and therefore if the Lint Room is not maintained at maximum efficiency it will not be possible to take advantage of the higher markets when they do occur and a mill could be at a serious disadvantage competitively.

Another point to be considered when the direct production cost of lint plus value of hulls approaches the selling price of the lint, is that a reduction in the lint yield will not usually accomplish the desired results. For example, take the case of a mill cutting 50 pounds of first cut and 150 pounds of second cut for a total yield of 200 pounds. Under these conditions, their direct production cost was 1.0¢ per pound. The value of hulls was $12.00 per ton or .6¢ per pound making the total production cost of the lint 1.6¢ per pound. Had they included interest and depreciation on equipment the production cost of the lint would have approached or exceeded its value. So, suppose it had been decided that under these conditions to reduce the second cut yield to 100 pounds for a reduction of 50 pounds per ton. They might make a slight reduction in the total cost of a few items but unfortunately the production cost per pound of lint would be increased. If each mill will put the pencil to each and every production cost item they will find that in practically every case the higher the yield the lower the cost per pound of lint.

This brings up the question: "What about cellulose in connection with these high lint yields which are more profitable?" This again is a much discussed problem but under the old basis for cellulose premiums on chemical linters previous to 1965 the premium or penalty was directly in proportion to the basis cellulose value of the lint. In other words, if the beater removes, say 5 pounds of hull pepper per ton of seed from the lint the premium for the proportionally higher cellulose would just about offset the 5 pound loss in yield. Unfortunately, even under ideal Lint Beater conditions it is impossible to knock out 5 pounds of pepper without losing some lint and, therefore, the total lint yield will be reduced more than the 5 pounds, and higher cellulose could not be justified.

Since 1965 with higher cellulose adjustments, there is now an incentive to produce higher cellulose and this should be given serious consideration. For example in 1969, a mill producing 73% cellulose lint would get 3.5¢ per pound for the chemical lint. If this mill was producing 122#/ton they have a revenue of $4.27/ton of seed from second cut. Therefore they could afford to reduce the yield by 23 pounds to 99 pounds per ton, if it would increase cellulose to 78% and the adjusted price to 4.3¢/pound. This is an extreme example and it is doubtful that many mills could make so much improvement in cellulose, even with a reduction of 23 pounds in yield. But if it could be done on a break even basis, it would be highly desirable because the better quality product would be more readily marketable. The point is, each mill should put the pencil to their own particular case and do what is most profitable.

The question of lint color or staple and the difference in value between the so-called "export lint" and chemical lint will have a bearing on this problem. In recent years, particularly in Texas, Arizona and California there has been a good premium for the export lint grades, and in some cases, it has apparently been profitable to make slight reductions in lint yields in order to produce this export grade and sometimes pick up, say, .5¢ per pound. This is, of course, a very profitable business where the quality of the cottonseed makes it possible for the mill to deliver their normal second cut production and meet the export grade specifications. On the other hand, where it is necessary to reduce the yield each mill must make accurate calculations. Say, for example, a mill has been producing 150 pounds of second cut to the chemical trade at 4¢ per pound for a total revenue of $6.00 per ton of seed. At a 4.5¢ price for the export lint they could afford to reduce the second cut lint yield to 134 pounds and break even and anything they could cut in excess of 134 pounds would be a profit, plus gain in cellulose. On the other hand, rather than break even, or perhaps make a slight profit, with the 134 pounds, why not arrange the Linters for three cuts and then take off the remaining lint which could be sold to the chemical trade at the 4¢ price. This, of course, would require the installation of an additional Baling Press for the third cuts and it would be up to each mill to calculate the economics of this expenditure. However, it is one of the many things necessary in evaluating all of the factors in an efficient delinting program. This was discussed in Part #5 under Multiple Cuts.

There are many interesting aspects and sidelights to the linter business and all of them have some bearing on evaluating production problems. The fact that the price for chemical linters goes up and down in cycles, apparently beyond the control of the industry, makes it difficult to predict what profits can be anticipated from year to year and therefore impossible to estimate the economics of major improvements or alterations in the Linter Department.

However, by past experience with the up an down cycle of prices, the mills can anticipate an average situation, or at least assume that if the price of lint one year does not justify certain expenditures, it usually will in the next year or two. Therefore, it is advisable to be prepared to take advantage of the situation when it occurs. At least, that has been the case in past years.

