Attachment 14

June 1977

The Folly of Compulsory Licensing

A finding that the U.S. cannot afford to experiment with compulsory licensing in the energy field

BY MARCUS B. FINNEGAN*

I. INTRODUCTION AND OVERVIEW

A. The Urgency of the Energy Challenge

President Carter, in one of the first major policy statements to the nation and the world, has announced a far-reaching energy program which includes extensive conservation measures as well as encouragement for the development of new energy sources and technology. The warning is clear that time is running out and answers must be found quickly to meet our increasing energy needs at a time that our primary energy resources are rapidly being depleted.

M. Finnegan

President Carter emphasized the need to balance inducements to save energy and the disincentives to waste energy while encouraging development of new energy alternatives such as solar, geothermal and wind power. The new administration's proposals have initiated an emotional but serious debate among the American people as to the needs and priorities enunciated in the national energy program set forth by the President. Yet, few dispute the urgency of the crisis and the challenge now faced by all the peoples of the world.

In 1973 the "energy crisis" first captured the attention of the American public, and the magnitude of the problem was forcefully demonstrated to all. The Organization of Petroleum Exporting Countries (OPEC), culminating a long process of evolution, asserted its control over the rich Middle East oil reserves. In classical cartel price-fixing fashion, OPEC quadrupled the price of its crude oil, thereby triggering a new, more serious round of worldwide inflation and causing concomitant devastating, disruptive influences on employment, production of fertilizers (and hence agricultural production), home heating, transportation and the international balance of payments.

Initially, the energy crisis was perceived as a problem of immediate shortage engendered by a multiplicity of factors, but gradually it became evident that the problem was more fundamental. No longer could the industrialized countries depend on an ever-expanding supply of petroleum to propel their economies forward. No longer could energy be carelessly wasted by all sectors of the economy.

The starkest reality of all is the fact that world petroleum reserves will be exhausted within one lifetime at present rates of consumption. [1] Since the United States depends upon petroleum and natural gas for 75% of its energy needs and since our per-capita energy consumption is far above that of any other country, the potential impact upon this country is staggering. The amount of its oil that is imported by the United States has now risen to above 40%, and there is little optimism that the upward trend can be reversed, at least for the near-term.[2] Increased costs and voluntary cutbacks succeeded in reducing total national energy consumption in 1974 and 1975, but it now appears that public consciousness of the problem has eroded and consumption has again started to rise.

The danger of national dependence on any one source of energy is evidenced by the recent crisis engendered by our heavily reliance on petroleum. In passing the Federal Non-nuclear Energy Research and Development Act of 1974, Congress recognized the need to conduct a research and development program encompassing all potentially beneficial energy sources and utilization technologies, "including fossil fuels, nuclear fuels, geothermal resources, solar energy, and other forms of energy."[3] This is the optimal strategic approach, for some technologies will require long lead times to develop, others will require market testing and consumer acceptance, others may prove unacceptable and have to be abandoned, and still others will require careful analysis to determine the future availability of required raw material, labor, and capital.[4]

Seven high-priority technologies that promise potentially significant energy contributions in the near- and mid-term and three technologies with longer-term potential, have been identified by ERDA.[5]

Congress also found that, "the urgency of the Nation's energy challenge will require commitment similar to those undertaken in the Manhattan and Apollo projects."[6] Enormous financial, scientific, and technological resources will be required, and a fuller understanding of the problem must be developed by the consuming public. Regular reports to the Congress and informed public debate on the costs and benefits of

*Partner, Finnegan, Henderson, Farabow & Garrett, Washington, D.C.; *The author is indebted to C. Larry O'Rourke, associate in the author's law firm, and Wilbur G. Hamlin, student at Harvard Law School, for their assistance in preparing this paper.*

alternative policy choices must be encouraged. For the gargantuan undertaking envisioned to meet our future energy needs, cooperation among government, the private industrial sector and the general public is obligatory and indispensable.

B. The Rationale for Government Assistance to Catalyze Energy R&D

One key to successful resolution of the "energy crisis" will be to find a way to encourage and stimulate the flow of investment capital into the energy industry. A major economic factor discouraging investment in the development and commercialization of new energy sources and utilization technologies has been the availability of low cost, plentiful fossil fuels over an extended period of time. The risks associated with investment in new energy sources, which initially will be noncompetitive with existing fossil fuels, are extraordinarily high, and the technological barriers are substantial. Therefore, private investment in energy research and development has been relatively low.[7] Given this background of disincentive to private industry, United States governmental assistance to the private sector is both necessary and desirable.

Governmental assistance in energy R&D is also appropriate since the social returns from such research (in the form of decreased pollution, less dependence on fuels which must be mined, increased use of inexhaustible sources, and the like) are, at least initially, likely to be higher than private returns. Economists have found the problem of social and private returns from R&D to be a fertile ground for debate, and at least one recent study finds that the social returns are much higher than the private.[8] This will most certainly be the case in such important energy technologies as solar and fusion energy, where the capital expenditures will be large and the economic rate of return, at least in the beginning, will be low.

Other factors which militate in favor of governmental assistance are the protracted development periods and massive amounts of capital which will be required. Private corporations tend to maximize short-term returns and constantly reevaluate the rate of return on their investments. Large investments which can only prove profitable many years in the future are not likely to be undertaken by private industry whose management is most concerned with its current income prospects. This behavior pattern is demonstrated by private industry's concentration on investment in applied research and development, having a near-term pay-off in commercial products, instead of investment in basic research where the commerical pay-off is long-term and speculative at best.[9]

C. ERDA's Mission and the Role of Patents

ERDA's role, as the governmental catalyst to encourage private investment in research and development in new energy sources and utilization technologies, will be enhanced by an enlightened patent policy, but it could be doomed to less than complete success, or even failure, by a dulled and reactionary policy. Although patents are but one factor in ERDA's overall program, their importance to achievement of ERDA's goals should not be underestimated. As a vehicle for technology transfer within private industry, patents can increase the pace of competition by encouraging investment to find new, cheaper and cleaner sources of energy.

If ever adopted, mandatory licensing will have a tremendous, but highly questionable, impact on ERDA's patent policy. The Congressional mandate to the Administrator of ERDA[10] to make recommendations on mandatory licensing requires a close scrutiny of how best to achieve transfer and use of new technology without discouraging private investment — the ultimate question being, "Will mandatory licensing help?" Proposals for mandatory licensing of patents are not new. With minor exceptions,[11] however, they have not been found necessary by Congress and, consequently, have not been encated into law.

This paper focuses on whether mandatory of compulsory licensing, as a possible device to be used under ERDA auspices, will encourage and channel private investment into energy related areas of innovative activity and promote transfer of new technology as it is developed, or whether it will have an opposite and deleterious effect. In the first section, aspects of the patent system, pertinent and relevant to mandatory licensing, are discussed to establish the underlying propositions of the paper. The incentives for private investment in new technology are then discussed.

The role of voluntary licensing of patents, which as a profit producing mechanism is itself an encouragement to private investment, is next explored to determine its efficiency as a vehicle for transfer of technology. Mandatory licensing, as an adjunct mechanism to the existing system, is then discussed in terms of its costs and benefits. The final and important question analyzed is whether ERDA can better achieve its goals with, or without, a mandatory patent licensing provision as a part of its policy. This author concludes that mandatory licensing has no place in ERDA's patent policy.

II. CHARACTERISTICS OF THE PATENT SYSTEM, REAL AND IMAGINED

A. The Legal and Economic Justification for the Patent System

A discussion of mandatory or compulsory patent licensing[12] must be based upon a thorough understanding of the patent system and its economic justifications. It must be understood what the system is designed to accomplish, how it functions in practice, and what its imperfections are. Only then can an informed opinion be formed, buttressed where possible by empirical studies, as to what the benefits and costs of the system, without mandatory licensing, are to society and whether in fact it "promotes the progress of. . .the useful arts."

The constitutional basis for the patent system[13] is well known. The several patent statutes enacted from time to time by Congress under authority of Article I, Section 8 of the Constitution have all provided for an *exclusive* right in the inventor protectable by the remedies of injunction and damages. Although Americans have always been suspicious of economic monopolies,[14] there are sound economic justifications for granting an inventor such "exclusive" rights.

In his 1958 study, Prof. Fritz Machlup presented one of the better explanations.[15] First, there is the Aristotelian idea that man has a natural property right in his own ideas — the "natural-law" thesis. Second, the "reward-by-monopoly" thesis holds that justice requires that a man receive reward for his services in proportion to their usefulness to society. Third, the "monopoly-profit-incentive" argument claims that to make it worthwhile for inventors and investors to expend their efforts and risk their money, society must intervene to increase their profit expectations. Fourth and lastly, the "exchange-for-secrets" proposition is that the patent represents a contract between the inventor and society, with the former surrendering possession of secret knowledge in exchange for protection of a temporary exclusivity in its use.[16] Perhaps none of these theories is individually sufficient, but when considered collectively, the rationale and justification for the patent system becomes clear.

B. Costs and Benefits of the Patent System

Basically, the award of a patent allows the inventor, and his financial backers, to reap the rewards of his invention over a 17-year period. It remains for the patentee (hereafter denoting the owner of the patent) to develop his invention into a marketable product, educate the consuming public as to its advantages, and then compete in the marketplace against all other similar products. Imitation by others is seldom immediate, and without a patent system it is probably true that an inventor who introduces a new product or process would have the "exclusive" use of his invention for some brief period before the copiers could enter the market. It is likewise true, however, that the absence of patent protection would work to the advantage of large, established firms with the technical, financial, and marketing resources to exploit the work and ideas of others with impunity.

But under the patent system, the potential reward offered spurs the self-interest of inventors and investors. In some cases, it is possible the rivalry may lead to premature commercialization,[17] as when a prospective patentee/inventor fails to pursue all the possible inventive approaches to a given problem and settles on less then the best solution to anticipate his competitors' entry into the marketplace. It is also apparent that duplicative research, which is a necessary result of a competitive situation, is economically wasteful. One inventor is rewarded with a patent for being first, and another inventor who may have pursued a similar path is denied for being second. But no alternative, whether by administrative fiat or scientific selection, has been found to identify before the fact that one single person or group of persons best qualified to solve a given problem. The patent system encourages those best qualified to try, and it rewards the first one who is successful.

Certainly the patent system inhibits or prevents copying of another's invention by the threat of an infringement suit and possible injunction. But the prospective infringer has the knowledge revealed by the disclosure of the issued patent and, if the financial incentive is great enough, he will try to "invent around" a commercially successful invention. The patentee will probably seek patents on improvements and related inventions to enhance his defensive posture even though, after further experimentation, he will decide to develop only the best commercial embodiments.[18] In any event, scientific and technical knowledge is advanced by this process, and the public is benefited by these advances.

The benefits which accrue to the public from patented inventions are numerous, the most prominent being the reduction of production costs, the satisfaction of consumer demands, the solution of societal problems, and the production of new products, information and knowledge. These benefits are unrelated to the rewards for the inventor, and although not solely the result of a patent system, furnish additional justification for the patent system. In the energy field the need for them is manifest. For instance, energy sources must be produced that are economically competitive, but the unmet demand for clean, inexhaustible energy sources has been accentuated by society's refusal to tax effluent, a proposal long espoused by economist.[19]

By not relating the full costs of pollution to the product, prices are suppressed and become increasingly unrelated to social costs. The countervailing need to control inflation and provide some measure of equity for the underprivileged disrupts the market forces and provides less incentive for industry and inventors to seek alternative innovative solutions. However, the patent system helps to alleviate this market imperfection by promising a reward to the one who can solve these problems. The existence of patent rights automatically tends to encourage the allocation of resources to innovative activity despite countervailing market forces.[20]

C. Alleviation of Technical and Market Uncertainties Through the Patent System

Even if the necessary resources are available for the inventor to pursue a solution to a problem and the investor provides his support, the obstacles facing him can still be sizable. A first obstacle is uncertainty, which takes several different forms. There is, in many cases, enormous *technical uncertainty*, i.e., the inventor does not know in advance what result he can achieve with a given method of exploration. The literature abounds with stories of repeated failures, persistent trial-and-error experimentation, and in a very few cases, ultimate success.[21] A second form is *market uncertainty*, where prediction of what the demand for a new product or process will be is often not possible. Some type of risk-shifting institution, such as the patent system, is both necessary and desirable to assist the inventor over these obstacles.

