SUBSTITUTES' FACTS

vs.

LUMBER'S GUESSES

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BY

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In the preparation of this paper is was not sought to bring about any immediate revolution in the lumber industry, an industry which a few years ago ranked among the highest but has now declined to a place farther down the ladder of economic importance than it rightfully should be, but to set forth one phase of the cause of this tremendous decline. There have been other papers which have called to the attention of the industry the fact that there are several causes which are directly responsible for this fall.

Here it is attempted to bring out the important points of one of the flies in the ointment - Wood Substitutes. While some writers claim that competition to the industry by means of substitutes is a very small item, there are facts to show that the industry has suffered to an immeasurable extent from this source.

Did you ever observe Mr. Pelican when he was out after his dinner? He will fly up in the air until he is high enough to spot a nice fish and then swoop down and get the finny creature along with a beak full of water. Did you notice too that there was Mr. Gull flying around watching Mr. Pelican? When Mr. Pelican settles down on the shore to enjoy his meal, Mr. Gull alights right in front of him. In order for Mr. Pelican to eat his fish he must first expell the water, and as he is doing this his beak must be open. This is an opportune time for Mr. Gull and he reaches right in and takes the fish out of the mouth of Mr. Pelican. We may liken the pelican to the lumber industry and
the gull to the substitutes and in that way we may see just how the substitutes have taken the food right out of the mouth of the lumber industry.

In reality it is more than just the food; they have taken some of the clothing too, for in the ten years prior to 1917 a total of over eleven billion feet of lumber annually was lost to the substitute trade. This loss does not include what structural material went into dams and skyscrapers for these are new projects for which lumber had never been used. The replacements were as follows:

Steel, brick, concrete 2,700,000,000 b.f.
Metal shingles etc. 1,440,000,000 b.f.
Fibre boxes 1,070,000,000 b.f.
Steel cars 261,000,000 b.f.
Fencing 4,030,000,000 b.f.
Miscellaneous items make up the balance of the eleven billion.

"Wood is one of the most abundant products of nature. Excepting food staples no material is so universally used, and no product contributes more to the convenience and comfort of mankind. More than one-half of all the houses of the world are built of wood, and most of the other one-half use wood for doors, window frames, floors, and other interior parts. Nearly all barns and out-buildings are made of wood. Wood warms the dwellings and cooks the food of more than two-thirds of all the people on earth. When we sit down it is generally on chairs or benches made of wood. Every day we eat from wooden tables. The books, magazines, and papers we read are printed on paper made from wood. Our furniture, musical instruments, household
utensils, toys and ornaments are mainly made of wood" Yet there are those who, realizing the importance of wood to the human race, will purchase commodities made of metal or other substitutes which will not serve the purpose as well as the same articles made of wood - an perhaps pay dearly for their folly.

This once great industry is not the product of thought and planning but has, like Topsy, "just growed". The pioneers in the business did not spend much, if any, time in preparing for the needs of the people. There was a ready market which was supposed by them to be secure and as the need for greater production arose they met it with larger plants and huger logging operations. Their strength has always been in mechanical skill and unmatched energy - but the weakness has lain in very poor economy and worse merchandising. Easy profits gleaned in the past have entirely spoiled the lumberman for painstaking developments of business and markets.

It is the fault of no one but the lumberman of the past that the industry is in such a deplorable condition at the present time. This does not mean that the present economic depression or the intense foreign competition is his fault. Had there been more time spent on looking into the future of the country and the development of markets here and abroad, a more even distribution could have been maintained throughout. It is admitted that the economic and social changes of the country would have been hard to
foresee and it is these changes that have brought about the reduction in use of lumber in proportion to other structural materials, but certainly it could have been seen that the moving of the timber center away from the market was bound to come and thus increase the cost of transporting the finished product to the consumer to such an extent that the transportation costs more than the lumber. However, it is too late to do anything about that so we must try to remedy the present situation.

