

Allocation Hearing Completed Today With Argument by Sherley on Behalf of Clear Channel Group

The allocation hearing which has been held before the Broadcast Division of the Federal Communications Commission almost continuously since October 5th was completed today when oral argument was made by Swagar Sherley on behalf of the Clear Channel Group.

Mr. Sherley told the Commission that the problem before it is to determine the broad policy to be pursued so that listeners may enjoy the utmost benefits from radio both in its present state and from future development.

Only by a clear concept of unique ability of radio among all forms of energy, said Mr. Sherley, can a proper approach be made to the problem. He pointed out the fact that by radio alone can space be conquered in terms of time. Area over which it may be used is limited he told the Commission only by the power employed.

Mr. Sherley argued that public interest demands that this power be not wasted or dissipated and he said that "necessarily its proper use is a national one". He contended that the Clear Channel Group have several things in mind including the fact that none of the existing clear channels should be lessened or broken down and that the power increase should not be limited. Super power he said is a phrase that is really contrary to the facts. He told the Commission that if he recalled correctly during the early days of point to point radio five hundred thousand watts were used for transcontinental transmission. He said that this so-called super power is much of a bug-a-boo and he said that this much power or more is used for the lighting up of the front of New York theatres each night, more than that is used for the presses of daily papers and each power house of the country uses more power than five hundred kilowatts. He referred to super power as "a tyranny of phrase."

Populated Areas

Mr. Sherley said that the use to be made of radio "presents conflict between those in the thickly populated areas of this country and those in more sparsely settled areas." The allocation of frequencies has been made he stated with an effort to compromise the claims of population alone and area to be served.

"In testing public interest" said Mr. Sherley "by the greatest good to the greatest number, greatest number should not be emphasized at expense of greatest good". The greatest good he said is to be found by ascertaining the greatest need.

Those whose need is greatest should have no lesser right he contended "than those more fortunately situated and consequently with less true need". The benefits of radio he contended should be available to all.

Mr. Sherley said that a quality of service has always been recognized by the radio law. Congress he said intended social consideration to outweigh economics.

"Clear channel stations have no desire to disparage the social service rendered by any class of stations" said Mr. Sherley and "approve increased power to regionals and locals to improve this service. However, clear channels serving wide areas do render the primary social service contemplated by the radio law."

Although United States radio reception said Mr. Sherley is superior to that of any other nation, it is admitted by all that the art has advanced so that greatly improved service can and should be rendered to listeners.

"In both city and country," he contended "the listener does not enjoy as good reception as knowledge of the art now renders possible. In both city and country increased power will not only improve reception of those who now enjoy it, but will give reception to many now without it.

"More power is the only real remedy which will afford better

service to both city and rural listener. Progress in listener service has always been opposed by the timid and the fearful." Mr. Sherley said that satisfactory service for the whole country can be obtained only by the preservation of clear channels and an increase of power to stations assigned to them. The engineering data he said shows that no possible arrangement of regionals and locals can produce this national coverage if all clear channels are abolished.

Limitation of Power

"Though not openly advocated as such" Mr. Sherley said "a limitation to 50 kilowatt power and permissive duplication will lead to elimination of all clear channels and as shown by engineering data prevent covering the entire area of the United States.

"Regionals have practically no secondary coverage at night and this secondary coverage of clear channels is the only method whereby truly national coverage is at all possible."

Discussing the question of the number of clear channels necessary Mr. Sherley pointed out that it is impossible for one clear channel station regardless of its power to serve the entire United States because of fading and the fact that the sky wave service is not constant.

To afford any variety of program service to the rural listener outside of the primary service area of other stations Mr. Sherley contended there must be still a greater number of high powered clear channel stations. The question of international complications from high power stations in the United States said Mr. Sherley is out of the picture. He contended that while this country wants to be a good neighbor it should not shackle the radio art. Our neighbors are not doing it he said.

On the question of monopoly Mr. Sherley said that the Clear Channel Group is highly individualistic and independent as evidenced by their ownership and the granting of 500 kilowatts would accentuate this individuality by decreasing dependence on the chains.

Can Prevent Duplication

The radio law he said is sufficient to prevent any undue duplication of programs and monopoly and he called attention to the fact that the advertiser will not pay for unnecessary duplication of his own program.

Mr. Sherley stated that increased power to these independent stations will create a bargaining power able to deal with both broadcasting companies. The prevention of concentration of ownership he said eliminates monopoly.

He said that the Clear Channel Group are not subservient outlets for the chains but they are independent and he suggested that the Commission should see that separate ownership is preserved and called attention to the fact that the Commission has power of control over contract relationship.

"Graphs showing overlapping areas served by respective stations" he said "do not necessarily prove any real duplication of programs to all listeners within the overlapping areas."

The radio listener he contended must have more than one station available for uniformly good reception. He said that in his opinion the data of the regionals overlook the fact that inability to get good service rather than financial limitations accounts for the absence of radios in many homes. Obviously he said 90 per cent of our citizens are not now receiving satisfactory radio service. If so, there would be no need for the increased power now sought by the regionals.

Dealing with the question of duplication Mr. Sherley said that while duplication is feasible the resulting benefits do not compensate for the loss.

Signal Strength

"In the narrow area lying between two stations" he said "it is possible by directional antenna to so suppress the signal strength as to protect the dominant station within the narrow area. As the width of the area is enlarged the protection becomes less."

If clear channels go to higher power said Mr. Sherley the condition as to feasibility of duplication changes rapidly. Such increase he said makes duplication impractical which may account for the opposition to the higher power. It is practically impossible he contended to again clear a channel that has been broken down. Clear channels he stated "should not be forced to repeatedly defend the exclusive use of their frequencies simply because from a strictly engineering viewpoint duplication is feasible in certain few areas."

There is no valid technical objection Mr. Sherley told the Commission to increase the power of clear channel stations. The opponents insistently urged he said "(1) that clear channels can not survive economically and (2) that they will so successfully survive as to drive regionals out."

Mr. Sherley contended that great weight should be given to the opinion of men who are willing to risk their money in the venture of 500 kilowatt stations. The question he said as to who should be allowed to increase their power can only properly be determined upon the hearing of individual application.

Service Limited

What radio stations have to offer to advertisers is limited in quantity said Mr. Sherley which presents inherent limitation in broadcast advertising regardless of the demand for a station's time. National advertising today he contended is extremely small compared to potential national advertisers. He admitted that if power is increased rates will have to be increased, based on increased circulation.

Mr. Sherley said that the ratio of radio advertising to other forms of advertising is constantly increasing and that there is now a steady growth in radio receipts. Stations he told the Commission can not exhaust or even satisfy the demand of advertisers with only 18 hours per day to sell.

"That regionals may no longer carry the same chain programs that clear channels carry," he said, "does not mean that there will be no chain programs available to them, since expansion of chain programs is not at an end."

Discussing the question of flexibility Mr. Sherley said that "it is well to consider what is meant by flexibility of regulation. If by it we mean that this plastic art should not be put into a straight jacket, I would say 'Amen.' If it means that all regulations are to be so elastic as to give no repose or security as to the basic character of different classes of stations, then I emphatically say 'No.'"

"Let me illustrate: The clear channel group have recommended a minimum requirement of 50 kilowatt power for all clear channel stations and are opposed to any maximum limitation on power. Why? For the reason that if a station is to have a frequency for its exclusive use, a very high grant, it should be required to make such use of it as to justify the grant, and if it cannot or will not, then it should have the grant revoked. There you have a proper rigidity, one necessary in the interest of the public in order that the all-too-scarce frequencies shall be put to a satisfactory use."

Better Service

"On the other hand, if a maximum on power is left open so that a station may progressively better serve the public, you have the flexibility necessary to growth. Again I can illustrate by the distance tables of separation of stations. Such a regulation is one of a working standard subject to be disregarded in the light of facts pertaining to particular frequencies and particular stations. To make such tables absolutely rigid, never to be departed from, would be to hobble the art."

"If I should undertake to formulate a rule as to when a regulation should be rigid and when flexible, I would say it was this: Let the regulation be rigid whenever it relates to a basic determination necessary to protect a desired and determined status; let it be flexible when within that classification or status a rigid application would prevent adaptability to actual facts in an instant case, and by all means let the flexibility be an aid to progress and not an invitation to retrogression."

"Perhaps another misnomer that has grown up in radio nomenclature is the expression 'secondary service area' as applied to clear channels. A truer description would be 'exclusive clear channel

service area,' for as this Commission knows full well, that coverage comes chiefly from clear channels, and is a truly primary service to many dependent almost solely upon it."

"But I must not pursue this subject. A book could be written on the harm that has come from the use of phrases that take the place of real thought."

Monopoly

On the question of monopoly Mr. Sherley discussed the likelihood of any possibility of that if clear channel stations are given increased power as professed by some.

"The stations in the clear channel group which I represent are highly individualistic," said Mr. Sherley.

"Consider the ownership of these stations and you will see how truly independent and individualistic they are. Financial ownership is entirely distinct; their relation to the national broadcast companies is separate and distinct and can be changed, and doubtless will be from time to time. While they carry in large part, chain programs, they exercise individual choice as to what sponsor or sustaining program they will take and the choices they make in these respects are frequently quite different."

"If all these stations went to 500 kilowatt power, this individuality would not only still remain, but he accentuated, for with the increased power would come a lesser dependence on the chains."