There is yet a third form of uncertainty, alluded to previously, and that is the high probability in a competitive environment that failure to assume the technical and market uncertainties may generate the substantial risk that another will succeed first. In a business environment, decisions to invest in R&D are but one part of overall corporate strategy. If a firm's products are competitive on the marketplace and are solidly protected by patents, it could elect to cut back its research endeavors. This type of election is, however, rebutted by the experience of the phar-

maceutical industry, which expends a higher percentage of its sales in R&D than any other industry in the United States,[22] yet continues to place heavy reliance on patent protection. Patents are important to this industry, and the risk that another will succeed is apparently the powerful spur to heavy investment in continued innovative activity.

In other industries (and to some extent in pharmaceuticals), some firms adopt what has been identified as the "fast second" strategy.[23] Such firms specialize in "reverse engineering" instead of creative research. When a small firm introduces a technologically innovative product, that proves, or at least promises, to have commercial possibilities, a larger firm can rapidly imitate the product and then use its superior marketing position to rapidly deploy its imitation and ensure retention of its dominant position in the industry. It is this type of activity which often results in patent infringement suits, and if the patent is held valid and enforceable, the penalty for being second is enormously increased. If the patent owner prevails, the infringer's activities can be enjoined by the court. The costs to all parties is usually high, but the patentee's investment of his resources to develop and commercialize the invention is protected.

D. The Worth of the Patent to the Patentee

In recent years the prospects for successfully enforcing a patent have greatly diminished.[24] In litigation where patent validity is an issue, findings of invalidity vary significantly between the federal circuits and even between courts and panels within the same circuit, but by any measure, they have been increasing.[25] Explanations for these increased holdings of invalidity range from the Patent Office's use of reduced standards of patentability in examining patent applications,[26] to a changed judicial attitude biased toward animosity against patents,[27] and even to basic changes in the process of invention because of the multiplication of scientific knowledge in this century.[28] Whatever explanation or combination of explanations is correct, the fact is that the "exclusive right" inherent in the patent grant is being diluted, and the patentee's expectations of securing real protection for his invention are being eroded by this judicial trend.

E. Alleged Private Suppression of Patents Contrasted With Actual Governmental Suppression

The idea of patent suppression has appealed to many critics as a cause for patent reform and has even been elevated to the level of dogma for some. At various times, business concerns have been accused of attempting to protect their own economic positions by failing to exploit patents which they have developed or acquired.

It is said that such nonuse prevents technologically innovative small businesses from entering the market and that corporations regularly acquire patents from independent inventors to keep the inventions from being purchased by competitors.[29] One proffered remedy for alleged suppressed patents has been compulsory or mandatory licensing.

There is, however, not a shred of evidence of actual suppression; to the contrary, there is every indication that there is no suppression of patents by the patent holder. Gilfillan recites a long list of prominent individuals who claimed that they had never heard of a suppressed patent.[30] Testimony before Congressional committees subsequent to Gilfillan's report has failed to cite a single example.

Debate in the political arena during World War II did much to cultivate the belief in suppressed patents. The widely publicized 1941 report of the Temporary National Economic Committee (TNEC) charged that certain corporations had used the patent system "to control whole industries, to suppress competition, to restrict output, to enhance prices, to suppress invention, and to discourage inventiveness.[31] Thurman Arnold, chief of the Antitrust Division and a member of the TNEC became the leading exponent of the suppressed patent argument and took his cases to court,[32] as well as to the people.[33] Arnold alleged that Standard Oil of New Jersey was responsible for the rubber crisis, that General Electric had conspired to restrict production in energy-saving fluorescent lights, that Bausch & Lomb had hindered the war effort by failing to exploit military optical patents, and that Rohm & Haas, among others, had prevented the expansion of the infant Plexiglas industry.

The rubber crisis of 1942 is often cited as an example of suppressed patents. Thurman Arnold alleged Standard Oil had violated the antitrust laws by entering into agreements with the German chemical cartel, I. G. Farben, not to license others to exploit the buna rubber (synthetic rubber) patents. When the Japanese cut off the Southeast Asian supply of natural rubber and the President appealed to the American public to turn in old tires, garden hoses, bathing caps, and raincoats, Arnold responded to the crisis by filing a 20,000 word antitrust complaint. A consent decree issued the same day and was unopposed by Standard Oil.[34] The Rubber Survey Committee set up by the President and headed by Bernard Baruch concluded that the failure to create an alternative to dependence on natural rubber was due to a complicated mixture of human, bureaucratic, and technical failures.[35]

Another writer viewed the facts from a completely different perspective than that of Arnold. Lawrence Langner explained that Standard Oil had traded information on the production of butyl rubber from petroleum to I. G. Farben in exchange for information on buna rubber, high-octane aviation gasoline, and synthetic toluol (essential for the manufacture of TNT). Since Germany faced a shortage of petroleum throughout the war and consequently could not exploit the technology from Standard Oil, it can readily be seen that Standard Oil got the better part of the bargain. It is fair to ask why Standard had not invested in a plant to manufacture synthetic rubber. The answer most likely lies in the initial capital required to enter this new market. It was estimated that over $800 million for plants was necessary to supply the needs of the country. Since natural rubber was plentiful and inexpensive, the corporation can hardly be faulted for failing to make such an investment.[36]

General Electric was charged with engaging in a conspiracy with certain utility companies to restrict the production of fluorescent lighting.[37] The consent decree was not made final until five years after the

complaint was filed and the facts are somewhat nebulous, but from the best evidence it appears that GE was, indeed, working the patents. Any conspiratorical agreements to restrict production were properly subjected to scrutiny under the antitrust laws, but the case cannot be cited as authority for the suppression of patents.[38]

The Bausch & Lomb case[39] also involved alleged suppression of patents. Secretary of War Stimson thought otherwise,[40] and the War Department publicly expressed the view that it had experienced no shortages of the bombsights produced under the company's patents (which had been obtained from Germany).[41]

An objective look at the facts of the World War II cases reveals that no patents were being suppressed. The rhetoric of both sides was filled with ringing appeals to patriotism, and it is likely that the Baruch report spotlights the real causes. However, certain facts are undisputed. The United States had virtually no military force in the 1930's, and isolationism was the order of the day. As late as 1939, Senator Borah was able to declare, "We are not going to have a war. Germany isn't ready for it. . .I have my own sources of information."[42]

In the Selective Service Act of 1940 Congress stipulated that draftees could not be used outside the Western Hemisphere.[43] In August, 1941 the House of Representatives renewed the Selective Service Act by but a single vote.[44] When the large investments required to commercialize these inventions are considered in view of the small military market and the predominantly isolationist political inclinations, business cannot be blamed for failing to anticipate what Arnold called "a war to preserve industrial democracy."[45] In the quest to win the war, the exigencies of the 1930s became the "suppressed patents" of the 1940s.

On the other hand, there are recorded instances of governmental suppression of patents. The Federal Communications Commission, with the consent of the inventing corporations, held back the introduction of television so the transmission standards could be established, frequency bands could be allocated, and the most promising designs could be tested. This nonuse of inventions actually accelerated and strengthened technological advance.[46]

The most famous example of government patent suppression is found in *Vitamin Technologists v. Wisconsin Alumni Research Foundation*.[47] The patents covered the process of irradiating oleomargarine to produce vitamin D and thereby reduce the incidence of rickets in the poor who could not afford to buy butter. The President of the University of Wisconsin, under strong political pressure from the Wisconson State legislature,[48] had continually refused to license any third parties to work the patents, ostensibly on the grounds that fradulent claims might be made concerning the equal effectiveness of oleomargarine when compared with butter. The court found the patents invalid, but remarked, "(even if valid) such refusal to permit such irradiation warrants the refusal of the equitable injunctive and accounting relief sought by the corporation (Wisconsin Alumni Research Foundation)."[49]

The American patent system is thus beneficial to the economy, to the businessman, and the American public, as well as to inventors generally. It is a part of the legal system which is uniquely vital to "progress. . .in the useful arts" by benefiting the public and the inventor respectively through full disclosure of the invention and by the grant of "exclusive rights" in the invention for a limited time. The patent law has been a viable vehicle for disclosure, and not, as has been alleged, a means for suppression of new ideas and concepts.

The patent system, however, functions as above described, because of the encouragement it provides to investment in innovative activity. The patent reduces the formidable risks faced by the investor in striking out on new technological frontiers and helps to channel his dollars into enterprises which lead to new products and processes and to solutions of hard problems. The incentive to invest in the results of the human inventive spirit must be present before resources can be marshalled and applied to develop those inchoate results to the point where they can be put into practical use and thereby further technological progress. This important incentive is the next area for inquiry.

III. THE INCENTIVE TO INVEST

A. Investment, Competition, Risk and Government Incentives to Innovate and Disclose

The role of the patent system as an incentive to invest (Machlup's "monopoly-profit-incentive" thesis) is often overlooked because of apparent basic changes in the nature of innovative activity in this modern scientific age. To reduce an idea to an identifiable invention a century ago, an inventor needed time, knowledge, and capital. When he received a patent, further, more substantial capital investments were necessary to commercialize the invention. In all instances he faced risks in the development of his idea, and his patent was designed to minimize these risks, both in the innovation and the commercialization stages, as discussed above. In the absence of investment capital, most inventions were not exploited.[50]

The situation today is not inapposite. As scientific knowledge has expanded, innovative activity had become correspondingly more difficult. The requirements for human resources in the form of time and knowledge have multiplied to the extent that teams of inventors are now necessary for industrial firms to remain competitive. Capital investments in salaries, laboratories, and equipment have also increased enormously.[51] In some industries (e.g., petroleum) the capital requirements for R&D are so high as to pose an absolute barrier to all but the largest firms. The substantial investment, both in research and product development, required in technologically-intensive industries (e.g., much of the energy industry) to remain competitive can usually be met only by a large scale R&D organization.

But still the patent system provides an important incentive to invest in innovative activity and the follow-on commercial exploitation of inventions. However, several studies have shown that when competition — and hence the risks inherent to such activity — has been reduced in certain regulated industries, the rate of innovative activity declines dramatically.

A recent study of the railroad industry examined the development and diffusion of information systems for freight cars and concluded that the failure to introduce a national freight car information system was not a problem of technology but one of institutions and institutional rules and procedures.[52] It was found that economic regulation limits ownership rights in freight cars through the legal restrictions it places on the use and exchange of such cars, and these limitations on ownership rights affect the ways in which a national freight car information system could and would be used in freight car distribution. The report also suggested that a larger governmental role in the development of such a system would probably not hasten introduction.

A further conclusion is inescapable. Long-term economic growth and stability of the railroad industry through technological advance and the introduction of cost-saving measures has been impeded through over-regulation. This may have been compounded by the risk aversion of bureaucracies. As a result, massive public funds are being pumped into the railroads in an effort to resurrect the remnants of an important industry.

The experience of the railroads has important implications for ERDA. First, transportation is a major consumer of energy, although the largest percentage is through automobile usage. But now, as petroleum is rapidly becoming more expensive, it may soon be more economical to ship certain goods by rail than by truck. If such a reversal takes place more innovation will be required in the railroad industry to enable it to fulfill its increased transportation role efficiently. Second, the ERDA plan calls for the increased use of coal, which will create a need for more rail capacity, at least until alternative transportation systems are developed. Third, the noncompetitive environment in which the railroads now find themselves does not provide the incentives to innovate and to introduce such innovations into use. If the potential for profit in a particular industry is depressed, it is an axiom of economics that less capital investment will be channelled into that segment of the economy.[53]

The government has a number of tools available to encourage investment in innovation in energy-conserving technology. For instance, the National Research Council has proposed various tax credits and payment deferral procedures to encourage innovative activity.[54] Each of the tax proposals focuses on a slightly different aspect of the product introduction life cycle. This tax incentive approach seeks to make it more economical for industry to invest in innovative activity and to carry it to a point of commercial exploitation, but it has little effect on reducing the element of risk which is ever present. The patent system efficiently reduces that risk, and it accomplishes this desired result without the political controversy which invariably attends Congressional discussion of tax incentives for industry.