Perhaps one of the greatest troubles with which the industry is confronted at the present time is that it does not know its own product. Odd as it may seem - the people who put out the product do not know what it will or will not do. That is a broad statement and may not be at all true where some individuals are concerned, but in-so-far as the entire industry goes it surely is true. There are a great number of properties about wood which are not known to the trade. How can any manufacturer expect to put his manufactured product in favorable positions with the consuming public if he himself knows nothing about it? There is no other industry which has left all of the research in the hands of the consumer. In the past it may not have been necessary for the producer of lumber to find new uses for wood because there were certain things for which lumber had been used and never a thought that anything could be found to take its place. When substitutes first started to make inroads upon the sales of lumber there was a great
cry from the lumbermen that their market was being invaded by an enemy. They appealed to the public and to the Government. Their appeal to the public was not done in the right way so it was up to the Government to step in and give them a helping hand. New uses were found for wood and improved methods of production were set up. But what good was all of this if the lumbermen would not put themselves to it to make the best out of what had been done? Why should the people pay through taxation for the work that should be done by the companies themselves? It is estimated that there is about $3,000,000 spent annually on research in wood and its uses but over $1,500,000 of this amount is spent by the Government and only $1,000,000 by the wood-using industries, the rest being spent by the states and endowed institutions. "If the lumber and wood-using industries are in the long run to hold their won, if forest lands are to maintained in productivity, and if research is in fact the gateway to such achievement, the present aggregate research programs in forestry and forest products should be multiplied ten-fold". In other words it is up to the industry to get itself out of the hole into which it has gotten. Research is certainly not an economic loss in other industries which is shown by the fact that the annual laboratory research by American industries as a whole reaches 100 million dollars while that of manufacturing industries is one-half of this sum. The annual savings to these industries traceable directly to research is at least a half
billion dollars. If such is the case, why is it not possible for the lumbermen to profit by such an undertaking? Of course it is a known fact that the finances of the industry at the present time are very much depleted, but surely money for such a worthy cause could be gotten by some means.

Every man who sells lumber must know just what grade, specie, and finish is best for each particular use. There can be no guess-work about any of it, there must be facts and figures to show that what he says is right. The public must be taught to recognize the advantages of wood, but they cannot be taught unless there are teachers who know of what they are speaking. In order to find out what wood will do, there must necessarily be a great amount of research done, and the lumber industry must do it, for it is sure that the steelman, tileman, or slateman is not going to do it for them.

Mr. W.B. Greeley said in 1917 that ties were the only thing which substitutes had not effected, but I have reasons to doubt that the same is true at the present time. In a book put out by one of the steel companies, ties - metal ties - are featured exclusively. The title of the book is "Steel Cross Ties for Every Purpose". At present it is admitted that the railroads are very much in favor of wooden ties on account of the resiliency offered by them, but the steelmen are out after that trade and are going to do everything possible to get it. I quote a page
from this steel-tie book - "Previous issues of this pam-
phlet have dealt with the subject of Steel Cross Ties in
a general way, with little specific data for use of pros-
ppective users. In this edition attempt has been made to
give general information regarding sections, properties,
weights and other data needed by engineers in working up
plans and specifications so as to properly include Steel
Cross Ties in their reconstructions. While demand for a
Steel Cross Tie for main line steam railroad tracks has
not reached its ultimate level, there is a great demand
for sections suitable for street railway tracks, together
with lighter ties for mines and industrial plants. We are
always pleased to make suggestions as to the proper ties
to use for specific purposes." This shows how relentless-
ly the steel makers are going about to secure the tie
business from the lumbermen. The question is, will they
or will they not find a suitable tie made of steel to re-
place the wooden one? They show in this book very favor-
able figures on installation of steel ties in mines. They
do not, however, bring up the question of safety in which
the wood ties play an important part underground. It is
always more or less wet in mines and steel ties do get ex-
tremely slippery when wet. Never-the-less, many operators
are looking after the dollars which might come rolling in
as a result of using steel ties rather than the fact that
a man may slip and break a leg. It certainly is up to the
lumberman to come forth with facts and figures and protect
this trade which brings him in a good many dollars annually. To do so he must get busy and find out just wherein his product is the best and lay the findings before the men who purchase for these concerns.

The greatest expense attached to wooden ties according to the steelmen is replacement. There is no doubt that ties in the natural state will rot and even treated ties as they are now treated will not last as long as some authorities seem to think they should. Let the industry then get to work and find new preservatives that will retard rot for a longer period of time.