"Overlooking this individuality, critics of increased power insist that there will be an undue duplication of programs and a monopoly of the air by the chains and a few stations. A sufficient answer lies in the radio law itself."

"Control over programs of chains, particularly as to undue duplication of stations with overlapping areas, lies within the expressed power of this Commission. That such control will need to be exercised I seriously doubt, but that that power exists and if necessity arises can and will be exercised, is plain."

Duplication of Programs

Mr. Sherley said that monopoly will not be endured, either in programs, ownership of stations or otherwise. "But I think," he said, "it is fair to say that the advertiser will see to it that he does not pay for unnecessary duplication of his program. I vision in the future not a monopoly of radio broadcasting by the existing chains, but rather a multiplication of chains, not alone by the existing companies but by alliances between stations themselves."

Mr. Sherley said that "monopoly of chain broadcasting is made infinitely more likely by denying growth and strength to independent stations such as compose the clear channel group. By giving these independent stations sufficient power to cover large areas whereby four or five of them joined together can assure consistent nation-wide coverage throughout the entire year, you will create a strength of bargaining power able to deal on somewhat equal terms with either or both broadcasting companies. These stations will have resources sufficient to originate programs of equal merit with those furnished by the chains. It is even likely that in such a situation program creation will in considerable degree divorce itself from chain and station ownership and booking of such programs with groups of stations be the rule."

"The law gives you and you exercise control over change of ownership. You can and should prevent ownership of many stations in a few hands. You must prevent monopoly resulting from single ownership of all stations in any limited area. Prevent that concentration of ownership and you need have no fear of monopoly."

Contract Arrangement

"If it be thought that contract arrangement between stations and the chains gives control over ownership into the hands of the broadcasting companies, you have power to cause any necessary changes in such contracts. I know as to some of the Clear Channel Group for whom I speak, and it may be true as to a number of others, that the stations have notified the chain with which they are affiliated that the station will exercise its own judgment at any time it considers it proper to substitute its own or another program for chain programs that may have been contemplated."

"These stations are not simply subservient outlets for the chains. They are independent in the true sense of that term. They would not become less so, but just the contrary, by an increase of power and the ability to serve over larger areas. There is no danger of a monopolistic combination between such stations."

"Can you visualize a combination between WGN, the Chicago Tribune station, and WHAS, the *Courier Journal* and *Louisville Times* station? My imagination is not so facile or vivid. And

the same is true of any other combination of the stations in the group. Preserve separate ownership. Control if need be contract relationship and you will certainly prevent monopoly."

Dealing with the duplication of program Mr. Sherley said that the Commission must not let the talk of duplication of chain programs mislead it. "I am sure this Commission," he said, "will not overlook the need for some duplication, no matter how great the power that may be given to clear channel stations. It is one thing to show overlapping areas by graphs, depicting the areas served by respective stations. It is quite another thing to prove thereby that there is in any true sense a duplication of all listeners within the overlapping areas."

Advertising Claims

"This is apparent if we consider the matter from an angle other than the advertising claims of the broadcasting companies. The exhibits and data which have been assembled by regional associations as bearing on this question are on the basis of the ability to hear a single station and to hear it with a single strength .4141 millivolts." Mr. Sherley said that there was no use in refuting the statement that 90 per cent of the citizens of the United States are now receiving satisfactory radio service. "Were this true," he said, "the regionals situated in all the large cities and towns of the country would not now be seeking additional power. This Commission knows that static and man made noises make necessary increase of power if service is to be truly satisfactory in the city, town or country."

"Monopoly is not to be prevented by denial to a station of any class of power sufficient to adequately perform the service expected of a station of that class. This Commission is not so impotent in its power and control of stations as to need to keep them inefficient in order to preserve independence in broadcasting."

In connection with objections urged to the elimination of any maximum of power for clear channels Mr. Sherley said:

"Those who have opposed the elimination of the present maximum upon power permissible for clear channels and who in particular strenuously object to any grant of 500 kilowatt power to any of these stations, if I understand their position aright, urged in substance four reasons: (1) engineering objections; (2) economic objections, as applied to the clear channel stations themselves; (3) economic injury to regional and local station; and (4) international complications that will result. Let us examine these objections in order."

Engineering Opinion

"I think I am warranted in the statement that there is a unanimity of engineering opinion that in the light of the selectivity of present day receivers, there is no valid technical objection to the increase of power and this is true irrespective of whether there is a corresponding increase of power by clear channel stations on adjacent frequencies; or as the engineers put it, there is no insurmountable problem of adjacent channel interference."

"Men are always impeded by their fears and I recall that when the then supposedly great increase to higher power was being considered by the Radio Commission, and out of which came the present 50 KW power stations, it was urged that the interference between stations on adjacent channels would be such as to seriously impair the service that would be rendered. We all now know that those fears were groundless."

"I come then to the second objection urged, an economic consideration. We are told that the clear channel stations cannot afford to make the investment necessary for increased power and will be unable to bear the increased cost of operation, maintenance, depreciation, etc."

"I might in passing say that it strikes one as a little curious that those who urge the inability of the clear channel stations to survive are those who also urge that they will survive so successfully as to imperil the life of the regionals."

Economically Justified

"But I am not concerned with either the maximum or the minimum figures that have been presented, or some intermediate figure, though I want to suggest to your Commission before I go into the question of the reasons why I believe the increase of power will be economically justified, that very great weight should be given to the opinion of men who are risking their money in the venture. Certainly a commission should be exceedingly slow to stop the improvement of broadcasting service to the country by a predetermination on general considerations of the unwisdom of

expenditures by those willing to take the gamble. America's progress has been made by the courageous who in the face of the declaration that it could not be done, have gone forward and done the particular thing."

"Let me suggest again that the ability of individual clear channel stations to make the outlay and sustain the increased cost of operation is one that can only be properly determined upon the hearing of the individual applications. This Commission is not confronted with the decision of now determining that 30 clear channel stations shall go to 500 KW power and no such request is urged by the group that I represent. What is being asked is that the prohibition against going to higher power shall be removed from the regulations."

Problem as Whole

"But let us turn to the question, viewing the problem as a whole, as to whether there is advertising patronage sufficient to make the venture successful. I would like to impress the Commission with this basic thought: What radio stations have to offer to advertisers is limited in quantity. It should not be limited in quality by any regulation that the Commission may make. Now what I mean by that is this: There are probably not over 18 hours a day of salable time, varying in value according to the particular time of the day or night. This is a limitation inherent in broadcast advertising and in this particular it differs entirely from advertising through other media. The newspaper may increase the volume of advertising carried by it to whatever extent the demand may require. But no matter how great the demand for a station's time, it has only so many minutes and so many hours available to carry the advertising program."

"It is because of this limitation that I am quite sure that the difficulty ahead of radio stations of all classes is not to find advertisers wanting their time; the difficulty will infrequently be to find time for such advertisers."

"If you will consider the number of different national programs carried on the air today by all stations, you will find it exceedingly small. A few hundred would certainly cover the number. Compare that with the potential national advertisers as measured by those businesses in America now engaged in national advertising through other media and I think it will readily be concluded that the saturation point is in no sense even approached, let alone reached."

John V. L. Hogan testified before the Commission yesterday as president of the Interstate Broadcasting Company, New York. Others testifying yesterday included Edward N. Nockels, secretary of the Chicago Federation of Labor and general manager of stations WCFL and W9XAA, and Professor J. F. Byrne on behalf of Station WGAR, Cleveland.

John V. L. Hogan

Mr. Hogan in his statement to the Commission urged that the Commission retain the experimental privileges and requirements as to stations in the 1510-1600 kilocycle section of the broadcast band. He urged the Commission also to open the 1510 and 1590 kilocycle channels for stations of a maximum power of 10 kilowatts. He made several other suggestions.

Mr. Hogan said:

First I would like to congratulate you of the Commission and the staff of your Engineering Department upon the plan underlying the present hearings, and to thank you for the opportunity to express to you such of my views as may be of possible utility to you. It was my good fortune and pleasure to cooperate with the Department of Commerce in its first broadcasting allocations, and with the Federal Radio Commission in forming the engineering basis for the allocation of 1928. I have enjoyed hearing and reading much of the testimony that has been presented here, and I think that I may say that we should all be grateful to the Commission, for the Clear Channel Survey as a direct proof of many of the principles underlying allocation engineering, and to many of those who have appeared before you, for their sound analyses and applications of the engineering principles that have been available to guide us throughout the growth of broadcasting. It is a matter of considerable interest, if not of considerable importance, that these hearings have developed much new information in support and confirmation of sound engineering principles, and nothing, so far as I know, that is radical or which would indicate the need of any revolutionary changes in allocation or allocation engineering."

Second, I would like to give you, as concisely as possible, my

thoughts with regard to certain of the topics listed in your Notice relating to these hearings on Docket No. 4063. It may be convenient if I treat these in the order of the Notice, which seems to me to be logical and satisfactory. I have had the opportunity of studying these topics with the Broadcasting Committee of the Institute of Radio Engineers and of contributing to the Institute's comments that were presented by Professor Hazeltine, but nevertheless, you may be interested in hearing at first hand the viewpoint of an independent consulting engineer.