Another problem to be contended with is that when the price of chemical linters is low and the margin of profit is narrow, the buyer becomes very discriminating and will not tolerate a speck of shale, hulls or other trash. This requires every trick of the trade, in addition to extra good supervision of operations and maintenance. In other words, the production cost of the lint goes up when the price comes down. Then, usually after a full season's work and effort, to improve quality to where the lint is acceptable, the price jumps up and the profit margin increases. Under these conditions the buyers are much less discriminating and would take grades that could not be given away under the lower price conditions. Unfortunately, this situation does not give any incentive to consistently produce the best quality chemical linters. However, it is believed that oil mills should always have the proper equipment and maintain it in such a manner that the highest quality linters can be produced when necessary, and under these conditions it will be easier to maintain maximum yields at all times.

Conclusion

With adequate delinting equipment, properly maintained, it is usually possible to delint seed to less than 2% left on and produce a satisfactory quality.

Seed delinted to less than 2% will not always result in maximum yields, unless Lint Beaters are properly clothed and efficiently operated to prevent excessive or unnecessary lint losses.

Each mill should know its exact production cost of lint at all times and under various operating conditions.

They should make frequent comparisons of percentage of lint left on seed with the total lint on seed. From this they can calculate available total lint yield for comparison with actual yields.

With chemical lint prices fluctuating up and down from year to year and sometimes approaching 2¢ per pound, the production cost of the lint will at times approach or exceed the sale price, particularly with high priced hulls. However, it is believed that the efficiently operated and properly designed Linter Room will find it profitable to maintain reasonable yields, even with chemical lint at present prices. This is somewhat influenced by the fact that moderate reductions in yields would not make any appreciable reduction in the total working cost and the per pound cost for the lower yield would be higher, but cellulose adjustments must also be given serious consideration.

Chemical Linter Average Prices

Season Beginning August 1.	Season Average Price Per Pound (With Cellulose Adjustment)
	Cents
1940	3.13
1941	3.50
1942	3.50
1943	3.03
1944	3.21
1945	3.78
1946	8.22
1947	5.73
1948	2.85
1949	3.61
1950	14.19
1951	7.41
1952	4.33
1953	3.22
1954	2.77
1955	2.71
1956	4.38
1957	3.31
1958	2.15
1959	3.51
1960	3.29
1961	4.79
1962	2.91
1963	2.57
1964	2.52
1965	3.13
1966	5.69
1967	4.38
1968	3.50
1969	2.75
1970	2.75

NOTE: Beginning in 1965 the pulp plants established a cellulose adjustment schedule with increasing premiums above 73% and discounts below 73%. The attached 1970 schedule shows the complete range above and below the 73% base price.

CELLULOSE YIELD ADJUSTMENT SCHEDULE–970A
For Second Cut Linters

EFFECTIVE SEPTEMBER 1, 1970
ISSUED SEPTEMBER 1, 1970

BUCKEYE CELLULOSE C :PORATION
MEMPHIS PULP PLANT
P. O. BOX 8407, MEMPHIS, TENNESSEE 38108

(901) 324-8861

PREMIUMS AND DISCOUNTS IN CENTS PER POUND

Cellulose Yield Range	¢/Cwt. Adjustment Per % Of Yield		.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
80.0 thru 80.9	20		1.400	1.420	1.440	1.460	1.480	1.500	1.520	1.540	1.560	1.580	MAXIMUM PREMIUM
79.0 thru 79.9	20		1.200	1.220	1.240	1.260	1.280	1.300	1.320	1.340	1.360	1.380	
78.0 thru 78.9	18		.900	.918	.936	.954	.972	.990	1.008	1.026	1.044	1.062	
77.0 thru 77.9	16		.640	.656	.672	.688	.704	.720	.736	.752	.768	.784	
76.0 thru 76.9	14		.420	.434	.448	.462	.476	.490	.504	.518	.532	.546	
75.0 thru 75.9	12		.240	.252	.264	.276	.288	.300	.312	.324	.336	.348	
74.0 thru 74.9	10		.100	.110	.120	.130	.140	.150	.160	.170	.180	.190	
73.0 thru 73.9	8		.000	.008	.016	.024	.032	.040	.048	.056	.064	.072	
73% Base	0	FIGURES ABOVE 73% BASE ARE PREMIUMS AND BELOW 73% BASE ARE DISCOUNTS											
72.1 thru 73.0	8			.072	.064	.056	.048	.040	.032	.024	.016	.008	.000
71.1 thru 72.0	9			.171	.162	.153	.144	.135	.126	.117	.108	.099	.090
70.1 thru 71.0	10			.290	.280	.270	.260	.250	.240	.230	.220	.210	.200
69.1 thru 70.0	11			.429	.418	.407	.396	.385	.374	.363	.352	.341	.330
68.1 thru 69.0	12			.588	.576	.564	.552	.540	.528	.516	.504	.492	.480
67.1 thru 68.0	13			.767	.754	.741	.728	.715	.702	.689	.676	.663	.650
66.1 thru 67.0	14			.966	.952	.938	.924	.910	.896	.882	.868	.854	.840
65.1 thru 66.0	15			1.185	1.170	1.155	1.140	1.125	1.110	1.095	1.080	1.065	1.050