It has been pointed out that the upper grades of lumber have been holding their own in reference to price to pay for the cost of production and a return to the timber owner, but they cannot carry the load imposed upon them by the inferior grades. A way must be found to work up these grades and put them on a paying basis. If it is necessary, they should be fabricated and turned into products other than boards. It may be that they should be classed as by-products and handled in just that way. This being the case, they should pay the way for existing at all, and it is evident that this is not being done by merely making boards out of them. In this respect it is up to the industry to find out what to do with them - whether to market them at all or not.

Substitutes' greatest sales point is that of being cheaper than wood. This, without doubt, is true in most
cases; especially on the Eastern markets. In the first place, most of them are produced close to the markets and enjoy low freight charges. The freight paid on lumber from the Pacific Coast to these same markets is more than the cost of the product itself in a large number of instances. This is a hard factor to overcome as it cannot be remedied without the consent of the Interstate Commerce Commission and the railroads. Shipping by water is cheaper, but the boats have only to keep their charges a trifle below the railroads' in order to get their required amount of traffic. If, by some manner of means, by-products could be made from the lower grades and the waste which is left in the woods and goes out as slabs, edgings, and sawdust which would bring in revenue and help pay for the cost of producing the lumber; the higher grades would not have to carry all of the burden of the operations. This again is a matter of research which must be carried out by the industry.

A second factor conducive to lower prices of substitutes is the wages paid in the other industries as compared to those paid by lumber. They being manufactured in the more densely populated sections of the country where labor is cheap, makes the lower price possible. It may be that the President's proposed legislation on the matter of starvation wages of which he spoke in his radio address of May 7, 1933, will be a boon to the lumber industry. It is his idea to compel all industries to pay living wages. The lumbermen of the West have never paid wages that did not
permit decent living, but they have shut their plants down when shipments were too small to permit economical operation.

A third factor is that of the cost of holding the timber until it could be cut. The operators have blocked up huge holdings in the past and have had to pay taxes and protection costs for a number of years. These costs have made it necessary for them to cut the timber in order to get the money with which to pay these costs. In nearly all cases it was not necessary to log the timber to supply the market and therefore a loss to the timber owner was created. In some states there have been tax-revision laws which call for the payment of taxes only at the time the timber is cut. If more of the states would enact such legislation it would indeed be a relief to the timber holder. Especially the Pacific Coast States should tax the income rather than the value of the standing timber for a point has been reached where it is no longer possible for the operator to hold his timber at a profit. This means that it will be cut off with the idea in mind to get enough money to pay the fixed charges without regard to conservation or profit. The Pacific Coast States have the bulk of the country's standing timber and it should not be wastefully cut.

These three factors are brought out with the idea in mind of possible ways of meeting the substitutes' fact of lower price. While it is not a guess that the lumber price
is higher, it is surely not an irreparable condition but much work must be done on the part of the industry to bring about the necessary changes.

Wood has thirty-six distinct and separate properties which have a bearing upon its suitability for use in certain places. These properties come under three large headings; namely: Mechanical, Physical, and Chemical. These are required either singly or in combinations in all of the 4,000 uses to which wood is put. Of these thirty-six there are but fifteen - less than one-half - of which there is definite scientific information that can be used by the industry in presenting its product to the consumer. Of the physical properties there are few if any that could be applied to other substitutes. Of the mechanical properties more is known than of the others, but that in itself is not enough. For example: very little is known about resistance to splitting, resistance to abrasion, surface friction, nail-holding power, screw-holding power, and workability under machine and hand tools. What is known about these properties has not been brought about by scientific work, but rather is their result of accidental findings. If the industry is to be able to tell the consumer just what wood will stand up the best under the above conditions, it will be necessary for much work to be done in this research. "Just how can the lumber industry expect to merchandise its products intelligently, or profitably, as long as the principal equipment for that purpose with which it
can supply its salesmen consists of ignorance of the physical properties of its products and their exact suitability for the specific purposes for which consumers may desire to use them? Especially so, in comparison with the scientific precision with which most of the competing industries are able to describe the qualities and demonstrate the suitability of the products which they are now offering as substitutes for lumber."

Celotex - a competitor of lumber in the field of interior sheathing - has announced that it has at last found a way to treat its product to insure that it will never be destroyed by insect attack. In the past this product was not immune to insects, but through diligent research a treatment was found which would stop its being eaten up by these pests. It is true that the Government, through its laboratories, has done much toward this end in an effort to aid lumbermen, but so far no entirely satisfactory preparation has been found. Here is another excellent opportunity for the industry to step in and carry on the work which has already been started by Uncle Sam.