Classes of Stations

Your first topic is the "Classification of Broadcast Stations." There are just two classes of broadcast stations. One is that of the clear channel station, whose day and night service is properly limited only by the noise level at distant receiving points, or improperly by interference from station on neighboring channels. The other class is that of the shared channel station, whose day service is limited either by noise at the receiver or by interference from stations on the same or on neighboring channels and whose night service is limited principally by interference from other stations on the same channel. If there is to be any reclassification of stations, I suggest this simple division into the two groups, clear channel and shared channel.

As to definitions and purpose, the clear channel station whose service is limited only by noise level, is obviously for the purpose of serving listeners in nearby urban centers, in the hundreds or thousands of more remote cities and towns who have no stations of their own, and in the widespread rural areas that cannot be reached by shared channel stations. The shared channel station is for the provision of an *additional* or supplementary service, usually more local in flavor, to cities, towns and their nearby trading areas or otherwise defined local territories. That is all that shared-channel stations can do, by night, particularly if they are spaced so closely as is now common.

Number of Channels

With respect to the number of channels to be allocated to each class, I favor (and always have favored) an increased number of cleared channels. That is because I feel that, in general, urban centers have been getting all the radio they need, while our rural population has *not* been getting all the radio it needs and deserves. Since shared-channel stations serve the urban populations *only*, at the expense of the rural listeners, whereas clear channel stations serve *both* urban and rural listeners, there is no reason for further impairment of clear channel service and there are many sound reasons for working in the direction of at least 40 real clear channels in the broadcast spectrum.

With respect to the effect of frequency, I would point out that the sky wave depended upon for night-time wide area coverage is equally good throughout the broadcast band, and that the indicated difference in fading period favors the selection of the higher frequencies for clear channel service. So also does the reduced natural noise level that has often been observed. For daytime service, the lower frequencies are in general somewhat better than the higher frequencies, but by no means in the amount indicated by some of the witnesses here. There is evidence of the existence of a useful daytime sky wave at the upper part of the band, and much of the supposed increase in attenuation is offset by a higher antenna efficiency. Thus, for night-time service, the 1000-1600 kc. waves are equal or superior to the 550-1000 kc. waves, and for daytime service the variations in attenuation seem to be of less practical consequence than has often been suggested.

There can be no rule as to the number of stations to be permitted to operate simultaneously on a single channel at night. Once a channel has been dedicated to the supplemental service of *urban* listeners, i.e., once it has become shared, the number of stations to be permitted on it depends entirely upon the relative location and sizes of the areas to be served. At the two extremes are the present local channels, one each of which many small areas of perhaps only fifty or one hundred square miles are served, and the present two-station shared channels, on each of which two large urban and suburban areas may be served unless the two stations are geographically too close together.

Separation Tables

Mileage-frequency separation tables may be useful as a rough guide for shared channel allocation, but they can be no more than that unless they are extended to include the factor of the size of the area to be served by each station and, for daytime service, the

channel frequency and the character of attenuation for the territory under consideration. On the whole, I think it much wiser to establish service standards to be met and to be protected, and then to consider each specific case on its merits and in view of all the facts that can be determined to apply to that particular case, than to depend upon averaged or arbitrary mileage tables.

As to subclasses, there is no way to set up groups within the clear channel classification. Shared channels might be usefully subdivided according to the number of stations to be permitted on each.

With respect to the use of frequencies designated as clear channels "by stations of another class", it should be noted that this is impossible at night. As soon as a second station is allowed to operate on a clear channel at night, the channel is no longer clear, but automatically becomes shared, and automatically loses its capacity for rural service. But there is probably no need for a cleared channel by day, unless, with very high power and probably at a low frequency, a station can push out a division signal well above the noise level to such great distances that a second station on its channel would restrict the useful service. In general, under today's conditions, all channels that are clear at night could be shared in the daytime.

Protect Rural Listeners

However, the Commission should protect the rural listeners from the ever present dangers of losing their radio service, by refusing to such additional daytime stations any possibility of becoming (either gradually or abruptly) night-time stations, with the inevitable transformation of the channel from a clear channel to a shared channel.

In my opinion there is no reason why a single frequency should not be simultaneously used at night by two 50 KW. stations separated by a substantial distance, provided it is clearly understood that this results in a *shared* channel capable of serving well two centers of population, and that it is *not* a clear channel and consequently that it cannot serve as large a rural area as would be reached by a single 50 KW. station on a clear channel. By day it is entirely feasible to put two or even more 50 KW. stations into simultaneous operation on a single channel, without reducing the useful rural or urban area of any of them.

The hour of sunset at the westernmost station of a pair or a group is a convenient and, so far, a satisfactory time for making the division between daytime and night-time service conditions. Until we have learned more about the intensity of the daytime sky wave at the higher frequencies, however, it would be wise to limit the daytime loading of channels above 1000 kilocycles.

The remaining sub-topics of directive antennas and synchronization are in themselves matters that would warrant long discussion. At the moment I will say simply that neither one is the long sought answer to the prayer for a technical means whereby anybody can put up a new broadcast station anywhere he may choose.

Rule for Power

As to the maximum and minimum power, again there can be no general rule. The principles are well known: First, increased power always gives better service over noise; second, "Horizontal" increases do not change the distribution of service, but improve service where it had been given. There is no reason to fear increased power, as has amply been proved; it should be welcomed to the extent that it can be paid for and to the extent that it can be used without reducing the service of other stations on the same or adjacent channels. But every application for a change in power should be considered on its own merits, although not necessarily by means of a hearing. Your Engineering Department is competent to advise you as to the changes in service and interference conditions that may be expected to result from any particular change in power that may be contemplated. In general, there should be no reluctance in permitting daytime power five or even ten times that used by the same station at night, and, in the interest of the listener, there should be encouragement of the use of higher powers, both day and night, by stations of all kinds.

On your main topic II, Standards for Coverage and Interference, the Commission's use of 20:1 as a proper minimum ratio of desired to undesired signal and at 5.2 and 0.2 MV/M as measures of minimum service signal under urban, residential and rural conditions, have worked out about as well as any arbitrary figures could be expected to. We all recognize that 20:1 does not represent freedom from interference, but merely a condition that can often be tolerated, and I believe that the use of a higher ratio would give listeners a better service. Also, we all know that there are many urban locations where a 5 MV/M signal is utterly inadequate, although it seems to be a fair enough average value for first approxi-

mations. In relation to this point, I would like to emphasize the importance of working to reduce the urban and suburban noise level, a matter which is capable of much improvement by cooperative and even by legislative means. The broadcasters are working to deliver a signal-to-noise ratio, not merely a signal, and it is just as effective to help the listener by reducing the interfering noises as by increasing the transmitter power. Of course, the present practical way to improve the ratio is to increase transmitter power, for that can be done at once, but noise reduction should not be lost sight of.

Channel Separation

With regard to the established 10 KC. separation between channels and 50 KC. between stations located in the same community, I urge that these standards, which are none too high and which have been used for years, apparently without undue hardship to anyone, be continued as a service minimum.

Your sub-topic II, 6, (d), entitled "permissible disparity in power between stations on adjacent frequencies", seems to imply that the ideal situation would be to have adjacent channels occupied by stations of the same power. I feel that there are advantages in the opposite view, and that there should be no requirement as to a minimum difference in or ratio of power between stations on adjacent frequencies. This will be clear from consideration of the fact that a clear channel station serves a nearby urban and residential area plus a very large rural area, but is not expected to give optimum service in distant urban areas. If a second clear channel is immediately adjacent, each powerful transmitter will tend to reduce the rural service of the other in large areas. On the other hand, if the channels on either side of a powerful clear channel station are used by a number of channel-sharing low powered stations, each of the smaller stations may give a good service to the limited urban or community area in which it is located, but, because of the smaller power, its interference will not extend far into the rural service area of the cleared channel station. Thus the best possible allocation may well be one in which a "wave" system of power assignments is followed, the simplest case of the "wave" system being represented by successive channels with first low power, then medium, then high, then medium, then low, then medium, then high, and so on. This would be difficult to achieve at once without revolutionary changes in the present assignments, but is worth study and further consideration.

Blanketing Signal

As to blanketing signal, there is no doubt that 100 MV/M is too low. With most receivers as made during the past few years, and many made before, it is easy to receive programs 50 kc off the immediate local frequency even though that local signal have a field intensity of several volts per meter. Certainly no signal weaker than 1000 MV/M, i.e., one volt per meter, should today be called a "blanketing signal."

The only other topics of the Notice on which it may be helpful for me to speak at this time are Nos. 2 and 3 under heading III. I consider that it would be substantially impossible to establish a quota system that would include in a single set of rules all the factors necessary for adequate and proper compliance with Section 307 (b) of the 1934 Act. There is no automatic or mechanical way of providing "a fair, efficient and equitable distribution of radio service among the several states and communities," so far as I can see, except the progressive application of sound engineering principles and thereby the gradual evolution of such a distribution of service.