Lint Production Cost

The cost of producing lint has been discussed from time to time over the years at Oil Mill Technical Meetings but usually in a very general way. With one possible exception, nothing has ever been published as to methods of arriving at accurate production cost figures.

The method to be outlined below is relatively simple and could be used by any mill by simply substituting their own basic cost and production figures. The figures used in the sample calculations do not apply to any specific mill but are intended to be typical of a small or average Texas mill and should be approximately in line with average lint production costs in the U.S.A. Larger mills might obtain slightly lower costs and less efficient or smaller mills might have higher costs.

Basic Information

Annual Crush	30,000 tons
Average Crush per Day	140 tons
Lint Yield - 45 lbs. 1st cut	
160 lbs. 2nd cut	
Total	205 lbs/ton
7 - 1st cut linters and 20 - 2nd cut.	176 saws

Detail Cost Estimates

(1) Bagging and Ties

1970-71 cost at \$1.53 per pattern. \$1.53 divided by the bale weight of 650 lbs., gives a cost of .235¢ per pound of lint.

(2) Saws and Gummer Files

Linter saws at 53¢ each or \$93.28 per 176-saw cylinder. Assume 1200 tons of seed per cylinder or \$93.28 divided by 1200 equals 7.77¢ per ton of seed, or, .038¢ per pound of Lint.

Gummer files at \$3.40 per dozen or \$10.20 per set. Assume each set files 60 cylinders. Operating 7-1st Cut 176 Saw Linters and 20-2nd Cuts and sharpening first cuts on a 24-hour schedule and second cuts on an 8-hour schedule or about 22 cylinders per 8 hours. This requires changing gummers about every 24 hours. Their cost amounts to \$10.20 divided by 140 or 7.28¢ per ton of seed.

From the above, the total for Saws and Gummers, per ton of Seed, comes to 15.75¢. This is somewhat higher than average, and might be considered a maximum for Saws and Gummers. Some mills sharpen saws on a slower schedule and operate saws to less than 11" diamater. It can be said that saw and gummer cost will range from 10¢ to 15¢ per ton of seed. For the purpose of this study the maximum figure of 15¢ will be used which results in a cost of .073¢ per pound of lint.

(3) Power

The power for producing lint is usually the next to highest item in the lint production cost. Where saws are not properly sharpened or with high power costs, it would well be the highest item.

Very few, if any, oil mills have ammeters or watt-hour meters connected to the total lint room load, so the actual power to produce lint must be estimated or calculated.

For this hypothetical illustration the information as to power requirements given on the charts in Part #9 of this manual will be used: 25 H.P.H. per 100 pounds of lint or 20 K.W.H. should be sufficient. With this mill cutting 205 lbs. of lint per ton the Lint Room would require 41 K.W.H. per ton of seed. Assumming the power rate will average 1.2¢ per K.W.H., which is a fair average for the U.S.A., their power cost for the Lint Room will be 49¢ per ton of seed. To this should be added about 20% for Lint Flue System and Auxiliaries, making the total cost 60¢ per ton of seed, or .29¢ per pound of lint.

As a double check and to illustrate another method of arriving at power cost for linting, a similar oil mill to the hypothetical case was selected for comparison. This mill had not calculated their lint cost but their total power cost was about 1.60¢ per ton of seed, which is typical for an expeller mill in this country. It was then estimated that the Lint Room would consume 40% of their total power cost, or 64¢ per ton. This compares favorably with the above theorectical estimate of 60¢ per ton.

