shall be placed in back flue sheet with a these flues are first removed the 4 in. ends will be cut off completely and 6 in. ends applied, after which 5 in. ends should be used. Flues shall be swaged as at D, to 1 11-16 ins. outside diameter by 3 ins. long, including taper at firebox end, for new work; for old work, just enough to enter the copper ferrule. All scale must be removed from swaged ends of flues before application. Smokebox end of flues shall not be more than 1-32 in. less in diameter than holes in the smokebox flue sheet. If necessary, liners may be used.

Fastening of Flue in Flue Sheet.—Flues

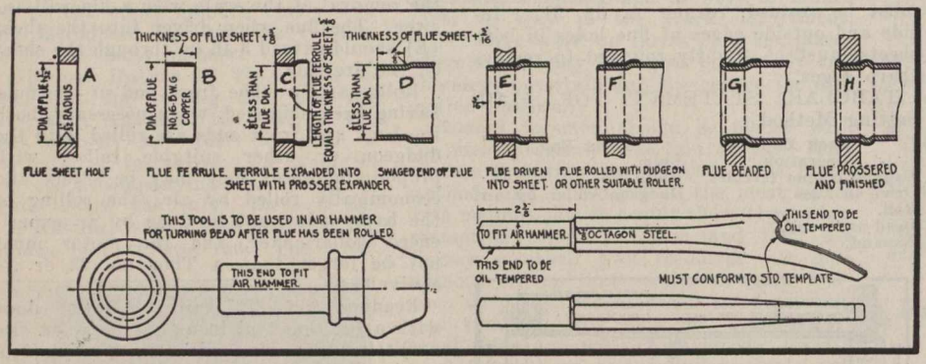

Fig. 30.—Method of Setting Flues in Flue Sheet.

bar, E, and project ¼ in. through the sheet. Gauge, F, shall be used in checking location of flues. Flues shall then be fastened at firebox end with straight sectional expander, G. While flue is being fastened it may be held in place at front end, using bar, E. Straight sectional expander shall be checked with master gauge, H, fig. 8. Before using sectional expander, and in order to obtain exactly the proper length of flue for beading, flues may be rolled lightly to fasten them in sheet with roller expander, O. After all flues are fastened they shall be flared at firebox end, using flaring tool, I, and long stroke riveting hammer.

Expanding Flues.—Flues at firebox end shall be expanded with sectional expander, J, and long stroke riveting hammer. Roller expander must not be used. Pin shall be driven into expander until flue is solid against flue sheet. This must be done three times, expander to be slightly turned before each operation. The expanding shall be performed as follows:—First, two vertical rows, from centre to top of sheet. Second, same rows from centre to bottom. Third, the two horizontal centre rows from centre to right. Fourth, same rows from centre to left. Fifth, all remaining flues. All flues must be carefully inspected after expanding to assure that recess in each flue is the full depth of recess in expander and even all around the flue. Sectional expander, J, to be checked with master gauge, K.

Beading Flues.—Flues in firebox flue sheet shall be beaded with standard beading tool, L, and short stroke riveting hammer. Care must be taken so that nothing enters between head and flue sheet. Beading tool must conform accurately to master gauge, M, at all times. Smokebox end of flues shall be tightened with flaring tool, N, before rolling takes place. All flues in smokebox end shall be rolled with roller expander, O.

Flue Maintenance.—The firebox end of flues in service must be expanded at regular intervals with sectional expander, J. This work shall be done when boiler is empty and all flues thoroughly cleaned out. Flue leaks in the firebox must be stopped with the sectional expander and not with roller expander nor beading tool. If beads are slightly away from flue sheet, standard beading tool shall be used to bring beads tight to sheet.

Sectional expanders and beading tools must be kept standard by frequently comparing with standard gauges. Any beading tool not conforming to gauge must be sent to principal shop for repairs; these tools must not be repaired at any other shop.

All shops and engine houses must be equipped with standard gauges. All gauges will be made where master gauges are kept.

To remove flues, use flue cutter, P, for the front end, cutting off flues as close to the front flue sheet as possible. Back ends should be split as little as possible, so that it will not be necessary to use safe ends longer than 5 ins.

SETTING OF SUPERHEATER TUBES.—Front tube sheet. Only eight members have had any experience with setting large superheater tubes. The practice followed out mostly is that the tube is rolled and beaded as shown on fig. 32, and this type of setting is suggested by your committee for further consideration.