Experience

Finally, I would like to discuss the 1510-1600 kilocycle portion of the broadcast band, based upon my experience with W2XR since it began operating as an experimental broadcast station on July 2, 1934. In this period of more than two years it has been demonstrated beyond doubt that the frequencies above 1500 kilocycles are satisfactory for the delivery of a useful broadcast service. By day they suffer somewhat from a higher attenuation, but only slightly more than other broadcast stations such as the high-power regionals, and this handicap is largely offset by higher antenna efficiency and the evident existence of a useful sky wave even in the daytime. At night the 1510-1600 kc channels have a tremendously effective sky wave, and we have satisfactory evidence that that sky wave can be depended upon for night time service at great distances. The channels can be used on either a clear or a shared basis, but the relation between the number of stations that may be operated simultaneously on one channel, and the

area that can be covered by each, is still to be determined by further observations on the day and night sky waves. However, our knowledge to date is sufficient to warrant the Commission in opening at once at least three more channels in the band, these being 1510, 1590 and 1600 kilocycles. Two of these, viz., 1510 and 1590 kc, should be made available only to interests that will do a good job of initial installation of stations of at least 1 kilowatt power with a well directed investigation and long-period study of wave transmission effects on those frequencies. The 1600 kc frequency might well be used under the same restrictions and for the same purposes, but its availability in many sections of the country for local stations of 100 to 250 watts power should also be considered.

High Fidelity

The high fidelity angle of broadcasting has also been proved out by W2XR, and there can be no doubt whatever that the vast majority of listeners recognizes and appreciates high fidelity transmission based upon extended frequency range, uniform frequency response and minimized harmonic distortion, even though they listen on commercial broadcast receiving sets. For that reason, I urge the Commission now to preserve the present 20 kilocycle separation between 1510, 1530, 1550, 1570 and 1590 kilocycles, and thus to permit the further demonstration of the value of high fidelity. This work should be carried on by the stations on 1530, 1550 and 1570 kilocycles with the present power limit of 1 kilowatt raised to at least 5 kilowatts and preferably to 10 kilowatts, so that the deleterious effects of electrical background noise on true high fidelity transmission can be more completely overcome.

Sidebands

We must recognize, however, that 10 kilocycle sidebands can be effectively transmitted over the service area of a high fidelity station even though an adjacent channel only 10 kc removed is occupied by another station, provided that the two stations are separated geographically so that the carrier of one has been attenuated to the noise level at the margin of the other's service. This offers the opportunity for the Commission to open first the 1520 and 1580 kilocycle channels, under such rigid geographical restrictions, and later the 1540 and 1560 kilocycle channels after the results have been observed and studied. In view of the excellent sky wave night-time service that all these channels can render to rural listeners, the Commission should be extremely careful not to permit any crowding of the channels with the consequent loss of rural service that cannot now be had in any other way. It would be far better to open additional channels, even at the sacrifice of 20 kilocycle separation between widely spaced stations, than to put more than a very few stations on any one channel other than such as may be dedicated to local service. In these new channels, by limiting their use only to licensees who will carry on the necessary and fundamental investigations that are needed by the art and by the Commission, you have the opportunity of determining more facts that are greatly needed while at the same time providing an extended radio service to listeners. I hope that you will not lose sight of the facts that the 1530, 1550 and 1570 kilocycle channels have already been found to be a valuable proving ground for what is new in radio, and that the pioneer work on these channels has resulted in increasing radio's potentialities for service both as to coverage and as to the realistic rendition of programs.

Summary

There are a number of other aspects of broadcasting that I would like to take up with you, but I have already perhaps talked too long. Let me summarize by recommending:

1. That you retain the experimental privileges and requirements as to stations in the 1510-1600 kc section of the broadcast band.
2. That you immediately open the 1510 and 1590 kilocycle channels for stations of a maximum power of ten kilowatts.
3. That you immediately change the power limitation for stations on the 1530, 1550 and 1570 kc channels from 1 kw to 10 kw.
4. That you study the advisability of opening the 1520 and 1580 kc channels to a limited number of stations, possibly using directive antennas, at a later date.
5. That you similarly consider the advisability of opening the 1540 and 1560 kc channels at a still later date.
6. That you immediately open the 1600 kc channel for similar stations, or, in your judgment of listeners' requirements, to a number of local stations of 100 to 250 watts power.

7. That you encourage the study of the sky wave coverage that has been demonstrated to be useful on these high frequency channels.

Hogan Cross Examination

Mr. Hogan under cross examination stated definitely that in his opinion it is necessary for the Commission to make provisions for local stations. He called attention during the course of his cross examination that engineering is an applied science and a science with an economic viewpoint.

Asked if he thought it is necessary to retain 40 clear channels Mr. Hogan stated that he did not know the answer to that. He contended that the Commission itself must decide how much service is to be given to rural listeners. Mr. Hogan stated that the curves of the allocation survey of the Commission are useful as a basis for coverage.

Discussing the question of directional antennas Mr. Hogan said that "directional antennas are useful medicine the same as alcohol is but like it, it can be abused." On the question of high power clear channel stations Mr. Hogan said that one station located on either coast could not give a good service to the country as we know it in the cities. Two high powered stations located on the east and west coast on the same frequency would cause interference he said, unless a fence could be built in the middle of the country.

City Noises

Discussing the possible reduction of city noises Mr. Hogan said that he had no specific recommendations to make in answer to this problem but he suggested that the Commission look into it. He stated that surveys are being made abroad on this subject.

In answer to further specific questions Mr. Hogan said that in his opinion there is no reason for a top limit of power nor is there any reason for a low limit. He testified that he is opposed to technical rules which will work hardship in any cases.

Mr. Hogan said that day-time static effects lower frequencies more than it does higher frequencies while at night-time the transmission is at a par.

Edward N. Nockels

Mr. Nockels in his testimony suggested to the Commission that it make a reallocation of the wave lengths and a revision of the regulations calculated to make sure "radio broadcasting is to be on the basis of the greatest need for the greatest number."

Mr. Nockels said:

In every other great country on earth the governments of those countries are so jealous of the use of broadcasting facilities in the interest of the people, that they have either placed strict limits on the commercialization of broadcasting or have entirely prohibited advertising by radio.

In this country Congress has permitted private interests to use broadcast facilities but wrote into law certain provisions to guide the Commission in the allocation of those facilities. It provided, first, that the Commission could grant licenses only for limited periods of time. Labor desires to commend the Commission for having carried out the purpose and spirit of that part of the law by limiting broadcast licenses to an even shorter period than the law requires.

In the second place, Congress provided that the Commission should grant licenses and *renewals of licenses* only in accordance with the public interest, convenience and necessity. That alone was to be the test. It was heralded as the Magna Charta of the radio listeners of America. It was claimed that this provision would forever protect the American people against over-commercialization of radio broadcasting.

What is the public interest, convenience and necessity? Labor desires to discuss this subject. It may be said that it is an old subject, but we submit it is a subject that is ever new in radio broadcasting in this country. It is always new in this country, because eventually public opinion will determine what kind of radio programs serve the public interest, convenience and necessity.

Public Interest

May we be permitted to call your attention to what Labor believes constitutes the public interest, convenience and necessity? It is that which contributes to the health, comfort and happiness of the people. It is that which provides wholesome entertainment, increases knowledge, arouses individual thinking, inspires noble impulses, strengthens human ties, breaks down hatred, encourages respect for law. It is that which aids employment, im-

proves the standard of living, and adds to the peace and contentment of mankind.

Is it in the public interest, convenience and necessity that this marvelous new means of communication should be placed within the control of a few large corporations, or handed out as a free gift to a few private business concerns for commercial exploitation, or sucked into the maw of great metropolitan newspapers already in uncontrolled possession of power that threatens the welfare of this country? Is it that the public interest, convenience and necessity is to be determined by noisy acclaim? If so, then the movies overwhelm the universities and are themselves outranked by a ball game or a prize fight. The basest sex novel would then put to shame the greatest scientific treatise.

Utility Monopoly

Is it in the public interest, convenience and necessity that Bill Jones of Podunk have a radio station to advertise his garage or that a great public utility monopoly operate a 500,000 watt or even a 50,000 watt station to further its interest, when great labor and educational organizations are asking for radio facilities to serve great masses of the people instead?

The public interest, convenience and necessity is nation-wide. It is age long. It has to do with the physical, mental, moral, social and economic welfare of all the people. It is not greatly concerned with Bill Jones' garage or the private profit which a station owner hopes to derive from these broadcasting operations. It is not enhanced by the granting of special favors to a few individuals or corporations, however large and powerful they may be. The great things of civilization are not sob songs, nor symphony orchestras. They are matters that have to do with employment, home life, health, standard of living, great economic and industrial problems that enter into the web and woof of the existence of all the people. To serve the public interest, radio must pour into the homes of the nation not only entertainment, but something that will help solve the practical problems of everyday life.

Is it in the public interest, convenience and necessity that all of the 90 channels for radio broadcasting be given to capital and its friends and not even one channel to the millions who toil? Will the public interest be served by granting all the channels of communication to those who do the employing and denying even one cleared channel of communication to the vast groups of employees?

Some years ago Station WCFL urged Congress to create a permanent Commission in charge of all wireless communications. We appreciated the extraordinary difficulties and problems that confronted the Commission in its early work. We recognized the magnitude of the work it has had to do. We tried not to indulge in fruitless criticism.

Engineering Tests

We urged a substantial amount of engineering tests and surveys. We believed they were necessary in order that the Commission might have accurate information regarding radio interference. We wanted channels and frequencies used efficiently. We recognized the relative advantages of high and low power. We desired the utilization of short wave frequencies, and many similar matters. We believed the law could not be efficiently administered by anybody until such scientific data had been assembled. But we never believed that the Commission should disregard the social, educational and economic considerations that broadcasting involves.