(4) Labor

Most mills have attempted to offset increasing labor rates by operating with fewer men in the Lint Room but the labor cost for delinting cottonseed is still the highest single item. With a total of 27 linters at least three men per shift would be required, consisting of linterman, saw filer and baling pressman. With rates in excess of $2.00 per hour, the total cost per day will run $150.00 $1.07 per ton of seed; from this the cost per pound of lint comes to .52¢. (Not including surcharges.)

(5) Maintenance

There will, no doubt, be considerable difference in accounting procedure on this item of repair labor and materials for the Lint Room. Most mills will do most of the routine repairs with the linterman and operating labor and charge no repair materials to this account. During the dormant season, they will charge both labor and materials to the general repairs and may or may not segregate the Lint Room. For the purpose of this study for a mill crushing 30,000 tons per year, It is assumed that total repair labor will amount to $8,000.00 and assume 1/4 of it chargeable to the Lint Room or $2000.00 labor for repairs. $3000.00 is estimated for repair materials, making a total of $5000.00 for Lint Room maintenance. This would amount to 16.7¢/ton of seed or .08¢ per pound of lint.

(6) Warehousing and Shipping

This is another item that will vary quite a bit from mill to mill and most accounting systems will not charge it separately to linting. Many mills will arrange for the baling press operator to store the lint bales, where the warehouse is alongside or near the baling press. Otherwise, he might truck it outside to be stored when convenient by the yard crew. Loading of lint bales into box cars or trucks is usually done by the yard crew or miscellaneous labor and is seldom charged direct to the lint room.

For this study, it is assumed that one man could load a box car of lint in 3 hours with a lift truck. For a total of 95 cars per season and a labor rate of $2.50 per hour, the total labor for loading amounts to $712.00 or 2.56¢/ton of seed. Charging a prorata part of the lift truck cost to loading lint, would add at least 5¢ per ton, making the total for loading and handling at least 7.56¢ per ton of seed or .036¢ per pound of lint.

Summary of Lint Production Costs

		Cents per lb. of Lint
1.	Bagging & Ties	.235¢
2.	Saws & Gummer Files	.073¢
3.	Power	.300¢
4.	Labor	.520¢
5.	Maintenance	.080¢
6.	Handling	.036¢
	TOTAL	1.244¢

As mentioned above, the value of cottonseed hulls has a direct bearing on the production cost of linters in that any lint not removed from the seed will remain on the hull and increase the hull yield accordingly.

The price for hulls in the U.S.A. will vary over a wide range and during the 1970-71 season fluctuated from $6.00 to $30.00 per ton in different areas. A good guess for 1971-72 would be from $12.00 to $18.00 with an average of $15.00.

At this average hull price of .75¢ per pound added to the above estimated production cost of 1.244¢, the total production cost for lint comes to just about 2¢ per pound. Under these conditions anything over 2¢ per pound for lint is a profit, but if it ever gets under 2¢ the mills must find some method of processing with the second cut lint left on the seed.

In the few extreme cases of $30.00 hulls or 1.5¢ per pound, this 2¢ lint price jumps up to 2.75¢ and if the mill can't get at least 2.75¢ for second cut, they lose money. Therefore, any mills with high price hulls must carefully watch their lint production cost.

From the above tabulation of chemical linter prices, it was indicated that the base price for 1970-71 ranged from 2.75¢ to 3.75¢ and with cellulose adjustments would be slightly higher. It is estimated that 1971-72 prices, after cellulose adjustments will range from 3¢ to 4¢. It would therefore appear that it will continue to be profitable to produce chemical lint, even with $30.00 hulls. Where the price of hulls is lower, the situation is not so critical, so long as direct production cost does not exceed the above estimate of 1.244¢/pound.

The above information as to lint production cost and the tabulation of chemical linter prices for many years will pretty well confirm that delinting of cottonseed continues to be a profitable business. It should also be obvious that the properly designed, well maintained lint room, operating at maximum efficiency, could very well make a profit of $1.00 or more per ton of seed over the less efficiently operated lint room. With first cut lint prices ranging from 5¢ to 7¢ per pound, depending on quality, it is easy to "put the pencil" to the economics of high yields versus low yields, but without a flexible arrangement or multiple cuts, it is not always possible to take advantage of the most profitable combination of cuts. When a low yield of first cut becomes profitable, it is usually necessary to switch some of the first cut linters to second cut in order to maintain the total yield and the maximum revenue from linters.

