Inquiries are often received at the Forest Products Laboratory as to possible new lines of manufacture that can be undertaken on a small or medium scale. This report was prepared for use in answering some of these inquiries.

Many of the recent technical developments in forest products have been primarily applicable to fairly large-scale operation. But this does not mean that there are no possibilities for smaller-scale production more in line with the demands of today than many of the overworked ideas that have too long prevailed. It seems fairly realistic to consider a course for small wood processors midway between the highly technical methods of the large concern and the outmoded practices that have come to be thought of as the main "out" for the small concern.

It is important to take into account what may be applicable to a small- or medium-scale operation, because the majority of timber ownerships and manufacturing operations fall into these categories. Also, some of the important changes taking place in the lumber-products field give impetus to certain types of small-scale operations catering to near-by markets for technically good and modern products.

Any possible new role for the smaller operation cannot be predicated on special technological development, because most technicians have looked upon small wood-processing and wood-fabricating plants (except small sawmills) as perhaps theoretically fine but economically not very promising. Actually, the broad swing of technology and merchandising in the forest products field is so definitely applicable to the large concern that it tends to squeeze the small concern out of many markets. Although the squeeze may get tighter, it seems unwise to jump to that conclusion because part of the reaction may be in the opposite direction. It is up to the individual to read the signs as best he can and plan to operate in line with the trend, rather than to ignore it or try to buck it.

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In viewing the prospects for the smaller industries, it seems logical to look to the major fields in which wood has always been used rather than to fields more foreign to the material. Building products and accessories for homes and farms, for example, have long been major uses for wood products, and there are good prospects that these markets will continue to be of major importance. The time has passed, however, when any one material completely dominates the market, as lumber did a relatively short time ago. Standard items of lumber and conventional wood products now face a stiff struggle with the new forms of wood products and with the many new and alternate materials now available.

The brunt of this struggle will be borne by the large producers, but small producers have some recourse of their own through openings that they themselves can develop.

Merchandising experts have pointed out the trend toward a greater consumer interest in specialty items and have stressed the need for relatively small local plants to provide these items, which large plants are not inclined to supply. By specialty items are meant products of somewhat restricted rather than universal use, involving nonstandard designing and styling or new forms to appeal to individual consumer interest. It is a broad term susceptible of varied interpretations, but in any sense it is the antithesis of large-volume production.

In new homes, all-wood construction is becoming relatively rare, compared with construction that involves a combination of materials, such as composition siding with wood gables or partial fronts, or standard wood siding combined with stone or brick. This applies to the single home just as much as it applies to housing projects where the monotonous appearance of identical homes is relieved through minor architectural treatments that make use of wood in various forms.

A similar situation applies to the use of materials in the interior of houses. Wood is no longer the automatic and exclusive choice of the building public for casing, trim, and finishing flooring. It is used and prized but usually in combination with other materials -- often one wall of a room is paneled and the others are papered or painted.

Such trends away from the so-called all-wood houses are not the doom of wood as a building material but the signal for some changes in the way in which some of it is made available to the consuming public. It seems to be true that the more the synthetic and composition materials take the place of wood in houses, the greater is the consumer's interest in injecting some decorative display of a natural material to provide a warm, textured contrast to the flatness of synthetics. Contrast in texture is sought even between wood products, such as plywood or other sheet materials and individual board paneling. This desire for combinations and contrasts appears to be more than a passing fad. It is probably a rather basic reaction to the increased use of synthetic sheet materials which by themselves often appear cold and flat.
The inroads that substitute materials are making on standard lumber items will be stopped, it seems, only as special wood products are made easier for the consumer to procure and use, not only by the skilled carpenter but by the many owners who are coming to do much of the finishing work themselves. Business journals say, "Keep your eye on the fast-growing do-it-yourself movement in the building field," and report that in 25 percent of all new homes the owner does part of the work himself.

Some of the more market-wise lumber representatives have long stressed the latent market that exists for hardwood lumber paneling, especially knotty, character-marked hardwood, so selected and supplied that the ordinary builder can get it easily and install it economically. But to the larger mills and regular channels of distribution, such specialty items have seemed to require too much attention and difficulty.