Labor believes the Commission must observe certain engineering rules, but believes the Commission should also apply the sole test provided by the Radio Act, viz: "The public interest, necessity and convenience." Permit me to state why.

In the earlier allocations some years ago the Commission granted the General Electric Company, Westinghouse Electric & Manufacturing Company, and Radio Corporation of America eleven stations with aggregate power of about 220,000 watts. It granted them seven cleared channels. These three great corporations at that time already had a strangle-hold on the radio industry by reason of some 2,000 patents which they have cross licensed to each other. We insisted then, that was in 1929, that it was not in the public interest, necessity and convenience to hand over to them so large a portion of the limited broadcasting facilities, while denying any adequate facility to other applicants, some of whom represent reputable and substantial citizens in very large groups.

Violation of Rules

At that time Westinghouse Company owned five stations, all in the National Broadcasting Chain, on cleared channels, and three

of them had high power. In fact, it had so many stations it leased KYW to the Chicago *Herald Examiner*. That was a 5,000 watt station then, located in the heart of Chicago in violation of the Rules of the Commission, and over our protest. It blanketed our Station WCFL, which only had 1,500 watts power then. Another Westinghouse station, KDKA at Pittsburgh, had 5,000 watts power on a cleared channel adjacent to WCFL and caused a great deal of interference with our programs.

That was seven years ago. What has happened? The Department of Justice brought anti-trust actions against the General Electric Company, Westinghouse Electric Manufacturing Company, Radio Corporation of America, American Telephone & Telegraph Company, Western Electric Company, R. C. A. Photophone, Inc., R. C. A. Radiotrone Company, R. C. A. Victor Company, and General Motors Radio Corporation. It declared them trusts and monopolies with the result that they have been split into many separate corporations. But what has been the result in the broadcast field?

Of the forty cleared channels an analysis today shows that National Broadcasting Company, now 100 per cent owned by Radio Corporation of America, owns or controls eleven 50,000 watt stations. They are: KPO San Francisco, KOA Denver, WENR and WLS Chicago, WMAQ Chicago, WBZ Springfield, WEAJ New York, WJZ New York, WGY Schenectady, WTAM Cleveland, and KDKA Pittsburgh. This company alone controls approximately 550,000 watts of aggregate power today as compared with the 220,000 that the total trust combination controlled in 1929. Now let us examine the Columbia Broadcasting System. It now owns or controls seven 50,000 watt stations and one 10,000 watts. They are: WCCO St. Paul, KMOX St. Louis, WBBM Chicago, KNX Hollywood, WABC New York, KFAB Lincoln, WCAU Philadelphia, and WBT Charlotte, N. C. Thus they control 360,000 watts of aggregate power, which is almost one and one-half times as large as that controlled by all the organizations in the trust in 1929.

Networks Control

As the situation stands today, the networks control more than 50 per cent of the total facilities now available on cleared channel assignments. Is that in the public interest? Labor thinks it is not. To give each of their stations now asking 500,000 watts will only make the situation that much worse.

Another development which Labor has watched with growing apprehension is the acquiring of more than one station in a given locality by these interests and closely allied individuals. In New York City the National Broadcasting Company controls stations WEAJ and WJZ, with 50,000 watts each. In Chicago the National Broadcasting Company controls WMAQ and WENR, each with 50,000 watts. In San Francisco the National Broadcasting Company controls Stations KPO with 50,000 watts and WGO with 7,500 watts. In New York City the Columbia Broadcasting System controls WABC with 50,000 watts and is attempting the control of another cleared channel used by WPG and WLWL with 5000 watts each. In the Chicago area the Atlas Brothers own station WJJD with 20,000 watts and WIND with 5000 watts. Any technical denial of this fact can be easily refuted by their published commercial propaganda.

The National Broadcasting Company further owns and operates in conjunction with three cities in the Northwest duplicate facilities, namely, Portland, Oregon, stations KGW and KEX; Seattle, Washington, stations KOMO and KJR; and Spokane, Washington, stations KHQ and KGA. In the opinion of Labor, a condition such as this is not in the public interest, convenience or necessity.

Oppose 500 KW.

Labor is opposed to the authorization of any additional 500,000 watt stations in America for the reason that such authorizations are contrary to the public interest and directly opposed to the fundamental principle of accomplishing the greatest good for the greatest number. Any further authorization of super power stations would be directly in line with the erroneous and much to be regretted policy in the first allocation of wave lengths, which amounted to nothing more or less than the cutting of a monstrous melon into forty luscious slices. These were passed out to the gluttons of monopoly and dedicated to the furtherance of selfish interest, with little thought for the public interest, convenience and necessity.

Labor has predicted and still predicts that the radio industry and radio service to the people of America will never reach a maximum of efficiency until the original misallocation of wave lengths is corrected. The first allocation can only properly be described as the division of the swag, at which time all persons and organiza-

tions whose desire for radio facilities were actuated by a zeal for public service were forced to sit on the side lines, while the monopolies and trusts and representatives of special privilege together with the monopoly owned newspapers and magazines and the radio chains were well taken care of in the manner to which such economic royalists were accustomed.

Reason for Opposition

The reason the authorization of 500,000 watt stations should be strenuously opposed is as simple as ABC. It requires no great mathematician or engineer to figure it out—it is based on a few fundamental natural facts which no one can deny. The time pieces of the world account for only twenty-four hours a day; of these twenty-four hours not more than eighteen can be said to be the average listening day of any radio station. In that average day it is only possible to crowd a limited number of programs. If a few radio stations in America are given the right to use power to the extent to which they now demand, they will to all intents and purposes drown out many other stations in America, and there will be available to the 120 million people living in this country only those limited programs which will be broadcast over a limited number of stations which might operate on this proposed super power.

That is not all. The cost of these super power stations, both to build and to operate is so large that the only way to maintain them is to increase advertising rates and thereby load down their programs with more and more advertising. Already the American people are protesting against too much advertising and too much commercialization. Labor respectfully submits that this Commission should not make that situation worse by grants of super power that will necessarily compel more advertising.

In times of national emergency, controversy, strikes, lockouts, and disagreement, these interests will surely disseminate propaganda the like of which this country has never yet experienced, with the result of further clipping and controlling by sheer power and brute force the intellectual and economic soul of this country. The importance of radio and the tremendous effect it has created in removing mental shackles from the public has been a source of consternation to the trusts and monopolies. In recent years they have made a determined effort to bring this powerful medium to a point of absolute subjugation. Failing in this they then made a determined drive to gain control and, gentlemen, they are now at the threshold ready to accomplish this purpose.

Power to Prevent

This Commission has the power to prevent the accomplishment of their purpose. Labor appeals to you to protect the people against them by refusing to grant their latest demand for super power stations all over America that will necessarily prevent the enlarging of radio facilities for the use of those other organizations who desire them for the public good instead of profit.

Although America has been quite properly called the "melting pot of the world", still its 120 million people are by no means possessed of the same characteristics nor of the same tastes when it comes to radio programs. These people spring from a varied type of antecedents. They have lived and are living in different kinds of environments. Their interests can not help but be diversified. They have widely separated likes and dislikes. If the radio channels are to be used in the public interest, all these people should be provided the variety of entertainment they demand. Along with this entertainment radio should furnish the varied types of economic and educational matter, which if intelligently disseminated, will do more than anything else toward removing the unrest with which the nation is afflicted.

The radio channels rightfully belong to all the people. We have previously asserted they constitute the last of the public domain. A basis should be carefully worked out for their permanent distribution for the benefit of all the people rather than for the benefit of a few of those special monopolistic interests which unfortunately stood ready and waiting at the time of their first distribution, to gobble them up for their own selfish interests and purposes. The granting of authority for super power to the radio stations now applying for it, as well as additional stations who might apply, would only be a continuation and enlargement of the original error.

Two Wrongs

Two wrongs do not make a right. Instead of making another grievous mistake, let us go back and rectify the first, in so far as rectification is possible. The Commission can do this by reassign-

ment of the cleared channels so that they may be occupied and utilized in perpetuity for the public good.

I am General Manager of Radio Station WCFL, "The Voice of Labor", and our short wave station W9XAA. WCFL started out with 500 watts over ten years ago and then was increased to 1500 watts and finally to 5,000 watts. Under this power authorization we have rendered what might be termed comparatively good service for those times. All the other stations in Chicago that had started at along about this time commenced to increase their power until we suddenly found that those stations which had originally been comparable with ours secured authority for utilizing 50,000 watts.

What happened? The radio audience naturally turned its dials and soon discovered that with 50,000 watts these stations not only had a larger coverage in adjoining territory, but a more intensive coverage within the Chicago Metropolitan area. We, therefore, applied for 50,000 watts and our application is pending before the Commission at this time. We certainly shall not discuss that application here, except to say that Labor is of the opinion because of its pioneering in this field, it is justly entitled to one national cleared channel in the United States.

Various Stations

National Broadcasting Company operates Station WEAJ on 660 KC. with a power of 50 KW. The only other station that exists on that channel is Station WAAW at Omaha, Nebraska, a 500 watt station operating until sunset only. Station WABC in New York City, owned and controlled by the Columbia Broadcasting System, operates on a power of 50 KW. on a frequency of 860 KC., with no other station on that channel excepting Station WHB with a power of 1 KW. day only, at Kansas City. Station WBZ also controlled by National Broadcasting Company, operates on a frequency of 990 KC. with a power of 50 KW., unlimited time in synchronism with Station WBZA in Springfield, Massachusetts, a distance of only 96 miles, and with the exception of these two stations no other facilities are utilized anywhere in the United States on this frequency.