But, the efficacy of the patent system depends upon the advantages which businessmen can see in the system. If patents are infringed by competitors and eventually declared invalid after long, expensive law suits, the incentive to obtain patents and the corresponding incentive to invest in innovative activity will be lessened. There are indications that many firms are now resorting more frequently to trade secret protection in lieu of seeking patent protection, a point which will be developed later in this paper.[55] Some technology is particularly susceptible to trade secret protection, e.g. where the innovative work cannot be reverse engineered without inside knowledge or the disclosure of a patent. For instance, process technology is particularly susceptible to trade secret protection. Process technology will be extremely important in the energy field in all the areas identified by ERDA,[56] and the government should encourage, not discourage, disclosure of such technology.

B. What Policy Should ERDA Adopt to Compress the Development Period

Investment in innovative activity should not be viewed as a single, lump-sum infusion of capital with a resulting output of patents or trade secrets, but rather as a continuing process that can be roughly segregated into the following stages: basic knowledge, applied research, development and product testing, market testing, and product introduction.[57] According to one study, the time period from discovery of a technically feasible concept to the beginning of commercial development averages nine years, and the commercial development period then averages another five years.[58]

ERDA's mission, in part, is too compress or shrink this development period, and, simultaneously, its efforts in the research area will undoubtedly have a significant impact on the production of new knowledge. However, it must be strongly emphasized that knowledge does not benefit any consumers until that knowledge is put to use,[59] and no products will be introduced until a firm has adequate incentive to invest in and to develop new technology and until the firm can confidently assess both the risks and the potential profits. Patent protection plays an important role in these investment decisions for many firms, both because it reduces the risks and uncertainties for the investor and because it makes possible relization of profits through licensing, cost reduction, increased efficiencies and the like.

Recent studies show that many of the largest industrial firms are bypassing the patent system or have adopted a policy of licensing all applicants.[60] If such firms are successfully resorting to trade secrets as a protective measure for their investments, the consuming public is ultimately the loser. Disclosure of advances in the art by others are vitally important as building blocks for additional innovation and subsequent compression of the time to develop new energy technology to the point of commercial use. Advances in energy technology will be more rapid and more certain, if they are built on public disclosure of inventions, which can at least be assured in part by the incentive of a strong patent system.

C. The Exclusive Nature of Patents, a Spur to Investment

The need for exclusivity in patent protection should be distinguished from the desire for exclusivity in a sales or manufacturing situation, where restrictions such as territorial or customer limitations may con-

stitute a violation of the antitrust laws. Often the invention described in a patent is untested in the marketplace; it must compete with established products, customer loyalties, extensive marketing networks, and other obstacles. The strong belief that the development and introduction of new products and processes is beneficial to the general welfare is of the essence to the rationale behind our patent laws. The reward of "exclusive use" gives the maximum possible encouragement to inventors to develop and introduce beneficial technological advances. Government policy in the continuing present energy crisis should also offer the maximum possible encouragement to inventors and innovators to create technological advances.

If the exclusivity provided by a patent encourages investment, then compulsory licensing, would axiomatically be counterproductive. Although many variations could be drafted, it must be assumed that any new statute would be patterned after the Hart-Long Amendment[61] and that the concern behind such proposals is primarily based on the "lessening of competition" or the "tendency to create a monopoly." Yet a patent demonstrably increases competition in technology. It brings a new idea to the marketplace and gives the inventor the exclusivity of his defined invention for 17 years to compete against existing products. If his invention offers consumers a better product at a lower price, it is conceivable, though rarely the actual case, that the entire market will divorce his competitors and turn to him. In the face of shrinking profits, formerly entrenched firms would then have several options: (1) to cut prices (and profits) to remain market-competitive, (2) to attempt to negotiate a license with the patentee, or (3) to try to improve upon the patent, i.e. "invent around" it.

Given the long period necessary to introduce and market a new product, an invention cannot be expected to dominate a market for the entire or even a substantial part of the 17 years of the life of the patent. Even if a patentee should be so fortunate as to successfully attract the entire U.S. market for a given product before his patent expires and even if he should refuse to license others (which is almost never the case),[63] it could not be said that he has damaged the consuming public. The theory behind competition is that the public will be benefited by the widespread availability of the best goods at the lowest possible price, but if a market were to prove to be so stagnant as to lose all sales to a new patented product, such a market would have to be viewed as imperfectly competitive. If a patent owner refuses to license, he forces others either to innovate immediately or to wait until his patent expires. In short, the existence of a patent often makes the market more competitive, not less.

Just as a single patent can strengthen competition, the assertion of patent rights, when not justifiably subject to a misuse challenge, does not have a "tendency to create a monopoly." The myth that a patent is a monopoly in common antitrust parlance was given an appropriate burial by the Supreme Court when it perspicaciously stated:

> The term monopoly connotes the giving of an exclusive privilege for buying, selling, working, or using a thing which the public freely enjoyed prior to the grant. Thus a monopoly takes something from the people. An inventor deprives the public of nothing which it enjoyed before his discovery . . . He may keep his invention secret and reap its fruits indefinitely.[64]

The analysis is thus carried back to Machlup's fourth justification for the patent system, the "exchange-for-secrets" thesis. The grant of an "exclusive right" should be viewed as a contract between the inventor and society the object of which is to increase competition by encouraging investment in new innovations and the concomitant toleration of exclusive rights for a limited period of time, at the expiration of which the invention will be freely available for use by all. Perhaps the problem in the energy field is the fear that some inventor will develop a low-cost, miracle substitute for gasoline or the much discussed "215-miles per gallon carburetor" and make enormous profits.[64]

However, any idea that some new invention will solve our energy problems overnight should be dispelled immediately. Meeting the nation's energy problems will require the diligent labor and cooperation of all our citizens, the creative efforts of inventors, and enormous capital investments. Any proposals which sacrifice long-term progress, the production and publication of knowledge, and the incentive to invest should be discarded as shortsighted attempts to manufacture quick solutions to these enormously complex problems.

D. Competition for the Investment Dollar

One critical problem facing the energy industry is the availability of capital. ERDA and the Federal Energy Administration have recognized this problem and the consensus seems to be that "capital markets will be capable of meeting the energy investment demands within the range of the historic proportion of energy investment to total business investment (23% average over the past 25 years)."[65] This proportion, however, has been greater during the past five years, and ERDA estimates that the investment per unit of energy over the next quarter century "may range from 50% to 70% greater than today's investment per unit of energy."[66]

Private investors, then, will demand a higher rate of return due to the risks and uncertainties and the large amounts of capital required. In view of the recent low rates of return on equity and profit constriction, it seems likely that investment may be more debt-oriented. Recent studies suggest that investors in the venture capital market are already more heavily involved in debt financing than might otherwise be expected.[67] Tight money policies, if continued, could also have an adverse effect on channeling investment capital into energy R&D to cope with the energy challenge.

Removal of the traditional exclusive right that accompanies that patent grant would have an especially damaging impact on the ability of small business to attract financial backing. Private investment everywhere is spurred by the hope of picking a winner, and recent surveys have shown that even the poor do not wish this opportunity to be removed from the American way of life.[68] Arthur Okun, President Johnson's chief economic adviser, adds his support to this incentive and declares:

> The possibility of "making it big" seems to motivate many Americans, including some who

> have not made it at all. They dream of rags-to-riches and project that dream from generation to generation . . . In 1972 a storm of protest from blue-collar workers greeted Senator McGovern's proposal for confiscatory estate taxes. They apparently wanted some big prizes maintained in the game.[69]

It is the prospect of a high return on investment (ROI) that maintains the venture capital market. This same possibility is what spurred Carlson to invent Xerography and Land to create the Polaroid Camera. Virtually all small companies consider financing a significant barrier to research,[70] and these small companies are often the most technologically innovative.[71] If exclusivity through patent protection is removed, small business will have little or no incentive to join in the effort to respond to the energy challenge.

E. The Role of Government Policy in Reducing Commercial Uncertainties

Even government assistance in raising capital cannot remove market uncertainties. Commercial acceptance of a new product is the ultimate test. Perhaps the most significant problem faced by the solar heating industry is the high initial cost for an unproven product, and few individual consumers are willing to assume such costs. The government may find it necessary to assure a market for this industry, thereby providing incentives for further competition, demonstrating system feasibility to the nation, and lowering prices in the process.

The incentive for private industry to invest has always been high when a market is assured or the government is the consumer (witness the experience of DoD, NASA, and TVA). The other side of the coin is illustrated by the Department of Agriculture, which conceives, develops and publicizes new inventions for its private sector market, the farm community. Patents have not been especially important to businesses engaged in R&D with the USDA, probably, not only because its policy has been to freely grant nonexclusive licenses or to dedicate the patents to its public, but also because there is no well-defined and assured market for its inventions.

ERDA's mission is uniquely different from that of most other agencies. ERDA is not a consumer and will only have a partial role in the development of new technologies, with such R&D work as it does designed to create a multiplier effect throughout private industry.[72] Widespread commercialization is, of course, the final objective, and the conclusions of the 1968 Harbridge House Study, directed primarily to the defense industries, are instructive in this regard.[73] This study found that once an invention is developed, the major factors influencing its actual commercialization are: (1) the extent of market demand for products employing the invention; (2) the degree of promotion by government agencies which sponsored the research; (3) the size of the firm's investment necessary to bring it to market; (4) the prior experience and attitude toward innovations of the organization that developed them; and (5) the type of patent rights available to protect the firm's investment.[74]

In the energy field, market demand for new products or processes will be unknown initially. If technology advances occur rapidly, inventions and investment may become obsolete just as rapidly. Capital investments will be large — ERDA estimates expenditures over the next decade at $450 to $600 billion.[75] Given such facts, industrial corporations will need the maximum possible protection for their investments. The patent system can help provide this protection and the necessary incentive to ensure commercialization.

IV. LICENSING AND THE TRANSFER OF TECHNOLOGY

A. Factors Which Encourage Licensing

Before examining the available evidence on the effects of compulsory licensing resulting from both legislative and judicial determinations, the role of "voluntary" patent licensing, as it relates to the transfer of technology in our modern industrial society requires analysis. An underlying assumption in this analysis is that both licensor and licensee are seeking to maximize their private returns on investment and are seeking to use the best technology available for their particular situations. The bargain which can be struck depends, as always, on the relative bargaining position of the licensor and his potential licensee. Patents, know-how, and trade secrets may be licensed, and the best available evidence indicates that licensing is becoming more typical in practically all technology-dependent industries.[76]

The decision to license any particular technology is, of course, only one part of overall corporate business strategy, but there are many reasons why a firm would want to license others to use its intellectual property.[77] First, and surely the most basic justification for licensing, is the desire to realize royalty income. Remuneration may vary substantially with the value of the technology and the need of the licensee to receive it; the most common arrangement is a royalty calculated as a percentage of net sales.

In other situations, fixed or lump sums have been negotiated. In the absence of specific statutory regulation, licensing agreements are regulated by the antitrust laws, and existing case law demands that licensing be conducted on nondiscriminatory terms (sometimes interpreted as "identical terms") in the absence of sound business, economic, or legal reasons for different rates.[78]

A second justification for licensing is the desire to penetrate foreign markets which may be blocked off because of duties, local sale peculiarities, restrictions on direct foreign investment, transportation costs, and the like. Licenses may be negotiated with local firms to the benefit of each party. These international licensing arrangements normally have a positive effect on the balance of payments for the United States and an insignificant impact on the domestic labor market. In a corollary situation, a U.S. firm may wish to lend technical assistance to its foreign subsidiaries, and licensing provides an appropriate vehicle for accomplishing such a strategy.

As a third justification, a corporation may want to test market a product or test a process indirectly where it cannot be done directly. By licensing technology to another firm more willing or more able to risk the investment in new technology and then ob-

serving the results, a firm places itself in a better position to justify large plant, start-up, and marketing expenses. In this particular situation, the owner of technology is more likely to actively seek out prospective licensees.