In many lines of manufacture, small plants are often in the best position to develop and introduce new products. The overhead and inertia of large plants often stand in the way of innovations while small plants have to rely on innovations to keep alive. They can hardly compete on a price basis on volume production of standard items, whereas they have the flexibility that enables them to introduce new departures. This is a factor that does not seem to have received full recognition in considerations of possible improved status for small industry in the wood-products field.

Even without supporting survey statistics, the viewpoint outlined should be fairly acceptable. When one attempts to go beyond such generalizations, however, wide differences of opinion will likely occur. The more specific points indicated below are mainly by way of illustrating lines of exploration which seem to be warranted. Only the end-products themselves are taken into account here, the business aspects being an entirely different matter. The business aspects are the most important, of course, but consideration of products comes first. For some of the products, there is not much precedent to go by; for others, the technical possibilities have not been established; but for some it is mainly a matter of searching for suitable details and patterns to follow.

Some specific lines of effort worthy of consideration are as follows:

1. Giving home builders -- especially the do-it-yourself buyers -- easier access to a range of inexpensive wood-paneling materials of various species and patterns.

2. Providing local builders and home owners with a wider variety of exterior wood siding to supplement present conventional types of siding and to cater to those desiring relief from uniformity and monotony by use of something new and different.

3. Supplying home-improvement items, such as window shutters, sun shields, trellises, flower boxes, work benches, and special flooring, that can be used to add to the livability of the thousands of new homes that, in

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recent years, have often been built on such basis as to supply initially little more than minimum requirements.

4. Providing lawn and garden furniture in improved designs, especially of simple bent laminated construction adapted to modern seating and cushioning materials.

5. Making more readily available a choice of ornamental garden fencing materials which are reasonably low in cost and easily erected by the owner.

6. Fabricating structural parts of small farm structures or providing ready-built structures for easy erection on the site.

7. Experimenting with the sale of fireplace, picnic, and barbecue fuel bundled or packaged for the convenience of the user.

8. Catering to home workshop enthusiasts by supplying suitable wood cuttings in miscellaneous kinds and sizes not easily procurable elsewhere.

In all of the above, the dominant thought is to gear the operation as fully as possible to the use of local species and lower grades.

Most of these fields are not really new. What may be new is the idea that small enterprise can be built around them. Others might place more emphasis on the well-known products usually made by small operators, but, in general, new and improved forms are the key factor. This presentation is primarily for those interested in departing from conventional operations.

Distribution would be an almost insurmountable problem if a small company aimed to put such products on the national market. If it geared its operations to its home markets, however, the small company might find many advantages. Its ability to shift operations, for example, might permit it to link nearby raw materials with a potential market. But only products involving low equipment costs, not requiring high-volume production to cover high charges, can avoid the bogies of distribution.

In addition to the usual conception of selling from a shop with adequate displays and local advertising, certain ideas of modern merchandizing can perhaps be borrowed from other fields of selling.

The device of model-home shows as used by real estate people might be borrowed for the purpose. Or cue can be taken from the roadside display techniques used by implement dealers, garden supply shops, gift shops, and the like, which one sees increasingly along the highways (fig. 1).

A home-building specialties display along the highway or a chain of them at other points, including the operator's home and those of his sales associates, can make an appeal to the public eye and interest as great as that of any other display. Starting with a few items, an operator could
add others as circumstances justify until a diversified line of special products for homes and gardens is offered.

Siding Panels

Some new designs of house siding that can be manufactured from low-grade and short-length lumber are already available (fig. 2). The Forest Products Laboratory, for example, has developed a panel that is adapted to local manufacture and merchandising by small concerns. It has been patented by the Laboratory and is available for anyone to use free.

The panel is made from 1-inch lumber and is of nailed cleated construction. Proper seasoning is essential, but in general it requires only good but simple methods of manufacture. As it is entirely shop fabricated and good corners and joints are provided, there is a minimum of cutting, nailing, or fitting to be done on the building site. The paneling, which can be made from a variety of woods, is applied directly to the studding without additional sheathing, and it is especially designed to shed moisture.