Station KYW owned by Westinghouse and operated by the National Broadcasting Company, operates with a power of 10 KW. unlimited time in Philadelphia with only one other station operating on this frequency, which is WDZ with power of 250 watts and until sunset only. WDZ is located at Tuscola, Illinois.

Station WCAU at Philadelphia, controlled by Columbia Broadcasting System, operates on a power of 50 KW. unlimited time on 1170 KC. with no other station operating on this frequency within the bounds of the United States.

It is a matter of very interesting public record that Station WGY, owned by the General Electric Company and operated by the National Broadcasting Company, fought for and won the right in court to simultaneous operation on 790 KC. with Station KGO in San Francisco, both stations operating full time and controlled by the same concern.

East Coast Outlet

It is also an interesting fact that when the National Broadcasting Company desired an east coast outlet at Raleigh, North Carolina, without hesitation they placed Station WPTF on 680 KC. and operated simultaneously day and night with their owned and operated station KPO at San Francisco, California, which station operates with 50 KW. unlimited time.

Station KDKA at Pittsburgh, Pennsylvania, operates on a frequency of 980 KC. with a power of 50 KW. unlimited time. It is owned by the Westinghouse Company and operated by the National Broadcasting Company with no other station in the United States operating at any time on this frequency.

The three stations formerly owned by the Northwest Network and which were unsuccessfully operated by two corporations before the National Broadcasting Company acquired ownership, as I before stated, have been leased to associated corporations operating other stations in the same cities and it is the recommendation of Labor that Station KJR in Seattle, being controlled by the same corporation which controls these frequencies on the east coast, which frequencies are not being duplicated for simultaneous operation in the west coast, be placed on 990 KC. to operate simultaneously, full time, thus freeing a channel for which Labor has striven and to which Labor is justly entitled, with no inconvenience to the owners and controlling interests who administer the policies of these two stations.

Since it has been demonstrated that two stations can operate during night time hours simultaneously on opposite coasts, when

they want to do so, it seems to Labor that the principle has been flagrantly neglected in further application.

It is not in the interest of the public. It is only in the interest of monopoly.

Monopolistic Tendency

Certainly the holding of these cleared channels without an attempt to duplicate them with additional facilities for simultaneous operation on opposite coasts shows a monopolistic tendency and not one in accordance with the intent of the law when referring to the clause "public interest, convenience and necessity."

After the advent of radio the first attempt of the newspapers and national periodicals was to nullify and kill the effect radio might have on the public. In later years, failing in this attempt and recognizing the fact that the printed word might soon be outdone by the spoken broadcast message, they then sought to render their own opportunity of molding public opinion doubly secure by acquiring radio facilities. Then they operated these radio facilities in behalf of the same interests for which the kept press had been operated for years. Not satisfied with owning one station, some single newspapers have sought ownership or control of two or more stations, and in the last few years we have witnessed the development of a chain of radio stations owned and controlled by William Randolph Hearst and operated by him in the same manner as his newspapers are operated for his personal benefit and aggrandizement.

Summary

For these reasons, Labor takes the position that there are but three ways out of this situation with which radio broadcasting is confronted today:

1. A re-allocation of the wave lengths and a revision of the regulations calculated to make sure radio broadcasting is to be on the basis of the greatest good for the greatest number.

2. A limitation of all stations to a power of 10 KW., making them all virtually local stations, and serving only their own locality, and with only one station in any locality to any one owner or controlling interest.

3. That the Government take over and operate all radio stations in the United States. Labor hopes and trusts that the necessity for the last named alternative will not be forced upon us, but we are heartily and thoroughly in favor of complete government control and operation in preference to complete control and operation by trusts, press, magazine, radio networks and their closely allied interests.

Labor sincerely hopes that in this crisis the Federal Communications Commission will exercise its vested authority in the action which they are about to take in correcting the conditions I have here mentioned. The History of this country definitely shows that the people still have a powerful voice in matters of legislation and that the people have been compelled to destroy the trusts and monopolies in a continual war on private control and that these actions have occurred in a never ending cycle.

No public utility in America is as sensitive to public opinion as radio. Every Senator and every Congressman is in close touch with that public opinion as it changes from time to time.

If these trusts and monopolies and vested interests of an avaricious capitalistic group of corporations and individuals, seeking special privilege, are allowed now to obtain their ends, then will the people, through their one weapon, the Congress of the United States, be forced to take action again.

Nockels Cross Examination

During a brief cross examination Mr. Nockels said that labor strenuously opposes duplication of programs on networks. He said also that labor is anxious that the farmers of the country get good reception. He testified that there is no interference between WCFL and KJR. He said that his station had asked for 50 kilowatt power because it was not reaching its listeners. He expressed himself as being definitely opposed to 500 kilowatts.

J. F. Byrne

Mr. Byrne on behalf of Station WGAR, Cleveland, presented testimony with slides from the point of view of both the listener and as an engineer.

Mr. Byrne said:

The material presented at this time will be offered partly from the point of view of the listener and partly from an engineering point of view and it is hoped that the lines of thought presented will prove to be of some value in connection with the purpose of this hearing.

Aside from the important and extensive engineering advances that have taken place since the inauguration of the present allocation plan in 1928, probably the most outstanding change has taken place in the listeners' attitude toward broadcast reception. The average broadcast listener of today is not a radio fan, he is today a broadcast listener in the strictest sense of the word, and values his radio receiver because it is capable of providing news, entertainment and educational features. Today's listener picks two to five channels in the broadcast band and looks to these channels for his broadcast service. These channels ordinarily provide the most satisfactory technical service at his receiver. The change in the broadcast listener's habits is further clarified if one glances at the radio page of the New York *Times* of eight years ago and compare it with a radio page today. In 1928 the *Times* printed detailed programs of transmission for stations in the far west, southwest, middle west and south, in addition to the program material of the local stations. Today the programs of foreign short wave stations replace those of our own remote broadcasting stations. The rural listener survey of this Commission furnishes still further and more convincing evidence concerning the listening habits of a rural group and will be mentioned frequently.

As a matter of clarity it will be convenient to discuss the present allocation system and conditions as they exist today, in view of the technical considerations furnished by the allocation survey of the Commission. The discussion will be taken up in the following order:

1. Clear Channel Stations
2. High Power Regional Stations
3. Regional Stations
4. Local Stations.

The principal source of material is the allocation survey published by the Commission September 1.

Clear Channel Stations

According to the Broadcast Committee of the Institute of Radio Engineers "The field of the clear channel is to afford service to those vast intervening areas in which the density of population is so low that a broadcast service could not otherwise be supported and in addition, to a single large center." This is an excellent summation of the purpose of a clear channel station. One is prompted to ask, however, how vast is the vast intervening area mentioned in the definition? The answer to this question is given in the postcard reports on file in the offices of this Commission.

Samples of cards from North Dakota, Kansas, Arkansas and Alabama were analyzed and produced the result shown in Plate I, where the sum of all listener reports of clear channel stations located at distances of between 100 and 200 miles from the receivers was plotted as a single point at 150 miles. The process was continued up to distances of 1000 miles. There were fifteen reports of stations at distances greater than 1000 miles, only 2 per cent of the total number of reports. The curve definitely shows that 50 KW stations have approximately 95 per cent of their rural audience located within 800 miles of the transmitter. The field intensity survey of the Commission may be used as a guide for estimating the field intensity existing at the various distances from a 50 KW station, assuming an unattenuated field of 1450 MV/M at one mile. The dotted curve in Plate I is a graph of field intensity exceeded 90 per cent of the time versus distance. This plate shows quite definitely that the average rural listener pays little or no attention to signals below 160 micro-volts per meter 10 per cent of the time. This practical limit of service of 50 KW stations exists at a distance of 800 miles and has several interesting angles. First, the operation of one 500 KW station resulted in its being shown a marked preference among rural listeners. This is undoubtedly due to the fact that its signal was 10 DB higher than other clear channel stations at comparable distances. However, beyond a point where its field intensity dropped to .25 millivolts, the number of listener reports it received was negligible. This lends support to the assertion that the average broadcast listener tunes to the strongest signal in the band provided that the program material is to his liking. Clear channel stations of less than 50 KW, or operating with a poor antenna, or in a poor location were quite easily noted in the card analysis. As a matter of fact, if the postcard survey were completely analyzed it seems reasonable to assume that the actual radiated power of each station could be estimated with good accuracy.

If a number of 50 KW stations were to increase their power to 500 KW it seems reasonable to assume that the revised picture of rural service would not differ greatly from that shown in the present survey. Why? Because one of the most important fac-

tors limiting the service of broadcast stations, particularly those on clear channels, is the *strong signal preference* of listener. With the present geographical spacing of clear channel stations this factor limits the practical service provided by stations of equal power to a maximum of not over 900 or 1000 miles for 500 KW groups, or 800 miles for 50 KW groups.