Another reason justifying licensing is the licensor's desire to obtain other technology. As part of the bargain, this can be accomplished through grant-backs or straight exchanges, but both parties must always be certain that their actions do not contravene the antitrust laws.[79]

In some cases, a licensee may wish to purchase new materials, services, or equipment from the licensor, in addition to the technology which is the main purpose of the contract. Where there is no coercion on the part of the licensor and the additional goods are sold at reasonable, competitive prices, there is no per se illegality.[80]

Particularly in the licensing of spinoff technology which the licensor does not intend to utilize to a substantial degree, there is an especially strong incentive to seek our licenses. The royalties from such agreements can be used to help justify large and continuing R&D expenditures. In many such cases, licensing serves an additional purpose — that of motivating an employee who can see his ideas put to work instead of lying fallow.

A final reason for a company to license others is the desire to avoid an antitrust suit. Large firms with substantial patent holdings and a solid market position are acutely aware of their vulnerability. The major thrust of the R&D work of such firms is not programmed to "block" or "fence in" competitors, but is designed to break new ground and assure that appropriate technology will be available should the firm find its needs changing. There is also a significant, though unquantifiable, advantage in having the engineering, production, and marketing staffs working as a team to solve overlapping problems. This interdisciplinary cooperative endeavor helps explain the tendency of large corporations to internalize R&D staffs and their often exhibited preference for intracompany technology (the "Not-Invented-Here" Syndrome, or "NIH Factor").

In short, there are numerous reasons for a technology-intensive firm to wish to license others; nonetheless, for a relatively small percentage of corporations, there are a few good reasons not to license.

B. Factors Which Discourage Licensing

First, time may be needed for a firm, particularly a small firm, to attract investment needed to develop its manufacturing capacity and associated know-how. Once a patent is granted a corporation may need its exlusivity to help obtain financial backing. This aspect of patent use, of course relates back to the incentive to invest. In addition to investment required during the start-up phase, the patentee may need to develop machine specifications, experiment with production technology, and determine optimal working configurations. During this period, especially considering the uncertainties involved with the commercialization of a product, in many instances a patentee would be ill-advised to license, at least not until he has his own operation developed and functioning smoothly.

Second, small firms use patents to gain a toehold in a market dominated by large concerns. Their survival often depends on the validity of their patents and the exclusive right to make, use, and sell a better product. In such situations competition is enhanced by protecting the small firm entering the market as a new competitor. There is an identifiable tendency on the part of the judiciary to protect such firms and the new infant industries which they spawn.

In the development stages, it is often true that a patent owned by a small firm will not be worked to the maximum extent possible. It is, thus, not inconceivable that a small company could achieve a significant technological breakthrough in the energy field, refuse to license others, and itself not be able to satisfy the then existing market demand in the United States. But such situations are like stop-action photographs taken at one particular instant in time, before the pressures of the marketplace and rational business judgment have prevailed.

The small businessman wants to maximize his profits as much as any other businessman and faced with unfulfilled demand for his product, he rationally must opt for increasing his ability to supply the product. He may achieve this ability by obtaining added investment secured by his "exclusive" rights or he may decide to license others to assist in meeting persistent demand. Either option increases profits to the small business and benefits society by meeting the demand for the product. The dynamic aspect of the scenario must be recognized to evaluate the ultimate effect upon the public.

Under the above circumstances, for an ERDA administrator to certify a finding to a U.S. district court that a patent is not "reasonably available," and is "reasonably necessary to the development . . . of an energy system;" that "there are no reasonably equivalent methods to accomplish such purpose;" and that "the unavailability of such right may result in a substantial lessening of competition . . ."[81] would be shortsighted and impetuous. Such a finding would only benefit the large, established corporations, decrease competition, and sacrifice long-term gains for a short-term increase in production. A compulsory licensing statute could be misapplied so as to work grave injustices upon a small company which manages to overcome technological barriers blocking others. Its reward for such contributions should not be an appearance in a Federal district court to explain why it should not be forced to license others, but rather should be the retention of the exclusive proprietary rights ensured by its patent and its freedom to pursue a rational business course.

Third, other firms may simply wish to keep their competitors at a disadvantage by not licensing essential technology. This strategy is adopted mainly by small-and medium-sized corporations, or those with a relatively small share of the market for a given product. Cost-reducing technology in the form of patents, trade secrets, or know-how, in and of itself, does not necessarily put a competitor at an unfair disadvantage, since the competitor can adopt other cost-reducing tactics in its own purchasing, production, marketing and management procedures. Technology is but one item which contributes materially to the cost of products and to assert that technology should be freely available to all is to imply

that every cost-saving measure should be likewise freely available, which comes dangerously close to the total absence of competition. If cost-saving innovations must be available to all, why should any firm innovate? The practical effect is to stifle innovation, which ultimately hurts the consumer, the same result reached through conspiracies in restraint of trade, only on a much larger scale.

A fourth reason for refusing to license is the possibility that the licensor may be dragged into litigation by his licensee. Since *Lear, Inc. v. Adkins*,[82] abrogated the doctrine of licensee estoppel, the federal courts have been subjected to a virtual plethora of actions seeking declaratory judgments of patent invalidity by licensees.[83] It has been held that federal courts have jurisdiction over a declaratory judgment suit brought by a licensee notwithstanding the fact that a state action for breach of contract had previously been initiated by the patentee.[84] The Third Circuit has found that a licensee may challenge the scope and validity of the licensed patent without first terminating the license agreement.[85] Under the *Lear*-doctrine extreme conduct by a licensee can be expected as in *USM Corp. v. Standard Pressed Steel Co.*[86] where the licensee sued for a declaratory judgment of patent invalidity, refused to pay the royalties due under the license agreement, and sought a preliminary injunction against termination of the license, which was denied. The licensee then appealed to the Seventh Circuit which affirmed the denial of the preliminary injunction, although it did grant the licensee additional time to pay the royalties he had withheld pending review of the interlocutory appeal.[87]

The merits of *Lear, Inc. v. Adkins* have been extensively debated,[88] but it cannot be denied that the the unfortunate victims are independent inventors[89] promote one "federal policy" have literally opened a Pandora's Box by encouraging expensive litigation, dilatory tactics, and the breaking of contracts. Many of the unfortunate victims are independent inventors[89] and small corporations. Even consent decrees, which normally carry the res judicata effects of a final judgment, have not been immune from attack.[90] *Lear* encourages a firm to negotiate a license, to build a plant without fear of litigation, to commence manufacturing operations, and then to file suit seeking a declaration of invalidity in the court of its choice, and, adding insult to injury, to cease to pay royalties from the date suit is instituted. Given the present state of turmoil and confusion and the demonstrated willingness of many courts to find patents invalid, it would not be surprising for patentees to give deeper consideration to the *Lear* problem before licensing others to work their patents.

The public policy expressed in *Lear* is to permit "full and free competition in the use of ideas which are in reality a part of the public domain,"[91] and the ultimate objective of the patent system is to encourage inventors to divulge their discoveries, or as Machlup defined the idea — an "exchange-for-secrets." But when the law takes away with one hand what it gives with the other hand, respect for the institution must inevitably decline. When business ethics are being assailed from all sides, as they are today, it may be time to question the contribution of the law itself to any decline in ethics. Patents may be "worthless" in two different senses. There may indeed be, as to some patents, a lack of "invention," or, on the other hand, there may be a refusal on the part of the law to abide by its contract with the inventor.

C. Trade Secrets as an Alternative Mechanism for Transfer of Technology

It is extremely difficult to quantify the extent of domestic licensing of technology, but by any estimate the value is well into the billions of dollars. International sales and licensing of technology in the form of patents, trademarks, copyrights, trade secrets, and know-how has alone amounted to over three billion dollars in recent years.[92] These international transfers of technology have had an important and positive influence on the balance of payments, helping this nation to maintain fiscal stability despite greatly increased expenditures for raw materials.

The patent system is meant to encourage such transfers of knowledge. The diffusion of knowledge and the transfer of technology are encouraged when private incentives can be channeled into socially useful endeavors, but when private perceptions and incentives change, efforts will be channeled elsewhere. Instead of seeking patents, inventors may resort to more trade secrets, which can be protected through state contract and tort law. Where trade secrets are relied upon, there is less technology transfer, because prospective licensees have little knowledge of the existence or extent of the technology involved. Nor are those who would build on the state-of-the-art concepts apprised of what the state-of-the-art is, since there is no general disclosure to the public.

It is difficult to separate patent licensing from trade secret and know-how licensing; however, patents usually provide the initial basis for entering into an agreement to transfer technology, and know-how and trade secrets are usually necessary additions for the licensee to successfully practice the invention in a commercial context. But if inventors should decide to rely more heavily on trade secrets as a substitute for patents, there could be a general decline in licensing, which would in turn have a deleterious effect on the transfer of technology . The exact effect is not known but could be a subject for further study.

It has been argued that a compulsory licensing statute would increase the voluntary licensing of patents and that this alleged result helps explain the infrequent use of the compulsory licensing statutes that already exist in foreign countries. This argument is an oversimplification. As shown in the attached Appendix, the foreign experience cannot be compared *mutatis mutandis* to that of the United States.

The strength of patent licensing as a vehicle for technology transfer depends on the strength and enforceability of patents. If patents are supplanted by trade secrets, not only is the inherent public disclosure afforded by the published patent document lost, but also the effective transfer of the technology through license agreements will be undermined.[93]

V. THE EFFECTS OF COMPULSORY LICENSING ON INVESTMENT AND THE TRANSFER OF TECHNOLOGY

A. Nonuse, Misuse, and Monopolies

Compulsory licensing statutes in the energy field could take any one of a number of forms, and indeed the proposals may be placed on a spectrum, with one extreme being the no-conditions, nondiscriminatory licensing of all applicants and the other extreme being licensing under such numerous conditions as to foreclose the practical efficacy of such provisions. The more often proposed rationales for compulsory licensing are: (1) in the event of nonuse by the patent owner (to cure alleged "suppression"), (2) in the event a patentee unjustly attempts to extend the scope of the patent and misuses it ("misuse" need not, and most often does not, rise to the level of an antitrust violation), and (3) in the event a patent, or a group of patents, has a tendency to create a monopoly or substantially to lessen competition (usually such a situation is subject to attack under the antitrust laws).

It has been developed, above, that past claims of patent "suppression" are in fact specious.[94] There is no evidence of "abuse" to be cured by a statute with provisions for compulsory licensing in the event of a failure to work the patent.[95] Further, any such statute raises serious Fifth Amendment problems, especially if the provisions were to be retroactively applied to issued patents that had not yet been worked. An inventor may work his invention in secret indefinitely, but if he is willing to disclose his invention to the public, society in exchange will grant him the right to exclude others.

The quid pro quo of the patent grant is disclosure, not the working of the invention, and it is disclosure which promotes the progress of the "useful arts." The working of the invention, and it is disclosure which promotes the progress of the "useful arts." The working of the invention comes about through the dynamics of the marketplace; the cost-benefit of the invention is the primary determinant of whether it is commercialized. In short, there has been an inadequate showing that patents ever have been or will be suppressed, and there is no other justification for enacting a statute providing for compulsory licensing in the event of non-use.[96]

The second evil that a compulsory licensing statute would allegedly cure or alleviate is patent misuse, or an attempt by the patent owner to extend the reach of his patent beyond its scope to an extent justifying the witholding of equitable relief by the courts.[97] Misuse often is asserted as a defense in patent infringement suits but also can arise as a claim or counterclaim in antitrust cases. The courts have developed a large body of law concerning patent misuse in recent years. Usually if misuse is found, a court will not grant injunctive relief for the patentee until the misuse has been cured or purged, and the patentee may suffer temporary loss of royalties from licensees and damages from infringers.[98] There is no demonstrated need for the Congress to define by a compulsory licensing statute the various situations in which equitable relief can or cannot be granted; such attempts cannot anticipate every conceivable situation, and the courts are better equipped to order or withhold equitable relief on a case by case basis.