In spite of the reasonably optimistic picture outlined above of the production of cotton linters, it must be pointed out that wood pulp continues to dominate the cellulose business and there are some who consider the situation pretty serious for the linter bleacheries. Just how long they can fight off wood pulp by coming up with new uses for linter pulp is questionable. For linter pulp to compete directly with wood pulp, the raw chemical lint would have to sell for 1-1/2¢ per pound or less and as outlined above, the average oil mill must get 2¢ to break even.

Although the long range picture for the linter pulp business in the U.S.A. does not look good, the production of chemical lint by the oil mills is still a profitable business if the Lint Room is properly designed, well maintained and efficiently operated. Should it ever become unprofitable to remove the second cut lint it can be left on the hulls, by making reasonable changes and additions to the hulling and separating machinery. There are some who content that the linty hulls could not be sold as cattle feed but several nutritionists point out that the additional cellulose would be helpful and it would certainly facilitate cottonseed meal sticking to the hulls.

For the foreseeable future it appears that the oil mills will continue cutting lint.

PART #12

Miscellaneous

This final section will give a few miscellaneous suggestions and helpful hints for the Lint Room Operators.

UNIFORM FEED. Unless provisions have been made in the Lint Room design to provide a uniform and consistant flow of seed to the first cut linters, it will be impossible to operate the linters at maximum capacity and efficiency. Where the spouts over the last one or more first cut linters is frequently running empty, it will not be possible to provide a uniform flow of seed to the second cuts and a proportional loss in tonnage or lint yield may be expected.

An assured uniform feed to the linters may be obtained with a mill supply bin or surge bin, usually located ahead of the seed cleaners. The variable speed feeder on this bin, and the seed cleaner feeders should be adjusted to provide a slight overflow from the first cut linters to be sure the spouts are always full. This overflow may be returned to the supply bin or the seed cleaners or to a special overflow bin in the Lint Room. There are many alterations and simplifications to the above arrangement but unless some similar arrangement is provided it will not be possible to provide a uniform flow of seed to the linters. The finest linters ever built will not operate at maximum efficiency unless the spouts are full of seed at all times so this most important item of design is mentioned briefly at this point. Likewise, an overflow bin should be provided for the second and third cuts or else there is a tendency to let the last linter spouts run empty in order to avoid an overflow, and if all linters are not running they are not cutting lint.

UNIFORM DELINTING. In PART #4, covering adjusting the linter, the importance of carefully checking the seed from each linter for uniform delinting was stressed. This is easier said than done and to walk down a row of linters, looking at the seed from each machine is no assurance that all machines are delinting the same. The only way to be sure they are uniform is to take a sample from each linter and place them side by side on a table in a good light. If this checking procedure is followed, it will soon be evident that some are cutting closer than others and adjustments are necessary.

To facilitate this checking at least each 8-hour shift, a flat box or tray should be provided with openings about 4" square and 2" deep. Each opening should be numbered to conform to the linters. The Linterman can then take his samples every morning, make the necessary adjustments and then take the samples to the superintendent's office for a final check. Some mills use muffin pans to catch the delinted seed samples from each linter. It has been said that a mill that does not use the muffin pan method will not do a uniform job of delinting.

After taking the accurate samples of delinted seed in the above manner, each group of daily samples should be accumulated in a box or can. At the end of each week, this composite sample can be well mixed and used to furnish a sample for the laboratory to determine percentage of lint left on seed.

CONSERVATION OF SAWS NO.1. As pointed out in PART #6, it is certainly desirable to conserve linter saws and not file off any more steel than necessary, but unless the saw teeth are absolutely sharp, the Lint Room cannot be operated efficiently.

A new linter saw blank measures 12-5/8" in diameter and for many years most operators and manufacturers recommended running them down to about 11-1/2" or not less than 1-1/4". At that point the capacity would begin to drop off and new saws could be justified.

This drop in capacity as the saw approaches 11-1/2" diameter is understandable in that the rim speed is reduced proportionally, and the capacity of the linter is proportional to the saw speed. This situation could be offset by changing saw pulleys and speeding up the saw. Unfortunately, when the saw gets down to 11-1/4", it has reached the limit of the various adjustments on the linter and gummer and capacity falls off badly, even if saw speed is increased. Over the years, several ingenious and economy minded lintermen, have discovered ways and means of overcoming these various problems and quite a few oil mills are now operating saws down to 10-1/2" diameter with no noticable loss in capacity. This means they have doubled the life of the saws and cut their saw cost in half. As this is certainly a worthwhile accomplishment, a summary of the necessary alterations to equipment will be listed below.