Possible Sharing of Present Clear Channels

If the engineering division's present requirement of a 20:1 ratio of desired to undesired signal is taken as a standard, Plate III shows the power permissible at various distances from a clear channel station. The 20:1 ratio is understood to exist at a distance of 800 miles from the 50 KW station at least 90 per cent of the time. A glance at the curve shows that a 1 KW station could be placed at a distance of 2270 miles. If this degree of protection is afforded the $\frac{1}{2}$ millivolt signal, however, we are doubtless affording far more protection to the signal than do the gods of the storm. A signal that exceeds $\frac{1}{2}$ millivolt 50 per cent of the time will only exceed $\frac{1}{3}$ of a millivolt 30 per cent of the time, or $\frac{1}{6}$ of a millivolt 10 per cent of the time. Does 160 microvolts sounds like a field intensity value 20:1 in excess of the average static level? Probably not. Grant that there is a scarcity of good data on atmospherics, and just scan the sample field intensity records enclosed in the clear channel report—noise records on comparatively sluggish recorders. They follow:

- | | |
|--------------------------------------|----------------------------|
| 1. May 14 at Florhan Park, average | 20-30 microvolts per meter |
| 2. Mar. 24 at Florhan Park, average | 20-30 microvolts per meter |
| 3. April 14 at Florhan Park, average | 5-15 microvolts per meter |
| 4. Feb. 5 at Grand Island, average. | 5* |
| 5. May 2 at Grand Island, average | 5-10* |
| 6. April 2 at Boston, average | under 5* |

* On a Brown recording instrument, crashes do not record well.

It should be remarked, that those reports were taken in absence of carrier, and hence are representative and comparable to side band intensities of a modulated signal. Inasmuch as the average modulation of a radio broadcast transmitter seldom exceeds 50 per cent, the above field intensities should be multiplied by 5 or 6 to compare them to a modulated signal, on an interference or noise basis. No doubt these data are far too sketchy to use as a criterion, but they certainly seem to show that a further study should be made to determine just what degree of protection should be afforded a .5 millivolt average signal. There is certainly little or no advantage in protecting it to a point where the side band intensities of the interfering signal are below the static level.

Furthermore, if further work shows that if a .5 millivolt signal is sufficiently protected when the interfering signal's side band intensities are equal to the static level, one would be led to adopt a figure more like 5:1 for the ratio of the desired to undesired signals to be exceeded 90 per cent of the time. Where this is the case, a 1 KW station could be erected at a distance of 1750 miles, and the channel would accommodate stations having a present regional classification at distances greater than 2000 miles. However, even the 5:1 ratio 90 per cent of the time would prohibit the simultaneous operation of two 50 KW stations, non-directional.

Frequencies for Clear Channel Stations

If one admits that a clear channel station serves a dual purpose, intense local coverage and extensive rural coverage, it might be rather difficult to state exactly what frequencies would be most desirable. It is a well recognized fact that the low frequencies are particularly good for ground wave coverage, while the signal to noise ratio is better at the higher frequencies. The remote listener receives a better quality signal as far as signal to noise ratio is concerned at the high frequency end of the band. It would seem that in populous centers, low frequencies would be desirable, while in smaller communities higher frequencies might be of more value.

Effectiveness of Present Clear Channel Stations

The records as represented by the listener survey in Plate II show that a considerable number of the "clear" channel stations are much below par as far as rural service is concerned. They apparently are not fully cognizant of the responsibility that is theirs, to provide a decent signal for rural communities remotely situated. This situation should be remedied, either by reducing the number of clear channels, or by requiring a field intensity of at least 1500 millivolts per meter at one mile of all "clear" channel stations.

Classification of "Clear" Channel Stations

An attempt has been made to show the vastness of the intervening areas mentioned by the Broadcast Committee of the I. R. E., and data have been presented to show, that for all practical purposes, the area has a radius of 800 miles. A "clear" channel station is thus a regional station—clearness of the channel notwithstanding. The region served is of approximately 800 miles radius. True, such a large area served by a station in the center of the country would not permit simultaneous operation of other stations of any consequence, but when located on or near either coast, some other class of service could be established on the channel at a remote point.

Note on the Economics of Sky Wave Service

Plate IV shows the power required to produce $\frac{1}{2}$ millivolt at various distances for both a quarter wave and a half wave antenna. The power per square mile required to produce $\frac{1}{2}$ millivolts 50 per cent of the time has been plotted against the radius of the area in miles and is given on Plate V. For any particular case, if the annual cost of operation can be expressed in terms of dollars per watt for transmitters of different powers, a curve, dollars per square mile of $\frac{1}{2}$ my service can be constructed. Figures, such as annual cost of operation, are subject to considerable variation, and this has not been done. Suffice it to say, that, unless the dollars per watt diminish very rapidly with increasing power, good economic practice will limit the service to less than 800 to 1000 miles.

High Power Regional Stations

Much of the material presented in the foregoing discussion of clear channel stations can be used in the discussion of the high power regional problem. Of particular importance in this connection is Table II. Consideration of this table shows that 5 KW and 10 KW stations are not a factor when secondary rural service is considered, due to the relatively low level of the received signal. If high power regional stations are to exist and justify themselves it certainly seems as though their signals should be afforded protection out to distances of 4 or 5 hundred miles, and powered sufficiently to provide a signal value that will be used by rural listeners. The radio public has become high level conscious and the trend noted in the allocation survey seems to show that the amount of power required for sky wave coverage should be at least 25 and preferably 50 kilowatts.

The minimum spacing of stations of this class will depend, of course, upon the degree of protection to be afforded at a distance of 500 miles.

The present status of high power regional stations is such that practically no sky wave coverage is obtained, and the ground wave coverage is extremely limited due to their high frequency assignments. Unless these stations are protected to an extent that permits secondary service, their present place in the broadcast scheme seems to be uncertain.

It is suggested that the function of a high power regional station should be to provide two services: First, a ground wave service of comparatively limited extent, and second, a secondary sky wave service out to a distance of 300 to 500 miles. The present frequencies would seem to be appropriate, if this definition of the service to be rendered is satisfactory.

Regional Stations

The function of a regional station has been well defined by other witnesses and need not be repeated here. However, the word regional might possibly require further definition. Economically, a station of the classification is interested in providing good ground wave service to those people living within the trading area of the community in which the station is located.

Service of Regional Stations

The amount of service rendered by regional stations in the United States varies between wide limits, a fact well recognized by everyone. In general the regional stations provide a day service much in excess of that provided at night. This effective day service might cover a region of anywhere from 20 miles radius up to 200 to 300 miles—the latter figures applying to conditions where the power is 5 KW, the frequency low, and the conductivity good. This day service, particularly in the west, is of considerable value to rural listeners, including small communities having no local radio facilities.

Because of the tremendous variation in ground wave transmission regional assignments are far from being equal in technical and eco-

nomic value. Plate VI, for example, shows the limit of service (on a 20:1 ratio 90 per cent of the time) as a function of frequency. The two co-channel stations are assumed to be 800 miles distant. If one takes the case discussed in Plate VI, and assumes a night power of 1 KW, the low limit of field intensity for good broadcast service is 5.6 millivolts per meter. This value is independent of conductivity and frequency, for the interfering signal exceeds 280 microvolts 10 per cent of the time. In the case of local channels a typical channel when analyzed shows that the field intensity exceeds 200 microvolts 10 per cent of the time and 20:1 ratio would require a value of 4.0 millivolts for 90 per cent service. It is of interest to note that for good conductivity the low frequency regionals (600 KC) provide good broadcast reception at 28 miles, the mid-band regionals at 20 miles (900 KC), and the high frequency regional at 14 miles. If the conductivity is fair to poor, as it generally is in the larger urban centers of the east, the figures are under 22, 15, and 10 miles respectively. If the service of a station in centers of population is limited to ten miles, it is placed at a distinct economic disadvantage. It does not provide a reasonably large portion of the marketing and with an acceptable signal.

Ratio of Desired to Undesired Signal Intensities

It is interesting to compare the figures quoted in the clear channel survey concerning limit of service of regional and local stations, with the 20:1 ratio 90 per cent of the time. The allocation survey quotes on page 6 as follows:

"Another part of the allocation survey was conducted by dispatching inspectors from the Field Section of the Commission's Engineering Department through various localities with field cars. On these trips rural listeners living within the primary service areas of several broadcasting stations of the different classifications were interviewed, for the purpose of determining the approximate limit of the night primary service areas. At the point where listeners reported to the inspectors that satisfactory service was no longer obtained, the day field intensity from the station was measured."

Class of Channel	Number of Measurements	Number of Stations	Day Field Intensity	Empirical Standard	Standards Based on Calculations
Regional	123	66	.935	1.0	5.6
Local	44	30	1.27	2.0	4.0

If the results as published in the survey are correct, it would seem that the 20:1 ratio of desired to undesired is not obtained in practice, the ratio dropping to 3.33 to 1 on regional channels and 6.3 to 1 on local channels.

What can one say about this striking difference in field reports (3 to 6:1) and laboratory tests (20:1)? There are several angles to the question. Undoubtedly the service provided by regional stations at their practical limit of service radius is inferior to that recommended by anyone who has conducted laboratory tests. The regional station, which provides a constant signal level at the receiver with a variable amount of flutter, cross talk, etc., does provide some service where to be conservative, the ratio of desired to undesired signal is of the order of 7:1, 90 per cent of the time. This service is used in spite of the fact that clear channel stations provide a secondary sky wave service at the points in question, entirely free from cross talk interference.