In 1917 there were less than 70 uses for steel in fabrication of commodities in competition with lumber. In 1925 there were over 300. Formerly, wood for most of its important uses had few or no substitutes. Today, there is no major construction or industrial use for lumber that there is not a good substitute available with the exception of ties and the steel men are trying hard for that trade as
has been pointed out previously. Besides steel there are now numerous other substitutes: metal alloys, fibre compounds, the resinoids, and sundry synthetic materials. Each one of these has been searched out and put on the market with a definite knowledge of what it would do and the use for which it was best fitted.

Fibre board came into use not alone on the strength of its cheapness, but on the claims that it was light, easy to work up, easy to nail, and its ability to take paint. These are all true enough, but they do not overshadow the facts that lumber is stronger which makes it less easily destroyed, stiffer which makes it more permanent, capable of being finished to give a more pleasing effect, and also has the properties claimed by substitutes.

Fibre boxes go on the merit of being lighter and cheaper. The lightness may save in freight one way, but the cheap first-cost and the saving in freight are more than off-set by the loss due to damage because of their failure to protect the contents from the effects of rough handling. It must be admitted that there are some commodities which may be shipped in fibre boxes to an advantage without so much danger of damage. The lighter goods such as corn flakes, toilet paper, paper towels, etc. come under this classification. When heavier articles such as canned goods, soap and the like are packed in fibre boxes, the damages run very high and cut into the profit of the seller.
One property which wood possesses and which is a very important one from the standpoint of construction of buildings is that of low thermal conductivity. By this term is meant its inability to transfer heat. Some years ago the lumbermen made assertions to the effect that houses built of wood were cooler in the summer and easier to heat in the winter than houses built of brick, concrete, etc. This is most certainly true but it cannot be proven by scientific data. It is possible to make boxes of various materials and apply heat to them and find out what amount of temperature-rise takes place under similar conditions, but this does not give figures that can be compared in relations to units. Much work has been done in steel and other metals and the thermal conductivity of these can be expressed in B.T.U.'s per unit of material per unit of time. Celotex—mentioned in a previous paragraph, has carried on research and can tell the consumer just how much heat will pass thru each inch of material. This factor is one of greatest importance to the builder and one which should be determined and put in forms that can be distributed to the users of lumber.

Perhaps it has seemed, from the contents of this paper this far, that the lumber industry has done absolutely nothing, but this is not the case. I have wished to point out so far some of the things which can and must be done in addition to what has already been accomplished in fact-finding. There are a number of things which have not been
gone into in detail that are of importance in aiding the lumberman to get back where he belongs. Some of these are: Research in plasticity, screw-holding power, sound insulation, combustibility, and resistance to alkali and acid.

The return to its rightful place in relation to other industries would be greatly expedited if facts about these things were available to the consumer.

The West Coast Lumberman's Association has completed one step in an attempt to get someplace by putting out the Douglas Fir Use Book. This book contains design tables and their uses for the construction industry. It makes no reference to anything but structural timbers but this is certainly a step in the right direction. For years, steel - the main competitor of lumber in the construction field - has had numerous hand books giving all of the data possible on the use of steel in construction. The Douglas Fir Handbook is, in effect, the same type of publication. The architect or engineer has only to consult this handbook to get all of the information needed to enable him to put up a building suitable, strong, and safe. They need not consult a specialist in lumber in order to determine what size and grade to use. With price lists furnished by both industries, it is a simple matter to determine the material to use on any particular job.
For many years the joining of timbers has been a problem to the engineers. In many cases the strength of the wood was sufficient for the job but there was no satisfactory way of joining the pieces so that they would not give away under stress. This problem has now been largely eliminated through the development and improvement of metal and wooden connectors. The research in this matter was not carried on by the industry of this country, but by engineers and lumbermen of Europe. At the present time there is much research being done along this line by the Forest Products Laboratory and by the laboratory of the National Lumber Manufacturers Association at Washington, D.C. A report on connectors was put out by the National Committee on Wood Utilization this year (1933). This publication is very exhaustive in its treatment of the subject. It gives the strength of each type of connector and diagrams to show the stresses.