(a) Maintain an extra set of saw sheaves or pulleys to increase saw speeds about 10% after saw diameter reaches 11-1/2".

(b) After the diameter of saws reach about 11-1/2" it will be impossible to lower the gratefall sufficiently to obtain the necessary projection of saw through the ribs. The first step is to saw out the angle iron top rail to which the adjustable butt hinges attach to allow the gratefall to come down a bit more at the top. Second, remove the casting, Part L.V. 826, and machine off the flange so the underside is flush with the lower side of the bottom rib rail. This will allow the bottom of gratefall to adjust on down as needed.

(c) Alteration "B" above will allow the gratefall to come on down but unfortunately, the lower side of the cast iron heads will soon strike and rest on the saw cylinder heads that clamp the saws on the cylinder. This may be overcome by machining off the heads, or end plates to within 1/4" of end saw, so as to reduce the diameter from 7-1/4" to 7", allowing the gratefall to be lowered on down.

(d) As the saw is reduced below 11" in diameter it is impossible to adjust the True-Line Gummer to maintain the saw teeth the proper angle and length. This may be corrected by installing special adapter plates on the bearing supports of the gummer, which blocks up the cylinder 1/2" and moves it away from the gummers 1/4". Adapter Plate SG 547.

(e) Additional threading of gratefall adjusting screws might be necessary and extension of slots as required for adjustment of draft shield and division board.

After making the above alterations it is possible to operate the saws on down to 10-1/2" or less and maintain linter capacity. Many mills are now operating on the above basis and instead of getting 1000 to 1200 tons of seed per saw sylinder they get from 1700 to 2000 tons. This would mean that the cost for linter saws could be reduced about 3¢ per ton of seed. This is a worthwhile saving but it should be pointed out that if it results in the slightest loss in capacity it could be disasterous in that a loss of one pound of lint per ton of seed will wipe out the saving in saws. There is also the possibility of increasing power cost in an effort to maintain capacity.

The above procedure is interesting and does offer a challenge, but it should not be attempted unless it can be carefully supervised and the mill supervisors are convinced their lint production and tonnage can be maintained.

CONSERVATION OF SAWS NO. 2. It is a well known fact that cotton gins use their saws only one or two seasons and then discard them with practically no reduction in their original 12" diameter. This situation has stimulated many oil millers to consider and study the possibility of utilizing discarded gin saws on linters. Several mills have tried it on a small scale but soon gave it up. However, a few foreign mills, where import duties on saws are high, have utilized the gin saws successfully and, as a matter of interest, the pros and cons will be briefly outlined.

Objections to the gin saws are as follows:

(a) Gin saws gage .037 as compared to .035 linter saws, which would require turning down the space rings.

(b) Gin saws usually run about 32 Rockwell "C" scale hardness as compared to 24 for linter saws. This makes it difficult to cut in teeth on the gummer without using excessive gummer files. This is where most mills failed.

(c) Most gin saws have a bore for 2-15/16" shaft. This is fine if used on old Continental linters with 2-15/16" shaft, but they must be rebored for the Carver Duplex Cylinder.

The few mills successfully using the discarded gin saws follow a procedure listed below.

(a) Turn down or grind the space blocks very accurately in their own shop so as to use the .037 gage saws.

(b) The saws are bored and the old teeth turned off in a lathe. They are then slowly and carefully cut in on the Tru-Line Gummer, taking 7 or 8 cuts as compared to 3 or 4 cuts with a regular saw.

The few mills who have been successful with the above procedure advise that although they use twice as many gummers in cutting in the harder gin saws, they later make a substantial saving in maintaining saws. For example, one man who had been using the gin saws several years states that after the harder steel saws are finally sharpened, they stay sharp longer with less gumming. One mill that gummed the regular linter saws on a 12-hour schedule was able to change on a 36-hour schedule and keep the saws just as sharp.

Extreme caution on the above procedure is urged. If these results can be duplicated; if the discarded gin saws can be obtained and reworked at a reasonable cost; if the saws can be kept sharp with no additional gummer usage, then there is a possibility of a substantial saving in linter saw cost. But it should be remembered that the total linter saw cost, even in a country importing saws, will not usually exceed 6¢ to 8¢/ton of seed so a higher gummer cost or any loss in lint yield might well offset the saving in saws.