The third rationale commonly advanced for compulsory licensing, i.e. when assertion of patent rights may tend to create a monopoly or substantially lessen competition, is supported by those who feel that the patent system is in derogation of, and conflicts with, the application of the antitrust laws. The line of demarcation between justified exploitation of a patent within the scope of the patent grant and illegal activity involving use of the patent as an anticompetitive tool is fuzzy and uncertain. The courts have tried to define this line and the Supreme Court has articulated the so-called "patent" rule of reason as a guide:

> Conveying less than title to the patent or part of it, the patentee may grant a license to make, use and vend articles under the specifications of his patent for any royalty or upon any condition which is reasonably within the reward which the patentee by the grant of the patent is entitled to secure.[99]

The rule is open to varying interpretations and has been criticized, because of the undefined size and scope of the "reward" to which the patentee is entitled. But this very problem, which can be more easily handled through the adaptability of the courts on a case-by-case basis, is why a compulsory licensing statute would be impractical. Although a court may decide to compel a patentee to license his patent, this is not the only remedy available nor necessarily the best in all cases. Nonetheless, in those circumstances which clearly dictate licensing as a remedy the courts can order it without any need for a specific compulsory licensing statute.[100]

Moreover, the language of the Hart-Long Amendment goes beyond the situations where patent use violates the antitrust laws and reaches the situation in which a patentee works his invention and refuses to license others. The underlying assumption is that competition should be open and unfettered for all commodities, but this assumption ignores the fact that any patent must compete with similar technology in the relevant market. It should be recognized that each new invention introduces new competitive pressures and forces the competitors to innovate. This competitive contribution of the patent system is in harmony with the spirit of the antitrust laws, and it would be against the public interest to require a patentee to make his invention available to others when he is merely exercising his "exclusive right."

Compulsory licensing has been a commonplace remedy in antitrust cases,[101] but in a cost-benefit analysis there is considerable doubt whether such relief achieves greater competition or transfer of technology. The most extensive study to date of the use made of compulsory licensing in antitrust cases was that of the Senate Subcommittee on Patents, Trademarks, and Copyrights in 1960. From August 1941 to January 1959 there were 107 judgments (13 in litigated cases and 94 by consent) filed in civil antitrust suits brought by the U.S. Government in which patent rights were restricted.

Generally, the judgments required licensing of present and future patents on a reasonable royalty basis, but in a few cases they required royalty-free licensing, dedication of specified patents, or limited injunctions against enforcement of misused patents.[102] The subcommittee survey, based on 81 defendants subjected to compulsory licensing for reasonable

royalties, reports that in 31 cases no licenses whatsoever were issued and in six additional cases there was no indication that the decree provisions had created any new licenses. Of the 30 consent decrees in which no license was issued there were written requests for licenses in only 17 cases.[103] Of the 12 litigated cases (the other 69 involved consent decrees) only one was unsuccessful in achieving subsequent licensing.[104]

The subcommittee attributed the success of achieving actual licenses in the litigated cases to the judicial evaluation of an antitrust complaint in terms of specific actions of the firms.[105] The difference, however, may also be because companies are more willing to litigate when commercially valuable patents are at stake. In general, the overall effectiveness of compulsory licensing was unclear to the subcommittee. Bearing in mind the limited increase in patent utilization through compulsory licensing, it may be helpful to look at several case studies of judicially ordered licensing to better evaluate its effects.

B. Three Case Studies of Court-Ordered Compulsory Licensing

The *Hartford-Empire* case[106] is an outstanding example of a case in which the compulsory licensing of patents played an important part in the relief that was granted by a court. The government's complaint initially charged Hartford-Empire, 11 other corporations, and 101 individuals associated with them as officers or directors with conspiring to restrain interstate commerce by acquiring patents covering automatic glass-making machinery. At the time the complaint was filed 94% of the glass containers manufacturered in this country were made on machinery licensed under the pooled patents.[107]

The government sought dissolution of Hartford-Empire, but the district court decided that a continuance of certain of Hartford's activities would be of advantage to the glass industry and denied that drastic form of relief. Finding, *inter alia*, that the pooled patents had been employed to suppress competition in the manufacture of unpatented glassware, the court in effect ordered the forfeiture of the Hartford-Empire patents, an action which the Supreme Court rightly recognized as an appropriation of private property and refused to countenance. The Supreme Court held that the compulsory licensing of the patents could only be ordered on the basis of reasonable royalties.[108]

The case has a significant bearing on the importance of competition in R&D. Hartford-Empire had been conducting essentially all of the research in the industry, and since the cost of such R&D was prohibitive for small firms the industry was greatly concerned as to the effect of cessation of this research. When the district court finally formulated a decree after the Supreme Court decision, one of the provisions included in that decree was an agreement on the part of Hartford-Empire to undertake a program of research and development that would be funded from its royalties and conducted along lines determined through consultation with industry members. The results of the program were to be made readily available to industry members.[109] In effect, the decree created an industry-wide technology insurance policy — a strong disincentive for competitive R&D.

Although the Supreme Court has on occasion recognized the necessity for joint ventures or cooperative R&D endeavors,[110] Hartford-Empire is the paradigm example of one R&D company doing research for an entire industry. There is no competition, and no business incentive to develop new technology in such a situation, and to some extent, there is also no competition under the analogous circumstances that occur when extensive industry-wide patent cross-licensing agreements exist.

In the more recent case of *United States v. Manufacturers Aircraft Association*[111] the Department of Justice alleged that a patent cross-licensing agreement administered by the MAA had the effect of "(a) restricting and suppressing competition among the defendants in the research, manufacture and sale of airplanes; (b) restricting and suppressing competition in the purchase of airplane patents and patentable inventions; and (c) hindering or delaying the research and development of patentable inventions for airplanes." About 1,500 patents were involved and the agreement had 20 signatories at the time of the action, including all of the major manufacturers.

A consent decree was entered under which the defendants, while making no admission of guilt, agreed to dissolve the MAA, cancel the cross-licensing arrangement, and to license all the patents and relevant technical data at reasonable royalties. The association noted, ironically, that the consent decree called for dissolution of the very organization which had been established in 1917 at the behest of the government.

The government stated that the judgment would cause the defendants to increase R&D activities to gain, *inter alia*, competitive patent advantages. The defendants would presumably have a greater incentive to channel their resources into more R&D and in the process to acquire patents or exclusive licenses to patents from third parties.

However, in 1975 three companies, Boeing, McDonnell Douglas, and United Technologies, were responsible for 78% of the industry-wide research and development. These three companies spent $644 million for R&D in 1975, a figure which represented 230% of their profit for the year. For these three companies R&D was 5.9% of sales, a figure which is higher even than that for the research intensive chemical industry.

In sharp contrast, General Dynamics, Lockheed, and Rockwell International, with combined sales almost equal to the combined sales for the other three, spent only $104.7 million on R&D, an amount which represented less than 1% of their sales.[112] It may not be possible to analyze the effects of the consent decree due to the relatively short time which has elapsed since it went into effect, but it certainly appears that R&D expenditures are disproportionately skewed toward three corporations within the aerospace industry. It is logical to conclude that these three corporations will have an initial competitive advantage and will acquire the bulk of the new patents in the industry.

The Department of Justice also felt that the judgment would make it possible for firms who were nonmembers of the MAA to gain access to the technology necessary to work the patents as well as to obtain licenses to such patents. For a period of five years, the defendant members of the dissolved MAA are required to furnish at a reasonable royalty, technical information necessary for use in practicing patented inventions to anyone licensed pursuant to the judgment. The government also sought the licensing of future patents (for a period of 3-5 years) to protect firms which had relied on the MAA agreement. This provision, however, was dropped.[113]

Although it could be argued by some that the 1,500 patents possessed by the MAA posed such a substantial barrier that new firms were unable to enter the industry, perhaps a more basic problem is the enormous amount of capital investment that is required in the aerospace industry. For whatever reasons, there are only a limited number of companies in this industry and with the recent difficulties of Lockheed, as well as the problem of a shrinking market, it seems unlikely that more companies will enter the industry.

If new firms do not enter the aerospace industry, it is conceivable that the small aerospace firms, lacking the technology made available in the patent pool, may not be able to afford the high cost of R&D and be forced out of the market. In this scenario, each new patent might tend to increase industrial concentration as long as new firms do not enter the industry, but each patent also introduces an added element of competition, as the Department of Justice rightly recognized.

Conceivably, this added element of competition could attract the needed financial backing for a smaller firm with its technology secured by patents. But if a compulsory licensing statute similar to the Hart-Long amendment were in operation for the aerospace industry, the companies which did not invest in R&D would have the benefits of one large technology insurance policy, exactly the benefits which they previously enjoyed under the MAA patent pooling agreement. Conceptually, the anticompetitive effects of large patent pools are virtually identical to the anticompetitive effects of a compulsory licensing statute. Solutions to the energy challenge facing this nation and the world require competition in R&D, not technology insurance policies for those who do not contribute to the effort.

Although the role of patents in the aerospace industry presents an interesting case study, the recent history of the automobile industry presents an even more fascinating history. In 1969 the Department of Justice alleged that the four major automobile manufacturers and their trade association had conspired to delay and obstruct the development and installation of pollution control devices for motor vehicles. In a consent decree entered October 29, 1969, each defendant was enjoined from, *inter alia:* (1) continuing to participate in a 1955 cross-licensing agreement; (2) refusing to grant royalty-free licenses on auto emission control devices under patents subject to the 1955 agreement to all that might request them; and (3) entering into any agreement to exchange their company's confidential information relating to emission control devices or to cross-license patents or patent rights covering future inventions in this area.[114]

On its face the action was designed to promote competition by forcing each firm to acquire patents through independent R&D. Congress, however, found this policy unacceptable, and less than two years later it passed the Clean Air Act Amendments, which included provisions for the compulsory licensing of patents relating to pollution control devices.[115] It could be thought that the existence of these provisions would have increased the licensing and interchange of pollution control technology, but there is no evidence of this effect. Now, years later, in the absence of effective pollution control devices in the automobile industry and certain segments of the utility industry, the evidence indicated that solutions have not been forthcoming from R&D efforts conducted under the umbrella of a compulsory licensing statute.

So far as patents on pollution control devices are concerned, the auto industry has made a complete circle from insurance to competition to insurance. Perhaps it is time to admit that manipulations of the patent system will not solve the problems of pollution, unless there is an element of competition and some potential for economic gain to spur the incentive of self-interest in the innovative.

C. The Unacceptable Consequences That Would Flow from Enactment of a Compulsory Licensing Statute

1. The inherent Difficulties of Determining Reasonable Royalties

Compulsory licensing necessarily engenders uncertainties at the policy-making level, and it also created extraordinary administrative burdens. Among the most difficult problems is the determination of a reasonable royalty. Courts have always struggled with this difficulty and have generally resorted to the willing-buyer, willing-seller formulation. In the *Hartford-Empire* case, for example, the district court experienced considerable difficulties in establishing reasonable royalties.[116]

Among the possible approaches to a royalty determination are the following: (1) viewing royalty as a function of the return that the licensor reasonably expects to realize; (2) relating royalty to the cost of the next best alternative to licensing which is available to the licensee; (3) considering current royalty in light of a rate previously established by the licensor in agreements with other licensees; (4) viewing royalty in light of a rates prevalent in the industry or to which the licensee has agreed with respect to related technology in agreements with other licensors; and (5) treating royalty as a direct function of the enhanced profitability or cost-saving to the licensee through exploitation of the licensed technology.

The first option basically considers the patent associated investment costs of the licensor and attempts to determine a royalty which will yield him a fair return on this investment. Research and development costs are normally viewed as recoverable in this determination, but there is often a problem in determining the exact amount of the R&D costs which should be related to the patent in question. Research

often involves the testing of many different approaches before a final solution in the form of a patentable invention is therefore, the cost associated with inadequate solutions or failures which led to the patentable invention probably shoud be included. Other costs include the costs of administering the license and fulfilling obligations under the license, such as, travel cost, auditing, preparation of blueprints, costs of technical assistance personnel, supervisory and inspection costs, and the like. The above cost items are usually difficult to allocate and require a sophisticated cost accounting system.