Aside from the distinctive appearance which it provides, especially in combination with other siding, it is believed to be competitive in cost with other low-cost siding.

Interior Paneling

Several types of solid-wood paneling are possible for small producers to manufacture and sell. Practically all species come into consideration here either as clear or knotty or so-called character-marked material. In full-length pieces of 8 feet or longer, problems of sorting out suitable pieces from mill-run lumber and marketing them through the regular trade channels are somewhat troublesome and have largely stymied the large-volume producers, as indicated earlier. Small producers and direct-sale channels seem to hold better prospect.

A completely shop-fabricated paneling has been developed at the Forest Products Laboratory that avoids difficulties in selection of material and provides a panel that anyone can easily install (fig. 2). It departs from common and conventional appearance, lends itself to a wide range in detailing, and has met with considerable favorable comment. It is similar in requirements for fabrication to the siding panel described above.

Home Improvement Items

In recent years, many of the small homes were built to satisfy the bare essentials. Now the homeowners are ready to add improvements that will give their homes greater livability and attractiveness.
In certain areas, for example, exposure to summer heat is a real problem. The problem is aggravated in the prevailing single-story homes and treeless settings because the inside blinds and curtains are not enough to protect the large window areas from the sun. Homeowners, therefore, are turning to the use of awnings, most of which are made of canvas, metal, and corrugated glass. So far, there has been little attempt to make available an effective and desirable awning utilizing the advantages which certain wood or fiber products might afford. It appears that here is an opportunity for an ingeniously designed plywood, hardboard, or solid wood awning to compete with the metal, fabric, and synthetic products.

A similar opportunity can be found in the desire of homeowners to install shutters to soften the stark appearance that plain windows often present. Conventional designs are used, but, in many cases, they are inconsistent with ranch style or other modern styles of architecture.

Solid wood panels are commonly used as fake shutters, but it is reasonable to assume that a shutter which would be not only decorative but functional and serve to shield the windows from the sun would be more desirable. The design and sale of such a shutter is a worthy challenge to the ingenuity and skill of those who are looking for markets for small-scale manufacture.

An important trend in home construction, particularly in some areas, is the use of concrete floors in basementless houses. Wood flooring over the concrete has been widely used in large buildings, but much of the house market has been taken over by nonwood flooring materials. In many cases, the nonwood floor coverings have proved to be less than 100 percent satisfactory (just as wood flooring has never been 100 percent perfect). It would appear that many who now have composition coverings or who contemplate them would return to the use of wood, if it were made feasible for them. Resilience, warmth, and appearance favor wood; first cost and misbehavior of some wood floors often favor the composition.

Standard flooring items are often used, but a need is recognized for flooring products that combine some of the virtues of wood with some of the advantages of other materials. One possibility, as developed at the Forest Products Laboratory, is a 1/8-inch veneer strip of fixed length and width dried in a special manner to reduce dimensional change and laid with a special mastic. Manufacture should be possible by a relatively small concern and the production costs reasonably low. The appearance is good, and the service life should be also. Other possibilities may be developed. It is conceivable that a thin, insulated, semiflexible wood floor block can be made to lay like a rug without mastic or nails over another floor which an occupant may wish to cover to give more warmth, resilience, and renewed appearance.
Outdoor Furniture

Prewar wood outdoor furniture has had to give way largely to low cost metal furniture. Some of the earlier rustic wood designs were good if not too durable, but much of the later board and slat furniture had little to recommend it. Since the war, some modern designs that have come from the West Coast have proved that wood does not need to give this field up completely. Good as metal furniture is for outside use, there are undoubtedly many people who welcome the opportunity to choose among well designed and well built pieces of wood furniture. Quantity production for the national market might be a tough competitive proposition, but production would be feasible for local markets with lower distribution costs.

A few good designs are available and more could be developed without too much difficulty by drawing on the designing talent available from such sources as the State universities. Close collaboration between the designer and the producer is essential because the requirements for good design and low cost fabrication are interdependent.