BACK TUBE SHEET.—Eight members advise that they use copper ferrules; one member who omitted copper ferrules is having good success with this method.

The consensus of opinion of the roads reporting is that the type of setting shown on fig. 32 is preferred, and your committee suggests this setting, except that the copper ferrules should be no. 13, .095 in. thick, instead of no. 16, .065 in. thick.

CIRCULATION OF WATER.—Your committee took up the question with the members whether any of them employed any special feature of design to facilitate circulation of water. We find that no member has any special design for this purpose. Four members advise that they use baffle plates in the boiler shells, located ahead and rear of the dome. This is to prevent, as much as possible, the water from surging when making quick stops.

Your committee has no recommendation to make in regard to the use of baffle plates.

Seventeen members deliver feed water to boiler in the first course on the horizontal centre line. The distance from the front flue sheet varies; the minimum distance is 22 ins. and the maximum 6 ft. Five members advise that they deliver feed water to the boiler through the top as well as from the side. One of these members advises that they have never been able to find any particular improvement which the top check has over the side check. Two of these members prefer the water to be fed into the boiler from the top. Boilers having the checks on top of the boiler have a pan shape deflector under the check valve which catches the water and prevents any direct stream of water falling on the top of flues. One member advises that they deliver the feed water in the first course on the horizontal centre line and use a deflector plate placed a short distance away from the boiler course. This is to direct the water to the bottom without striking the tubes. Four members have an attachment on the inside of the injector check to deliver water upward away from the tubes. One member advises that in addition to circulating water from the horizontal line of the boiler they have some locomotives with the delivery pipe passing through the back head, extending from 3 to 6 ft. from the front tube sheet, and the end of the pipe set to deliver water towards the side of the shell; the end of the pipe is submerged. Your committee has no recommendation to make in regard to any particular location where the water is to be delivered to the boiler, as any of the above arrangements seem to give entire satisfaction.

AUXILIARY DOME OR MANHOLE Cover to Facilitate Interior Inspection of Boiler.—One member advises that they provide an auxiliary dome, or manhole, for interior inspection of boiler. The size of manhole is 15 ins. in diameter, located a short distance ahead of the back flue sheet. This is submitted for your consideration, as it makes inspection of the interior of the boiler possible without removing the throttle standpipe and dry pipe. One member is using larger dome in new construction to accomplish the same result.

SURFACE BLOW OFF COCKS.—Three members use surface blow off cocks. One of these members has discontinued the use of same, the other two members using surface blow off cocks have located them on a line with the second gauge cock, and advise that they get good results from the use of both the blow off cock and surface blow off cocks by getting rid of the mud

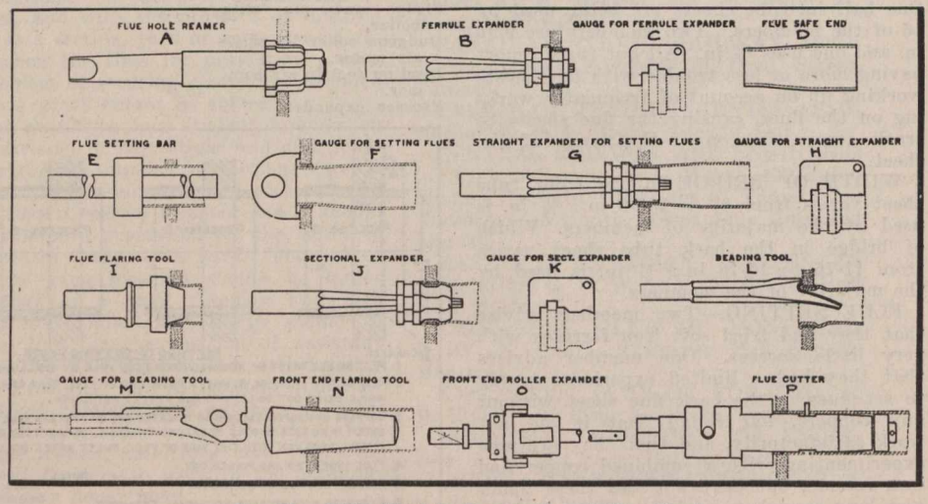

Fig. 31.—Tools Used in Preparation of Flue Sheet.