The maximum royalty that would normally be reasonable for a licensee to pay is an amount which is just less than the incremental cost of the next best alternative to the patented invention available to the licensee, i.e. the second option. Such alternatives would principally be: (a) direct use of the technology thereby risking litigation, (b) design of operative satisfactory technology that gets around the licensor patents, (c) licensing comparable technology from another source, or (d) avoiding working with the licensor's technology at all.

The third option is frequently used by courts in assessing a reasonable royalty, but most courts have required that the previous rate be shown to have been paid by a sufficient number of parties in the relevant industry and under such circumstances as would indicate a general acquiescence in its reasonableness.[117] The previous rate must have been agreed upon in licensing situations comparable to the current situation, but comparability is sometimes an elusive concept. For instance, there may have been a holding of patent validity or a change in commercial success intervening between the granting of a license to the first parties and the consideration of the granting of a license to subsequent parties. When a compulsory licensing situation arises, there will usually have been no previous licensees; consequently, this option is not normally a viable alternative.

The fourth option depends upon the availability of information concerning the royalty rates of other license agreements within the industry. In some situations front-end down payments to arrive at plant start up can be quite high, and would affect the relevance of other data to the license agreement in question. So many factors, irrelevant to the compulsory license, may have been of importance and considered to establish a royalty in other license agreements between other parties as to make it difficult or impossible to apply this option.

In theory licensing is based upon the premise that a license permits the licensee to generate profit in the most rapid possible manner and with the least risk. It is logical, therefore, to approach royalty formulation as a reasonable division (between licensor and licensee) of profits achievable by the licensee through exploitation of the licensed technology. Although, of course, there are differences of opinion, a figure of 25% of the profit earned by the licensee as royalty to the licensor has been cited by some as a fair royalty.[118]

Clearly then, there is no simple, fair manner to establish a reasonable royalty for all situations. Additional influencing factors are introduced by compulsory licensing which further tend to distort what might otherwise be the "correct" royalty for a given situation. Applying any of the methods becomes more difficult in an arbitration type proceeding, where arm's-length negotiating is not possible, and with the increased difficulties will come increased costs to all parties.

2. The Adverse Shift in the Bargaining Position of the Innovator

Under the present system of voluntary licensing, the patent owner and his prospective licensee determine what royalties are "reasonable," and the amount of such royalties depends upon the relative bargaining power of the parties. Among the factors which influence the outcome of the negotiations are the relative size of the parties, the need of the prospective licensee for the technology, the availability of alternative technology, and the opinions of each party regarding validity of the patent.[119]

The threat of an injunction may prevent a potential infringer from using the technology. As a consequence, the remedy is certainly an important, though inherently unquantifiable, bargaining chip. Its value to the patent owner as an inhibiting influence on the would-be infringer, however, has been diminished in recent years, because the courts have increasingly been finding patents invalid, furnishing encouragement to would-be licensees to challenge validity with less risk.[120] In some cases where particularly strong patents are involved, the threat of litigation may be enough to bring an infringer to the bargaining table to negotiate a license. However, it is simply not possible in either situation (before or after litigation) to quantify the effect the injunctive remedy has upon the royalties negotiated by the parties.

Theoretically, a compulsory licensing statute should shift the bargaining positions of the parties in favor of the prospective licensee vis-a-vis the licensor, but it is impossible to calculate either theoretically or empirically the net effect of this shift. In some situations, the public might be benefited by such a statute, as when a large corporation, dominant in a particular market, becomes more willing to license its patents to relatively smaller corporations. On the other hand, the public is more likely to be damaged by the effect of such a statute in almost all other situations, as, for example, when a compulsory licensing statute can be used to coerce a small, innovative company into licensing a relatively larger, established corporation, which can then use its superior manufacturing and marketing capabilities to restrict and reduce the competitive impact of the innovative firm.

In fact, there is every reason to believe that the latter situation (the large firm taking advantage of the small) will be more common than the former. In the first place, smaller companies are often more innovative and have been responsible for many of the most important technological breakthroughs in recent history.[121] Second, larger firms tend to be more interested in cost-reducing technology than in new concepts per se.[122] Third, despite proportionally larger expenditures, larger firms tend to patent less,[123] but are more willing to license their technology, even without a compulsory licensing statute.

If the effect of a compulsory licensing statute is to weaken the bargaining positions of small, innovative companies, the negative impact on long-term competition will undoubtedly be greater than any positive benefit to the public in the form of slightly decreased prices for a short period of time. Although industry-wide averages are not always meaningful for comparison purposes, it is nevertheless of interest that patent royalties in the petroleum industry are exceptionally low,[124] and any slight change in these royalties would be imperceptible to the public. The impact on competition of small, innovative firms could eventually become significant, however, and such firms should be encouraged to develop as rapidly as possible. When a strong patent law is enacted by the legislature and enforced by the judiciary, new firms can have a significant effect in reducing prices by introducing new elements of competition into the market. But compulsory licensing, as discussed above, would be a disincentive to such firms.

3. The Destruction of the Incentive to Invest

The most serious problem raised by a compulsory licensing statute is the dilution of the incentive to invest in new technology. Any investor must consider the security of his investment, the return on investment, and the potential for capital gains. Individuals, as well as lending institutions, are more hesitant to risk large sums of money in speculative enterprises and therefore demand greater security. Where natural resources, for instance, are involved, investors rely on geological surveys, market studies, and knowledge of past performance of the industry when making their investment decisions. Such information reduces the speculative aspect of the investments, but where new technology is involved, an investor is faced with the greatest possible amounts of uncertainty and speculation as to the results to be achieved. By assuring the inventor and investor of the "exclusive right" for a limited time to inventions growing out of their enterprise, the risk may be appreciably reduced.

Sophisticated investors, however, will demand more than the knowledge that inventions can be patented. These investors, who are usually the ones relied upon for the largest amounts of capital, will demand some estimate as to the strength and validity of the patent or patents and their value to the industry. The investors will also seek information on the structure of the existing industry, prior technology, and the magnitude of the potential market. If the investment is technology-intensive and proprietary protection is important, the investors will become more hesitant to risk their capital if they perceive that the rights associated with any ultimately issued patents are to be lessened. The general attitude of the judiciary toward patents is well known and provides a substantial deterrent to investments which are secured by patent protection. Additional dilutions of the bundle of rights, such as removal of the injunctive remedy, can only deter investors more and cause them to demand larger potential returns on their investment.

Even if a compulsory licensing statute were so tightly drawn as to encompass only the most serious abuses, the existence of such a statute would have a substantial psychological impact upon investors. The country needs important technological breakthroughs in energy, and it is clear that enormous capital investments will be required.[125] If the private sector is to be called upon to risk these large sums of money in speculative new enterprises, these investors will want and demand security.

Antitrust enforcement represents a known quantity for practically all American businessmen. Compulsory licensing, on the other hand, represents an unknown quantity and can only have a deterrent effect on investment. In short, given proper circumstances, a patent can call forth risk capital through the "monopoly-profit-incentive," just as in the well-known cases of *Xerox* and *Polaroid*. These basic and important inventions introduced new technology and new sources of competition into the marketplace, benefiting both consumers and investors in the process. In the energy field, where even larger, more speculative investments in new technology are required, we should not reduce the rights associated with a patent by introducing new and dangerous elements of uncertainty through compulsory licensing.

4. The Likelihood of Increased Resort To Trade Secret Protection

A problem likely to be created by a compulsory licensing statute is an even greater resort to trade secret protection. We have already alluded to a possible existing trend toward greater reliance on trade secrets caused in large measure by decreasing probabilities of successful patent enforcement and increasing litigation costs.[126] This trend can only be strengthened if compulsory licensing is enacted.

Patents and trade secrets provide neither identical nor mutually exclusive subject matter protection. Some patentable inventions cannot be protected as trade secrets, and the reverse is also true. Products that can be "reverse-engineered" and inventive concepts that can be easily comprehended once disclosed through use cannot be adequately protected other than by patents. However, certain types of subject matter may be more conducive to trade secret than patent protection, particularly when such subject matter may be unpatentable as not meeting the novelty, utility, and nonobviousness standards of the patent statute. Tolerances of machines or products, manufacturing specifications, the proper sequence and timing of steps in a process are examples of the latter type of subject matter. Where slight improvements over the prior art are involved, and patent coverage is doubtful, trade secret protection may also be relied upon. To the firm which has expended substantial sums of money in developing blueprints, mockups, and specifications which represent a valuable investment and would give competitors an unfair advantage if disclosed, trade secret protection is often the only answer.

But, there is an area of overlap where inventors and investors may choose between patent and trade secret protection. The choice will be made on the basis of which alternative provides the best protection for the investor. Many process patents, for example, can also be successfully protected as trade secrets, and the type of legal protection elected largely depends on an estimate of the relative merits and demerits of each

alternative reduced to the final question of which will provide the best and most secure return on investment.

It is in this area of overlap that the patent system performs a most important function by offering protection for the invention in return for the full disclosure of that invention (Machlup's "exchange-for-secrets" thesis). But, if an inventor and his investors judge that the financial gains offered by patenting are roughly equivalent to the potential gains offered by trade secrets, rational actors will select the system which provides more certain protection against appropriation by others of the invention or know-how.

There is every reason to believe that, in this country at least, the legal protection for trade secrets may often be more certain than that offered by the patent system. In *Kewanee Oil Co. v. Bicron Corp.*[127] the Supreme Court held that trade secret protection is not preempted by operation of the federal patent laws. Trade secret law is alive and well. At least 20 states have enacted laws protecting against the unauthorized disclosure of trade secrets,[128] and a number of other states rely on common law protection for trade secrets.[129] Several courts have ruled that trade secrets need not be disclosed during criminal prosecutions under state laws,[130] and there have been several successful prosecutions under 18 U.S.C. § 2314 for the transportation, sale or receipt of stolen trade secrets valued at $5,000 or more.[131]

When the broad protection afforded by trade secrets is contrasted with the frequent holdings of patent invalidity in the federal courts, it is not rash to predict that inventors will opt for the former when the subject matter is conducive to trade secret protection. It has been demonstrated that the patenting activity of corporations subjected to compulsory licensing in antitrust consent decrees has dropped by approximately 20%.[132] This may be due to reduced R&D expenditures, the elimination of unimportant inventions, or an increased resort to trade secrets. It is the feeling of this author that a compulsory licensing statute would weaken the appeal of the patent system to such an extent that in a significant number of cases, the inventor and investor alike would be more likely to protect new technology, whenever possible, through trade secrets.

There are substantial losses to society whenever an invention is not disclosed through the patent system, but practiced in secrecy by the inventor. First, there is a negative effect on the diffusion of technology. Patents are widely publicized and can be obtained from the Patent Office at trifling cost. The state-of-the-art in a given technology can often be best assessed by a search of issued patents, and many technical journals and associations keep their readers and members informed through publication of the most recently issued patents in their respective areas of technology. The patentee, once an application is on file, has no disincentive to publish articles in scientific and trade journals, but if the invention is protected as a trade secret, the inventor does not dare publish. In a society which is ostensibly devoted to open, fair competition, such nondisclosure represents a significant social, as well as an economic cost.

Second, the expense of protecting trade secrets is not to be underestimated. It is extremely difficult to quantify such expenses or even to estimate incremental costs but it seems universally agreed that industrial espionage is increasing,[133] and now represents a major part of the so-called "white collar crime" in this country.

Third, attempts to duplicate trade secret technology are economically wasteful. There is a certain amount of duplicative effort inherent in competitive R&D[134] but when a patent issues this effort can be redirected in view of the disclosure and channelled into improving on what is known. Where the first inventor relies on trade secret protection, however, other inventors may continue to explore blind alleys, wasting time and money. In other cases, the expenses of "reverse engineering" will be economically wasteful and even after the trade secret becomes public knowledge (which in itself may be costly and time consuming), still more time and resources will be necessary to achieve further technological progress. If the invention is protected by a patent, the R&D effort to invent around will begin with the knowledge and information recited in the patent and, if successful, may produce important new technology.[135]

Fourth, the resort to trade secret protection may have an adverse impact upon the ability of American firms to compete in foreign markets. If trade secrets cannot be protected in other countries, proprietary protection in foreign markets will be lost. Eventually a decline in American patenting overseas could have a negative impact upon our country's balance of payments.