Frequency Assignments of Regional Stations

If we expect to provide a reasonably high technical standard of broadcast service by the use of regional stations, it is obvious that at the present time, there are with few exceptions far too many regional stations operating simultaneously on the same channel and this is particularly true if regional assignments in small towns are to be expected to have the same geographical coverage as those in populous centers. Possibly some arguments can be advanced in support of the equality hypothesis, but the fact remains that where condensation of population occurs, whether it be large or small, the density of population in general diminishes with increasing distance from the population center in such a way that the number of people living between 10 and 20 miles of a large center is greater than the number of people living in the same limits of distance from a small center. As a guess, the ratio of the numbers would be about the same as the population ratio of the centers in question. Furthermore, people in the larger centers expect and

get a good quality of broadcast service and it is probable that the 20:1 ratio of desired to undesired signals comes closer to realization in such centers. With these facts in mind, consider the lot of a high frequency regional station in a large community. Its service is extremely limited by cross talk interference on its channel, and the radius of grade A service is, in some cases, as low as 6 or 8 miles.

As a matter of fact, if the 20:1 ratio is to be maintained, the service radii of regional stations is so restricted by present allocation that it is impossible to provide good broadcast service to any reasonably large city, particularly on a high frequency regional assignment. This difficult situation might be somewhat relieved if the frequencies 520, 530, and 540 KC. were made available for regional service in larger communities where at present a number of high frequency regional channels are the principal ones in use.

Power of Regional Stations

For economic reasons it is undesirable to allow too great a difference of field intensities to exist in the primary service areas of broadcasting stations in the same community. With the present trend toward higher power and improvement of signal to noise ratios generally, the question of the power to be used on regional frequencies becomes important. A table of considerations of power increases for regional stations follows:

For Power Increase	For Status Quo
Signal level competition	Small increase in primary
Signal to noise ratio	night coverage
Obsolescence of present equipment	Additional cost of new equipment
Increase in day service	Higher operating costs

In a large city, there may be clear channel assignments in or nearby, and the listeners near the boundary of the regional station's service will be receiving signal levels of greatly different intensity from the regional and clear channel stations. In a small community, however, the listeners will be for the most part, nearer the regional station's transmitter, receiving a high level signal, and primary clear channel service may not be available. Hence the advisability of raising the signal level in the larger cities, and the questionableness of raising it in smaller communities.

Man-made electrical noise is probably predominant in larger cities and considerable improvement in signal to noise ratio can be effected by power increases. In the smaller communities, because of the probably nearness of the transmitter, a marked improvement of signal to man-made noise ratio would be of relatively small importance.

Increase in day service is desirable for stations in both large and small cities although in the larger centers the additional population served is undoubtedly greater.

The regional station in small towns would receive little or no additional night coverage, while as has been pointed out, the increase in signal to noise ratio would possibly increase the regional coverage in cities.

Operating revenues of stations in small towns would probably be increased a negligible amount and technical operating costs increased to about the same extent as other stations of equal rating.

Summarize

To summarize, a power increase seems to be desirable for regional stations in larger cities—definite technical and economic objectives are achieved by the increase. The exact technical and economic objectives are not as easily defined, however, in the case of some of the smaller regional stations, and it is conceivable that some of them do not care to obtain an increase in power. The increase in power to be permitted might be arrived at by adopting a value of power that would result in equal signal values at a point half-way to the fading wall of a clear channel station and half-way to the interference wall of a regional station.

The above considerations again seem to strengthen the argument that low frequency regional assignments should be in the larger cities, and in addition higher values of transmitting power would seem to be indicated and desirable for this class of regional station.

Furthermore, consideration of Plate VI permits one to draw a general conclusion concerning regional assignments. The ratio of useful service area to nuisance area of a station is greater at the low frequency and of the broadcast band—hence, the desirability of low frequency facilities. A system of allocation of regional facilities that would place low frequency and higher power regional stations in larger population centers of the country would undoubtedly be most sound economically. While it is realized that

any sudden change might be undesirable and impracticable, a trend toward such a system would seem to be in order.

Local Stations

The principal problem of the local station in a larger town is very much the same as that of the regional station. Most of the discussion concerning regional stations could be repeated for local stations, with the single exception that the lowest local channel frequency is 1200 KC. Locals are almost necessarily situated in the centers of communities, and hence they very likely have and will continue to have low average antenna efficiencies. It should be noted here that if the interference level on a local channel exceeds 200 microvolts per meter 10 per cent of the time, the average local station on 1200 KC. would be limited to its 4 millivolt contour. At 1200 KC. and conductivity of 5×10^{-14} e.m.u. the 4 millivolt contour will probably lie at an average distance of $4\frac{1}{2}$ to 5 miles. The position of the local station might be expressed by the following table:

Service rendered	Stations
Large trading center, either as to area or population	Clear and regional
Intermediate center	Regional and local
Small center	Local

This alignment is in the process of being automatically effected, because of the inherent nature of the broadcasting business. There are, of course, notable exceptions to this general proposition, particularly in the clear channel group, where the most successful stations are not necessarily located in the largest communities.

Power for Local Stations

It has been pointed out before that the public has become and is becoming more and more strong signal conscious. As one contemplates the broadcast problem, with respect to horizontal increases in power on all frequencies, one is confronted with the fact that the increase in primary night coverage under such increases will be small. Improvement in service will be attained, however, because of the increase in signal to noise ratio. The question of increases in power is thus reduced to a question of increase in quality of broadcast service, and economically the question becomes, what is the increased quality of service worth in dollars and cents? This question should be answered by the local stations themselves, with some top limit of power authorized.

In connection with some of the more specific items on the docket, the following topical discussions are offered:

Antenna Efficiency

The allocation survey shows curves of field intensity versus distance, corrected to a common basis of 100 millivolts per meter at one mile. For purposes of allocation, should not these data be analyzed according to antenna types? From the point of view of duplication of stations on a single frequency the most important consideration is the field intensity at 800 to 1000 miles. If an analysis shows that the value of signal received at these distances, when corrected to the same field intensity at one mile, is of the same magnitude regardless of antenna, one cannot help but ask, of what value is a half-wave antenna to a regional station? Theoretically at least, the increase in low angle radiation is very nearly proportional to the increase in ground wave intensity, where a high antenna is installed. In practice, it is the writer's opinion that the same net result could be accomplished by power increases using the shorter antennas. This argument, of course, is not valid where conditions of fading limit the service of a station, but where co-channel interference is the limiting factor, high antennas would almost seem to be an economic absurdity.

The question of actual antenna efficiency receives undue emphasis because of the fact that station licenses are based on power input to the radiating system. What other method of licensing could be used? At present, a station may obtain a license on a power output basis, but the only difficulty is that such a determination is practically impossible. However, the polar radiation patterns of simple antenna configurations are easily calculated (a building top antenna is *not* a simple configuration). It would seem reasonable, for example, that a short, vertical antenna that provides an unattenuated field intensity of 186 MV/M at one mile is radiating one kilowatt, regardless of the input power necessary to produce this result. The principal consideration for all regional stations should be one of economy. The cost of additional power should be compared with the fixed charges on the antenna system. It is realized

that the thoughts presented above depend upon the relative nuisance signals produced at a distance of approximately 800 miles by a short and tall vertical antenna with the same field at one mile.

Directional Antennas

A minimum height limitation on directional systems would seem to be inadvisable, particularly on the lower frequencies. Here again, the additional cost of power supplied to the antenna should be compared with the actual fixed charges on the antenna system, and an antenna height selected that results in greatest economy. Directional systems could be licensed on a basis of RMS field intensity at one mile that would result with the licensed power if the antenna losses were not present.

Directional systems for regional stations should only be used in locations where a reasonable estimate of sky wave, etc., can be made.

Synchronization

Synchronous operation of a booster transmitter during the night hours might provide a possible "out" for high frequency regional stations in large cities, where sizable communities geographically adjacent now receive no night service. If the engineering and economic phases of operation are carefully worked out, it would seem that such operation should be permitted, and in some cases encouraged. The use of a directional antenna at the booster can greatly increase the feasibility of such schemes as the areas of distortion can be chosen so as to include as little population as possible.

Field Intensity Measurement

The Standards Committee of the I. R. E. some years ago, suggested the principle of using two coaxial loops as a standard way to measure receiver sensitivity. This same principle can be used to calibrate field intensity sets, and has the very definite advantage that the calibrating voltage is a distributed one, and errors introduced into measurements because of loop tuning, loop distributed capacitance, etc., are completely absent. When this system of calibration is used it may take the form of a small single turn loop located in the center and in the plane of the measuring or receiving loop. The mutual inductance between the receiving and calibrating loops can be accurately calculated, and the standardizing current in the calibrating loop can be accurately measured. The possibility of error is reduced to a minimum. Cannot this method of calibration be used as a standard? The complete technical advantages of such a scheme are too detailed to mention at this time, but the possibilities of the system as a standard are very encouraging.

Byrne Cross Examination

Mr. Byrne under cross examination stated that in his opinion the ground wave curve of the Commission's allocation survey is sound as a guide and he also declared that the sky wave curves in the same survey are good. He expressed it as his opinion that there is a need for some reclassification of regional stations. He favored, he stated, the use of lower frequencies for cities. Mr. Byrne said in answer to further questions that the rural people of Ohio listen to the University station while the city people do not.