Fabrication from solid lumber cuttings is part of the field. Modern glue-laminated construction for curved or bent forms is another important part, especially for lounge chairs that might be desired for use inside as well as outside. The latter has been applied perhaps more in modern Scandinavian designs than elsewhere, but good opportunities for development here seem to exist. New techniques have to be learned, and nonstandard but not necessarily expensive jigs and pressure devices have to be used. The use of thin strips in glue-laminated construction obviates difficulties often encountered in bending solid members. Partly for this reason it seems as well adapted to small-scale manufacture for home markets as to quantity production for a national market.

Modern cushioning and covering techniques are important factors to take into account; especially those which are susceptible to easy replacement by the nonprofessional.

Ornamental Fencing

A potential undertaking for small wood enterprise, seemingly warranting more attention than it receives, is supplying home and garden fencing of types that appeal to the home-owners' pocketbooks and fancies. In some of the Pacific and Atlantic States, ornamental wood fencing is used extensively, often as an essential part of the architecture of the house. Such fencing, however, is not featured in other parts of the country. The Midwest, for example, has plenty of snow fencing and woven wire fencing and some picket fencing, but it doesn't have the wide variety of wood types that are to be seen elsewhere. The Midwest certainly has as many home owners who like outdoor living and garden seclusion as have the Coast States. In fact, thousands of small homes would be enhanced in value by the individualism that an attractive fence often gives.

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Some of the local yards carry a limited choice of ornamental fencing, but as a rule it is not made easy, costwise or laborwise, for the home owner to satisfy his interests. In some western cities, companies sell nothing but specialty wood fencing. They display their wares along the main streets and advertise as conspicuously as do dealers in kitchen appliances. The East also has relatively easy access to wood fencing but much of it is imported and expensive.

The question of species has something to do with it. The West has redwood and cedar readily available in split or sawed forms; the East has small cedar and chestnut rounds. Midwest States admittedly do not have the natural fencing woods to the same degree, but usable species and forms are not entirely lacking. Designs and treatments need to be modified to suit the available species and forms, but the potentials for profitable enterprise and for fuller utilization of material of limited value for other purposes seem good.

Hog and Brooder Houses and Other Farm Structures

Prefabrication of small structures, such as animal shelters and feeders, is fairly well recognized enterprise for small-scale manufacture and local markets. Approved designs and construction details are usually available from the State agricultural engineering department, and several species of lumber may be used. Simple shop assembly methods often make it possible to reduce cost enough to make it more convenient and economical for the customer to buy the complete unit rather than attempt to build it himself out of standard lumber.

Special rafters for fairly large as well as small structures should also be considered for local shop enterprise. They are a make-to-order item, however, rather than a standard stock item.

Such rafters are of two types (1) the segmented, curved type sawn and nailed from 1-inch boards, and (2) the glued laminated arch type. The segmented rafter has been used considerably in certain farm areas where the local wood supplies are conducive to the production of short-length boards but not full-length dimension lumber. The laminated arch has been used mainly as the product of specialized laminating plants. There is little precedent for fabrication by small-scale operators and for them some substantial risk is involved. Consequently, initial effort should be limited to small structures and where full understanding exists of the procedures which are required to ensure good results.

Segmented curved rafters can be constructed for barns from 6- or 8-foot rough sawn boards of any common species. One edge of each board is cut to the curvature of the roof and the ends are trimmed along the radii of the curve. The boards are lapped one-third their length in 3 courses and securely nailed together from each side with eight- or tenpenny nails driven at about 6-inch intervals.
It is best to use well-seasoned lumber in this construction, but to facilitate nailing of the harder woods, it may be necessary to use the lumber in a partially seasoned condition.

In barns and storage buildings, the rafters are spaced 24 inches on center and are generally constructed in 2 segments that are joined with a tie plate at the ridge prior to erection. In smaller structures, single segments are set on frame or masonry side walls to form a low arch roof.