5. Government-Owned Patents: The Handmaiden of Compulsorily Licensed Patents — A Case History in the Nonuse of Technology

In recent years the government has been acquiring title to United States patents at the rate of about 1,600 patents per year, and each succeeding year has shown an increase in the total of unexpired patents owned by the government. The government owned over 27,500 United States patents at the end of fiscal year 1975. As long as the government continues acquiring patents at an ever increasing rate, the total number of government-owned patents will increase also. This author recognized several years ago that the active portfolio of government-owned patents could easily reach 34,000 patents in the near future.[136] Each of these patents is potentially available for licensing.

Although the patent system provides to the patent owner the grant of the *right to exclude* others from making, using or selling his invention in the United States for a term of 17 years, the government, when it is a patent owner, has, as a matter of policy and practice, not exercised its right to exclude. The possibility of a government-instituted infringement suit has only recently been contemplated for the first time following the executive branch's initiative in the early seventies of making it official government policy to spur commercial use of government-owned inventions by the exclusive licensing of government patents.

This new government policy has come under heavy attack from some quarters as a "giveaway" of government property.[137] Nonetheless, if the policy survives such attacks, past practice and policy may have to step aside to permit an active enforcement of the right to

exclude by the government so that the rights of its exclusive licensees may be protected.

Until recently then, the government has in the main adhered to a royalty-free nonexclusive licensing policy.[138] Since the government willingly licenses anybody under its patents, a patent held by the government is practice not really a patent at all, but more precisely a form of technically accurate publication.[139] Through implementation of this policy, the fate that has befallen government-owned patents is precisely analogous to the fate that befalls patents subject to compulsory licensing.

The government's experience as a nonexclusive licensor is less than a compelling story to encourage adoption of compulsory licensing. The economic benefits intended to be stimulated by the patent system have not been derived by the government or the public through the policy of open licensing of government-owned patents. The available evidence points to minimal licensing, a disincentive for investment of risk capital in new technology, a general absence of effective transfer of government-owned technology, and a failure to inspire competition in research, all as a result of the "license-for-all" policy.

It has been estimated that less than 10% of the government-owned patents available for licensing have in fact been licensed, and then only on a nonexclusive basis.[140] Studies have further shown that unless the government has brought an invention to the point of commercialization, industry has evinced almost no interest in developing government inventions. Additional development correlates directly with additional investment, and the investor, assured only of a nonexclusive license, has repeatedly backed away from venturing speculative risk capital to support the utilization of technology protected only by government-owned patents.

In an interesting bit of history, the Supreme Court, in the famous case of *United States v. Dubilier Condenser Corporation*,[141] revealed that it well understood the dilemma presented by government-owned patents. The court issued its original opinion on April 10, 1933.[142] Twenty-eight days later on May 8, 1933, the court on motion of the Solicitor General, struck from its opinion a paragraph which questioned the authority of the government to hold ownership to a patent.[143] Through striking this passage, the Supreme Court, by negative implication, thus gave judicial sanction to the government's practice of obtaining title to patents.[144]

More significantly, for purposes of this paper, however, the stricken paragraph contained the following statement with respect to the question of whether title to the patented invention in dispute should be awarded to the government:

> In these circumstances no public policy requires us to deprive the inventor of his exclusive rights as respects the general public and to *lodge them in a dead hand* incapable of turning the patent to account for the benefit of the public.[145] (Emphasis added)

The long-term experience with government-owned patents has been one of nonuse. The technology and the patents have lain fallow, and the incentive for investment of risk capital in new and untried concepts has been missing. This experience is an object lesson to be learned and heeded, when the champions of compulsory licensing urge its adoption.

Just as with government-owned patents, patents subject to compulsory licensing cease to be patents in the real sense. What is available to all will be invested in by none. Patents covering potentially important developments in energy should not be emasculated by destruction of the all important right to exclude through "lodging them in the dead hand" that is mandatory licensing.

D. Foreign Experience With Compulsory Licensing

Proponents of mandatory licensing often point to the relatively numerous statutes in foreign countries which require a patentee to license others under certain circumstances and argue that the United States should enact similar legislation. It is not enough, however, to argue that the United States should make its patent policy conform to that of other countries, particularly, if the evidence demonstrates such policies to be unwise and to have proven in practice to have been counterproductive. Further, if comparisons of national patent policies are to be meaningful, each national patent law cannot be examined in a vacuum, but rather in the light of the social, economic, and political factors which influence the varying treatments of patents.

One important factor which must be examined is the commitment of a nation to antitrust enforcement. The antitrust laws have an important bearing on patents for several reasons. First, vigorous antitrust enforcement discourages the rewards of monopoly or oligopoly and tends to increase the allocation of resources to R&D in a competitive environment. Although it is largely a subjective judgment on the part of this writer, the spectacular technological advances and economic growth achieved by West Germany and Japan in the aftermath of World War II are in no small measure due to the strong competitive environment fostered by antitrust enforcement and, as a partial result, an emphasis on technological innovation as a means to achieve growth and progress. Second, vigorous antitrust enforcement may obviate any perceived need for compulsory patent licensing. The constant threat of antitrust litigation helps to insure the diffusion of technology throughout an economy. It is more than coincidence that compulsory licensing statutes are common in countries with a weak antitrust policy and in countries with little or no industry to protect and foster.

A second factor which should be kept in mind is the growing tendency toward regional economic unity. In one sense, such regional organizations are built on a federalist concept, although without the strong central government which is the capstone of our federal system. The four Scandanavian countries (Sweden, Norway, Finland and Denmark) recently enacted substantially identical patent laws, but the lack of operating experience under these laws precludes an informed opinion as to their effects.

The European Common Market has been the most important economic union to date, and it has taken relatively small steps with respect to patents. The major emphasis thus far has been toward eliminating multination filings of patent applications, and it is too

soon to predict whether the Common Market will attempt to standardize patent laws, much less predict the substance of such a standardization. In Latin America the regional economic unions have been relatively impotent and have yet to consider patent policy in significant depth.

A third important factor which must be weighed and evaluated is the concern of each nation with its international balance of trade. If a nation adjudges that a particular compulsory licensing provision will not adversely affect its balance of trade, that provision is more likely to be enacted. If there is no industry in a given area to protect, a nation is less likely to be hesitant in adopting a compulsory licensing provision which would affect that segment of the economy.

Finally, it should be noted that compulsory licensing provisions everywhere are infrequently used. The only possible exception to this statement is Canada, which has experienced substantial use of its law providing for the compulsory licensing of drug patents, but it is questionable whether this policy has resulted in lowered prices for Canadians. There is, however, no doubt that the policy has reduced pharmaceutical manufacturing in Canada and made that country entirely dependent on imports. This author is unaware of any evidence to indicate that the infrequent use of the compulsory licensing provisions is explained by an increase in voluntary licensing and believes that the time has arrived for those who advance this argument to support their assertions with concrete evidence.

To the extent that comparisons between the patent policies of other countries and that of the United States are valid, this author believes that the following conclusions are in order. First, in some countries compulsory licensing is used as a weak substitute for antitrust enforcement. Where antitrust legislation is vigorously enforced, as in this country, compulsory licensing is not needed as a substitute. Second, the only discernible trend in the patent laws of the major industrialized countries is toward stronger patent protection. The United States has always had a strong statutory patent policy and it should continue to have one. Third, compulsory licensing is not appropriate for the United States. This is especially true in the energy field where rapid technological progress is so desperately needed.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. ERDA's Mission

The United States and, indeed, the entire world are today faced with the greatest crisis, and simultaneously greatest challenge, of the Twentieth Century. We must quickly develop efficient, economical, and clean energy alternatives to our present dependence upon petroleum and natural gas. The United States' answer, at least in part, has been to opt for a private-public partnership in energy development and research to be catalyzed by the Energy Research and Development Administration (ERDA). The goals are necessarily high. New energy sources and utilization technologies must be developed. The risks associated with achieving these goals are extraordinarily great, and the technological barriers are substantial. But the consequences of failure would be so catastrophic that the possibility of failure cannot be tolerated.

The mission of ERDA was set forth by Congress in the Energy Reorganization Act of 1974[146] which declared that the

> . . .general welfare and the common defense and security require effective action to develop, and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety.

The ERDA mission encompasses and includes direction of federal activities relating to research and development of energy sources and efficiency and reliability in the use of energy. ERDA expects to accomplish this mission as a catalyst in a private-public partnership to induce maximum private participation.

Importantly, ERDA's catalytic role should emphasize two objectives: (1) the development period required to bring new energy technology into effective use must be compressed, and (2) adequate incentives must be provided to stimulate rapid commercialization of the new technology. Encouragement of the private investor is the only sure way of achieving these objectives.

B. Investment is the Key To a Successful Response To the Energy Challenge

Private investment in energy research and development has historically been relatively low. Yet heavy investment is a key and indispensable factor needed to spur and support American innovation to overcome the technological barriers facing the energy industry. ERDA can provide direction and guidance to the private sector to encourage research not only in the near and mid-term technologies — conservation, energy efficiency, light water reactors, enhanced oil and gas recovery, direct utilization of coal, synthetic fuels, geothermal energy, and solar heating and cooling — but also in the long term technologies — breeder reactors, solar-electric, and the harnessing of fusion energy.

ERDA can provide the direction, but incentives must be provided to stimulate the investor to follow ERDA's lead and induce him to risk his precious capital in these ventures. The investor must be assured that on the long road to commercialization he will be accompanied by the security of proprietary protection against those who would unfairly benefit from the technology he develops without having to subject themselves either to his risks or his capital outlay.

ERDA's mission and specific objectives are important determining factors in arriving at its patent policy and in deciding whether compulsory licensing should be a part of that policy. The missions and objectives of government agencies and departments have traditionally provided the rationale for departmental regulations and policies governing allocation of patent rights. For example, the mission of the Department of Defense in sponsoring research and development is

primarily to find new materials, products and equipment for its own use with but slight concern or expectation that technology developed under its auspices will find utilization in the commercial market.

On the other hand, the Department of Agriculture's mission has historically been the development of new products to the point of public use in the agricultural sector of the economy. Whether the differing patent policies which have evolved for the Department of Defense and the Department of Agriculture are the best for meeting their individual and special needs may be questioned, but their respective missions have nonetheless largely been responsible for molding their present-day policies.

ERDA's mission dictates that adoption of compulsory licensing would be folly. ERDA will be contracting over the coming years with a diversity of companies for a variety of research and development projects covering the gamut of energy sources and utilization technologies. Yet the government input to energy development cannot succeed if it in turn does not attract private capital to carry the research and development forward to the final stages of practical public use.

Investment per unit of energy that will be required over the next quarter century is estimated to be 50% to 70% greater than today's investment per unit of energy. The clear implication is that inducement to the private investment community must be high to attract the necessary capital. ERDA's catalytic mission will be greatly assisted if the investor can proceed with assurance that patents achieved through his own enterprise will provide him with an injunctive remedy, if needed, to protect that investment.

C. Compulsory Licensing Will Not Benefit the Public

The public will not benefit from imposing compulsory licensing requirements on energy related patents. Consumer advocates, Congressmen, and members of the public rightly are concerned that the public should be the beneficiaries of an enlightened energy program. But compulsory patent licensing will not cure or remedy any alleged evils of the patent system, nor will it provide to the public economical and clean energy which will so urgently be needed as we approach the Twenty-First Century.

Courts now have available to them the compulsory licensing remedy to apply on a case-by-case basis when needed to protect the public. A compulsory licensing statute would introduce the further procedure of an administrative determination and certification to a district court. Implicit to such a procedure is broad discretionary authority in the hands of the administrator to investigate all cases brought to his attention.

The procedure would necessarily require an investigation and the threat of compulsory licensing which a competing party could bring to bear on an innocent patent owner through the administrator. Even if there is no basis for compulsory licensing, the potential for harassment is clear, and regardless of the intentions of the administrator, unfair pressures can be applied against the innocent patent owner. The enactment of compulsory licensing legislation would also be superfluous, because this remedy already exists in the courts, where due process protection is available. Moreover, any compulsory licensing order ultimately must emanate from the courts in any event.