Just a bit of "food for thought" on this subject. If our informant is correct and the harder gin saws can be sharpened without excessive gummer usage, and after cutting in can be maintained on a slower sharpening schedule, then it would appear that the saw manufacturers should consider changing specifications on linter saw steel, as this would result in longer saw life.

<u>CONSERVATION OF GUMMER FILES</u>. PART #6 gives a few suggestions for proper care of gummer files and points out that to continue operating them after they are dull and worn out is false economy. When the cutting edge of the gummer is worn off it is easy to detect by feeling with a finger or by careful observation. Where reasonable pressure is being applied and the saws are still not sharp and well pointed after gumming, it is an indication of worn gummer files. A good operator can tell by the sound if the gummers are cutting and can see them going into the steel when they are not dull.

Some observant operators have noticed that under certain conditions gummer files will wear out on one side. This is due to the machine stopping and starting in the same position and always striking the saw in approximately the same place each time. Under these conditions, if all gummers may be loosened and revolved 180° on the spindle, after sharpening about 30 or 40 cylinders, and considerable additional use obtained from the files.

<u>CONSERVATION OF BRISTLE STRIPS</u>. This was covered in PART #2 but for the information of those interested in further experimenting, there has been at least two substitutes tried for the hog hair or synthetic bristles. Years ago, some linter brushes were equipped with sheet metal strips projecting the same as the hair bristles. They seemed to operate satisfactorily on second cut, when accurately adjusted, but were never popular. A more recent substitute is a piece of 2" x 1/8" neoprene rubber strip. If this material is accidently set too close to the saw it causes no damage and if necessary it may

be trimmed with the regular bristle strip trimmer, but at a slower rate. One mill has been testing the neoprene on one linter for three years and claim it is entirely satisfactory. No recommendation will be made here but if the cost of bristle strips is excessive it can be investigated.

CONSERVATION OF OTHER PARTS. Many linter parts within the seed roll are subject to considerable wear when working seed with a high trash and sand content. When this results in excessive maintenance cost, some mills have found it profitable to chrome plate these parts and find they can get twice as much service from these parts. Some of these items that it is sometimes profitable to chrome plate are listed as follows:

L-3246 Gratefall Retaining Strip
L-140J Gratefall Extension Curve
L-3243A Gratefall Back
L-3943 Grate or Rib Units

The above is not a firm recommendation, but should be considered by mills encountering excessive wear on linters, hullers or other parts.

OTHER HELPFUL HINTS. As mentioned in PART #2 it is very important to maintain the float belts on linters to avoid any slippage. This requires constant attention with the many old linters in use today with flat belts. This trouble and expense can be avoided and these belts will always run with proper tension by installing a little idler. This idler should run on the under or slack side of the float belt. It should be pivoted and weighted to get the desired tension and the entire assembly mounted or bracketed from the left hand feeder casting. Not many of these devices have been used but any one who has been responsible for maintaining float belts will appreciate the advantage of this proposed float belt idler.