The glued laminated arch must be made according to rather exacting procedures which cannot be elaborated here. In general, the laminating stock is nominal 1-inch material of relatively narrow width. The stock should be dry and smoothly surfaced with the individual pieces within each lamination end-joined by well-glued scarf joints. The selection of the glue and its mixing and spreading are important factors, and adequate pressures must be applied while the glue is setting.

A laminated member bonded with glue is much stronger and stiffer than a similar member secured with mechanical fastening. Large, specially equipped plants are in best position to do this type of fabrication, but there are methods which small plants with fairly simple equipment can follow in making small members if the operator is properly trained and experienced.

Packaged Fuel Specialties

Packaged charcoal sells at grocery stores, filling stations, and similar retailers for prices equivalent to 560 to 1160 per ton. The proposition of a fancy packaged fuel for picnicking and barbecuing is geared largely, but not entirely, to charcoal. Wood briquettes are sold as utility fuel in some areas, and in other areas they are packaged for fireplace use and sold in department stores. Small bundles of white birch, attractively tied, are sometimes sold at roadside stands for city buyers. Hickory barbecue chips with fancy trade names are sold in 5-pound packages by mail, as advertised in metropolitan newspapers. Such products raise the question whether other fancy fuel forms do not come within the realm of merchantability. Packaged cubes of solid wood fuel may appeal to consumers' fancy also. Seasoned hardwood cubes bagged for ready handling might be salable like charcoal for fireplace fuel as well as barbecues. Attractively packaged and displayed, they might have a special appeal, either impregnated with chemical solutions to provide colored flames or unimpregnated for use in lieu of charcoal to give a real smoke taste to grilled steaks.
It is well known that the use of small woodworking machines in home workshops has become a national pastime. Many million dollars worth of machines and tools have been purchased by the hobbyist and do-it-yourself homeowner. But what we are talking about here is mainly the hobbyist. This has meant big business to the machinery suppliers which can be definitely appraised. There is no basis for estimating what it has meant to the suppliers of wood. It has been clearly recognized by the machinery suppliers for some time that the difficulties which the hobbyist encounters in trying to purchase the wood supplies he wants have been a rather serious obstacle. The hobbyist wants to buy certain kinds and sizes of wood in small quantities and frequently in a variety of species, the ordinary lumber yard does not normally deal in such assortments. A relatively few lumber dealers have come to recognize this situation and made some move to make it easy for the buyer to get what he wants, but generally there has been an unfilled gap between suppliers and users. Hobby supply shops have come into existence in many cities which retail some small wood items as well as plastics and other materials.

This is a situation which seems to warrant some examination on the part of individuals or concerns who may wish to consider catering to this field by supplying wood items desired. Presumably, assembling small bundles or packages of a proper assortment of species, forms, and sizes is one factor to be considered. Properly seasoned material would be a requirement; supplying some of the more attractive and unusual species would be another. Some wholesale lumber concerns specialize in supplying manual training schools and the like with specialty wood items covering many species and forms. What is referred to here is a more restricted small-scale retailing proposition for a home area.
Figure 1.—A shop salesroom which attracts attention along a main traveled highway provides a market for specialty wood products that the general public often wants but does not know where to get.

(2M92995F)
Figure 2.—Upper -- Siding panels designed to provide an architectural variant and to withstand the weather as well as conventional siding can be fabricated from cuttings from low-grade lumber of various species. Properly seasoned 1-inch lumber is used with concealed nail fastenings rather than glue, involving simple but accurate manufacture. Panels are for nailing direct to house framing, with diagonal bracing and blanket or batt insulation, and without additional sheathing.

Lower -- Interior paneling of attractive design is shop fabricated from resawn boards of a wide variety of species, either clear or knotty. Concealed nailed assembly is by simple, but good, shop methods, including kiln drying. Installing over studding is easy, and can be done by almost anyone handy with a hammer and rule.

(ZM92996F)
Figure 3. Modern architectural and interior designs often call for distinctive wood products involving a little craftsmanship but advantageously made by small plants. This screen product in various alternate forms is of significance in itself; but, mainly, illustrates a field of specialty products worthy of consideration by those seeking wood-working opportunities.

(ZM90919F)
Figure 3