By the use of these connectors, designers are given more latitude in the use of wood for construction and the costs are materially reduced. To give the scope of the report I will quote from the Forward: "The National Committee on Wood Utilization, in a survey of new wood-construction methods in Europe, amassed data on more than 60 types of wood and metal connectors, a large number of which are commercially important although some are of only theoretical interest. Thereafter, the Forest Products Laboratory tested some of the more promising types of the connectors applied to American woods"
This report presents the results of this work and points out possibilities for the use of these modern connectors in American construction. The results of the tests show that no single type of connector can be used to best advantage for all purposes, but that each one has its special field of maximum usefulness. Engineers, architects, and builders must therefore make their own selection of the type that will serve best in each particular instance and for each particular purpose.

But why should the engineer, architect, and builder do all of the work to find out which ones are the best for certain jobs? It would seem that it is the responsibility of the producers of the material who should find out the best ones and relay this information on to the persons who are the users. Only in this manner will the lumbermen put their product in favorable light before the consumer.

Prior to the advent of this method of connecting timbers, wood was restricted as to its use in many cases; especially in tower, wide-arch, and broad-roof construction. It seems proper to bring into the picture at this time some of the feats which have been accomplished with wood—and using these connectors in various forms.

Radio towers, 330 feet high, built of southern yellow pine with wood dowels and brass bolts. Three hinged arches, 200 feet in span and 30 feet high, in an auditorium. Guyed radio masts, 130 feet high, with a top pull of 6,000 pounds. A pulp shed having a clear span of 113 feet. An airplane
hanger with a clear span of 92 feet. Another auditorium with a span of 197 feet. A warehouse with two 70-foot spans with built-up columns of wood supporting 22-ton cranes. These are just a few of the many structures put up with wood which, before the invention of connectors, were unheard of. With all of this in the background, what will the future of such construction be if the industry digs in and does an immense amount of work to further this wood-use? Absolutely very little benefit will be derived from what work has been done if support is not given the movement by the people in whose interest it lies.

If the time ever comes when the industry wakes up and realizes that it must help itself out of a very deep hole by research, its job will only be well started. After the facts have been found and the guesses eliminated, there still remains the tremendous task of re-educating the consuming public to the advantages of using lumber and its by-products. Some authorities in the advertising field seem to hold that the lumber trade could even now be kept on an economical level through advertising wood and its uses, but that is rather a doubtful statement in as much as it has so little in the way of absolute knowledge to offer in the advertisements. But, with coupling of a gigantic advertising campaign and the facts found and used, there is little doubt that a great change can be made to take place. All of this will call for the expenditures of large sums of money - larger sums than are conceivable by the lumbermen
at the present time, but this expenditure will not be
without results if handled in the proper manner.

It must be remembered that it is the consumer who
must be converted from the use of substitutes to the use
of lumber. What a shame it is that the architects of the
country have not been educated along the lines of wood-use!
They could as well as not be boosters for lumber at the
present time instead of knockers of that product. A queer
quirk in this matter is that the states which produce an
enormous amount of lumber pay for schools in which men are
educated to be architects who, when their education is com-
pleted, go out into the world and preach the gospel of
wood substitutes. Here is a matter that could be remedied
if the timber interests which are located in such states
would bring pressure to bear in the proper place.

A number of lumbermen have blamed the retailer for
the falling off of lumber sales which is not the straight
of the thing. It must be remembered that the retailer is
the server of the consumers; he is at their command; he
must furnish them with material for which they ask. If he
does not, he quickly goes out of business. This means
only one thing - that the lumbermen must force the consumer
to ask for lumber when he needs material to build, repair,
or remodel. If the demand is there, the retailer will
quickly see to it that the supply is adequate to meet the
demand and thus he will order lumber instead of some sub-
stitute which will take care of the output of the mills.
In conclusion I may say that the old adage "God helps those who help themselves" applies to the lumber industry at the present time. The industry can help itself by:

1) Finding by-products which will help defray the expenses and thus make it possible to meet substitutes' fact of lower price; 2) Find facts of its own applicable to its products; 3) Sell these facts to the consuming public through extensive advertising; and it will need no help from outside sources to pull it out of the rough.
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