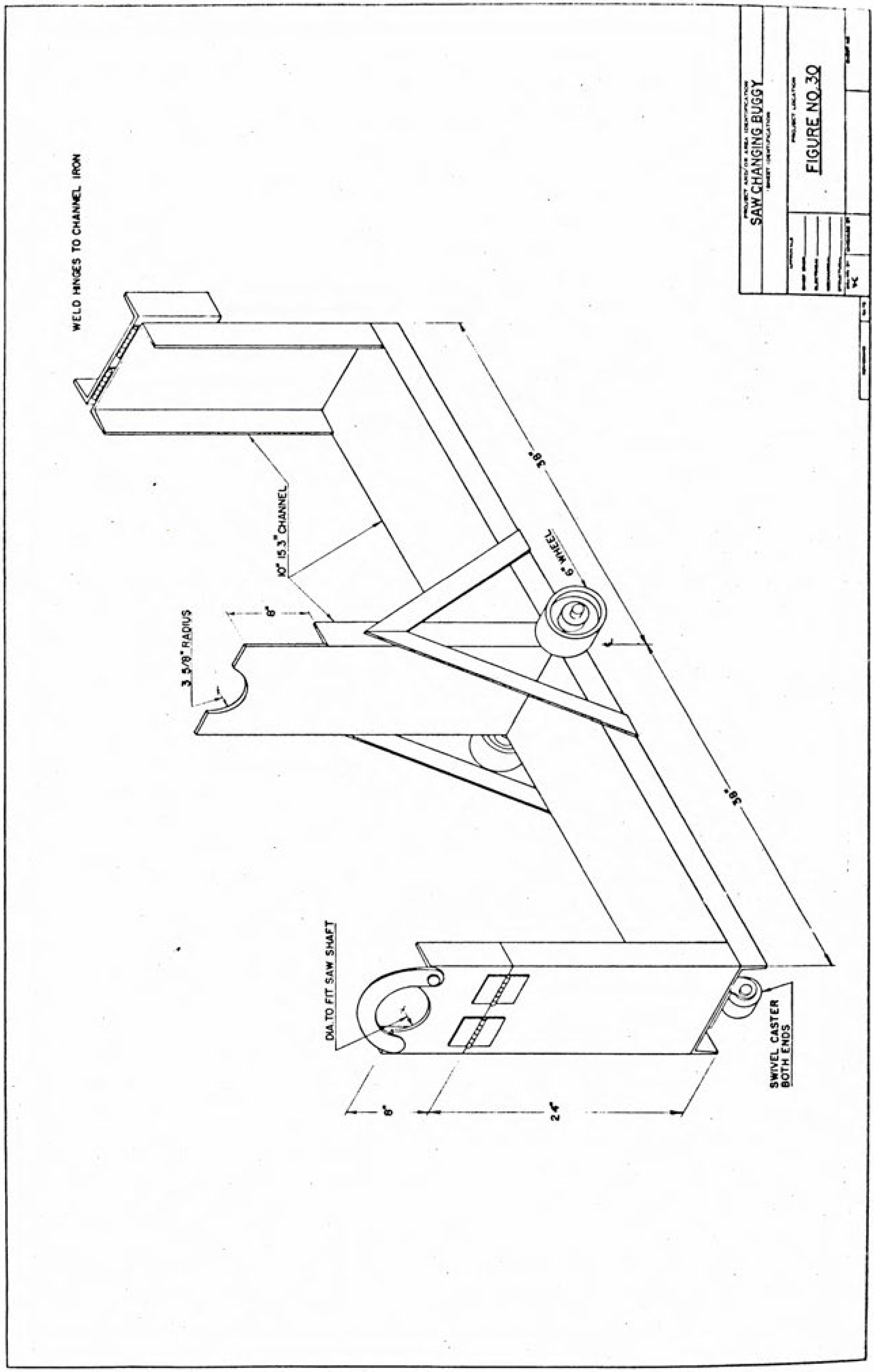
No superintendent or linterman should be without a good speed indicator for checking the speed of linter saws, floats, as well as fans and other equipment in the Lint Room. Any good speed counter is satisfactory, but one particularily liked by many oil millers is the "Jacoby Speed Indicator" for speeds up to 1000 RPM. It is made in Switzerland and handled in this country by Jas. G. Biddle Co., 1316 Arch St., Philadelphia.

Another instrument that is a must for any good Lint Room is an accurate manometer for reading the static pressure back of each linter for adjusting the lint flue valves. Any homemade vertical manometer can be used but they are not accurate.

A slant gauge with readings up to 2" water gage, is recommended. One that has been used extensively for many years is the Dwyer Inclined Manometer, Model 100 or 102. They may be obtained from Dwyer Instruments, Inc., P.O. Box 373, Michigan City, Indiana 46360.

SAW CHANGING BUGGY. This is a simple device, shown on Sketch #30, that can be built by alterations to existing saw buggies. The feature of this design is a special support at the center under the stationary center space ring and a clamping device on each end. This allows one end to be clamped while the other end is free to change saws.

Almost every oil mill over the years will drop and break a Duplex Saw Cylinder. If it is a clean break in the cast iron, it may be repaired as shown on Sketch #8, in PART #2.


WELD HINGES TO CHANNEL IRON
10" 15.3# CHANNEL
6" WHEEL
3 5/8" RADIUS
8"
36"
36"
DIA. TO FIT SAW SHAFT
SWIVEL CASTER BOTH ENDS
6"
24"
SAW CHANGING BUGGY
FIGURE NO. 30