Compulsory patent licensing has been promoted as a remedy for suppression of technology, misuse of patents, and antitrust violations. These alleged abuses of the patent system have usually provided the underlying rationale for compulsory licensing provisions, such as, the Hart-Long Amendment.[17] In Section V, above, it has been amply demonstrated that such abuses may well be illusory, and even if an actual abuse occurs, evidence demonstrates that compulsory licensing could not eliminate or cure the problem. The data available on court imposed compulsory licensing of patents as a result of antitrust violations strongly suggest that it has been ineffective to promote the transfer of technology.

D. Compulsory Licensing Will Not Induce Private Investment Nor will It Aid ERDA in Achieving Its Mission

It is unrealistic to believe that imposition of compulsory licensing will assist in the solution of our energy problems, just as it was unrealistic to believe that compulsory licensing could solve our pollution problems. The Clean Air Amendments passed by Congress required compulsory licensing of patents related to pollution control devices, even after the Justice Department had attacked and broken up a cross-licensing agreement within the automobile industry which it considered anticompetitive.

There is no evidence that Congress' action has increased the flow of technology or enhanced innovation in this critical technical area. Today, we still do not have effective pollution control devices in either the automobile industry or segments of the utility industry. There is no positive evidence showing that compulsory licensing has assisted in providing solutions which could lead to commercial implementation of pollution control devices.

Congress by the Energy Reorganization Act of 1974 intended for ERDA to be the primary agency responsible for the research, development and demonstration phases in the government's energy program. To effectively carry out its responsibilities in these phases, ERDA already possesses sufficient powers under the provisions of 28 U.S.C. § 1498.[18] This statute permits ERDA to use privately owned patents during the course of its R&D contracts. ERDA thus does not need a compulsory licensing statute to carry out its direct contracting commitments.

ERDA's catalytic role in inducing private investment to further develop energy technology to a point of commercialization will be enhanced by allowing the private sector to hold strong patent rights. The rational investor wants to reduce uncertainty and speculation before committing his capital to an enterprise. By assuring the inventor and investor of the "exclusive right" for a limited time to inventions growing out of their enterprise, the risks associated with bringing new technology to the marketplace are appreciably reduced and the likelihood of attracting investment to innovative activity is increased. In contradistinction, compulsory licensing reduces the rights associated with a patent and increases the uncertainty

faced by the inventor and investor to develop an innovative idea into a profitable product. In the energy field, where even larger, more speculative investments in new technology are required, compulsory licensing would have a chilling impact on the investor.

This writer draws four major conclusions relevant to the energy field concerning compulsory licensing:

1. There is no substantial evidence or data to show that compulsory licensing will remedy or cure "suppression" of patents, misuse of patents, or antitrust violations involving patents.

2. Analysis of past judicial decrees imposing compulsory licensing does not show that transfer of technology was encouraged thereby, nor does it show that there was increased innovation or competition. In fact, in some cases the evidence suggests the opposite — that compulsory patent licensing has reduced competition within a given industry.

3. Since compulsory patent licensing drastically diminished the scope or proprietary protection afforded by a patent, its imposition would adversely affect the incentive to invest in research on, and development of, energy technology.

4. Experience with government-owned patents, which are precisely analogous to mandatorily licensed patents, has demonstrated that when the right to exclude is emasculated or destroyed the patents are "lodged in a dead hand" and the technology covered suffers the fate of nonuse. What is freely available to all will be invested in by none.

This writer does not believe that compulsory patent licensing should be adopted as a part of ERDA'S overall patent policy and urgently recommends against enactment of a compulsory licensing statute as being the antithesis of what is needed to encourage the private sector to wholeheartedly commit its vast resources to the achievement of ERDA's vitally important goals. This country, facing a continuing long-term energy crisis and challenge, can not afford to indulge in the folly of experimenting with compulsory licensing in the energy field.

NOTES

1. Based on 1974 rates or production, the total reserves of petroleum would last for another 35 years. There has been much speculation concerning offshore reserves, but even allowing for the discovery of new reserves, one lifetime is a generous estimate. *ERDA, A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future—ERDA-76-1* 109 (1976) [hereinafter cited as *ERDA-76-1*].

2. *Id.* at 15-16, 24-26.

3. 42 U.S.C. § 5901(b) (1974). Although other government agencies have some tasks relating to energy R&D, the major responsibility for program and budget management now belongs to the Energy Research and Development Administration (ERDA).

4. In other countries R&D efforts in the energy area are in the embryonic stage and the outlook for the future is bleak. Private investment appears to be insubstantial and government investment tends to be oriented only toward developing the nuclear option as a means of meeting near-term energy demands (about 60% of the total energy research, development and demonstration (RD&D) in France, West Germany, Great Britain, Canada, and Japan is devoted to nuclear research). *ERDA, A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future—ERDA-48*, Vol. 1, App. C-3 (1975) [hereinafter cited as ERDA-48]. This disproportionate emphasis could be the greatest risk of all because of the potential for damage and pollution to the environment, a risk which no one has yet satisfactorily measured. Nonetheless energy planning and policy for the United States must be undertaken with a full recognition of the ultimate inseparability of the foreign and the domestic needs for energy. *See, e.g., Committee for Economic Development, Nuclear Energy and National Security* 63 (1976).

5. Near, and mid-term technologies are conservation (energy efficiency), light water reactors, enhanced oil and gas recovery, direct utilization of coal, synthetic fuels, geothermal energy, and solar heating and cooling. Long-term technologies are breeder reactors, solar electric and harnessing of fusion energy. *ERDA-76-1*, at 11.

6. 42 U.S.C. § 5901(c) (1974). From a management viewpoint ERDA may face more difficulties than the Manhattan and Apollo projects, whose goals were explicit and capable of definition (i.e., "produce an atomic bomb which can be delivered to an overseas target" and "put a man on the moon within a decade"). By way of contrast, ERDA's goal is somewhat nebulous ("achieve solutions to the energy supply and associated environmental problems in the immediate and short-term . . ., middle-term . . ., and long-term . . . time intervals," 42 U.S.C. § 5905(b)(2)).

7. The oil industry spent slightly more than $700 million on R&D in 1975, a figure which represents 0.4% of sales and 8.3% of profits. Oil exploration costs are capitalized and not included in the total. For a breakdown of R&D expenditures by industry and firm, *see, Where Private Industry Puts Its Research Money, Bus. Week*, June 28, 1976, at 62-84.

8. *E. Mansfield et al., Social and Private Rates of Return from Industrial Innovations* (1975) (report prepared for the National Science Foundation).

9. The basic research share of company R&D funds has decreased every year since its peak in 1963. In 1973 industrial firms performed only 16% of all basic research conducted in the United States. The chemical industry (where patent protection is the strongest) performed 37% of the industrial total. *National Science Foundation, Research and Development in Industry* 9 (1973).

10. 42 U.S.C. § 5908(n).

11. Clean Air Act, 42 U.S.C. § 1857 b-1 (1970); Atomic Energy Act, 42 U.S.C. § 2138. *See also*, Plant Variety Protection Act, 7 U.S.C. § 2404. There have been no requests for a compulsory license under either the Clean Air Act or the Plant Variety Protection Act. In the 22 years since adoption of the Atomic Energy Act of 1954, there have been only two recorded uses of the compulsory licensing provisions. These two cases are discussed in depth in *ERDA, The Patent Policies Affecting ERDA Energy Programs* 218-222 (1976). One of the requests arose only after extensive court litigation and appeal found a patent valid and infringed by Hewlett-Packard Company. Not satisfied with the Court decision, Hewlett-Packard filed a request for a compulsory license in accordance with 42 U.S.C. § 2183 and eventually settled out of court with the owner of the patent. Encouragement of wasteful litigation of this sort was certainly not the intent of Congress.

12. The terms "mandatory patent licensing" and "compulsory patent licensing" are used interchangeably in this paper and mean that, pursuant to a statute or judicial decree, a patent owner is compelled to grant a license to another and the patentee's only right is to a reasonable royalty for its use. Consideration in this paper is given only to mandatory or compulsory patent licensing and how it affects privately-owned patents and their use (under license) by others in the private sector and not the use of patents "by or for" the government.

Arguably, action under 28 U.S.C. § 1498, which precludes injunctive relief, for unauthorized use of a patented invention by or for the government, is a form of compulsory licensing; however, this complex subject is beyond the scope of this paper, since it affects patents in all fields, not just the energy field.

13. "The Congress shall have power . . . to promote the progress of . . . useful arts, by securing for limited times to . . . inventors the exclusive right to their . . . discoveries." *U.S. Const.* art. I; § 8. There is a strong argument that a compulsory licensing statute would be unconstitutional. The power to secure exclusive rights to inventors for limited times certainly circumscribes the limits of Congressional authority; indefinite patent grants, for example, would be blatantly unconstitutional.

The important question is whether the unambiguous words "exclusive right" preclude the Congressional determination that a lesser grant, i.e. the right to reasonable royalties, would better "promote the progress of . . . useful arts" — the constitutional purpose of the patent system. In one sense, the right to reasonable royalties comes close to a system of monetary prizes for particular inventions, a concept which was expressly rejected at the Constitutional Convention.

Much has been made of the fact that the original draft of the Constitution was amended and strengthened to its final form, that the absence of the word "patent" was intended to preclude reliance on the forms of the English institution, and that the brief mention of the patent system in the Federalist speaks of the wording with approval. *See* Schecter, *Would Compulsory Licensing of Patents Be Unconstitutional?* 22 *Va. L. Rev.* 287 (1936); Fenning, *The Origin of the Patent* ***Clause of the Constitution*, 17 *Geo. L.J.* 109 (1928). There was virtually no debate on the clause, however, and it does not appear that the Framers considered, to any great extent, the possibility of a lesser grant by Congress.

Although the Clean Air Act and the Atomic Energy Act do contain compulsory licensing provisions, they have been singularly ineffectual and no cases have arisen under them. In the absence of a constitutional challenge in a proper case, the Supreme Court has not

definitively settled the issue. It should also be noted that a compulsory licensing statute must be consistent with United States treaty obligations. *See* note 96 *infra*.

14. *See, e.g.*, the early expressions of Thomas Jefferson opposing monopoly and his later writings supporting the purposes of the patent system, as detailed in Graham v. John Deere Co., 383 U.S. 1, 7-10 (1966).

15. *Staff of Senate Comm. on the Judiciary (Machlup), 85th Cong., 2d Sess., An Economic Review of the Patent System* (Comm. Print 1958).

16. *Id.* at 21-24. Each thesis has been praised at various times by the courts. *See, e.g.*, (1) "The inventor is one who has discovered something of value. It is his absolute property." United States v. American Bell Telephone Co., 167 U.S. 224, 250 (1897); (2) "The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare . . . Sacrificial days devoted to such creative activities deserve rewards commensurate with the services rendered." Mazur v. Stein, 347 U.S. 210, 219 (1953); (3) "The controversy between the defenders and assailants of our patent system may be about a false issue—the stimulus to invention. The real issue may be the stimulus to investment." Picard v. United Aircarft Corp., 128 F.2d 632 (2d Cir. 1942) (Frank, J., Concurring); (4) "[Inventions]are of such importance to the public weal that the Federal government is willing to pay the high price of 17 years of exclusive use for its disclosure." Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 481 (1974); Universal Oil Products Co. v. Globe Oil Ref. Co., 322 U.S. 471, 484 (1944); Grant v. Raymond, 31 U.S. (6 Pet.) 218, 242 (1832).

See also, Finnegan and Pogue, *Federal Employee Invention Rights—Time to Legislate*, 55 *Mich. L. Rev.* 903 at 936-937 (1957).

17. Barzel, *Optimal Timing of Innovation*, 50 *Review of Economics and Statistics* 348-355 (1968).

18. It has been asserted that a compulsory licensing statute would reduce, or in some cases eliminate, the need to "invent around", and it is sometimes implied that "inventing around" is a negative and wasteful process. This argument, however, ignores the fact that the process of "inventing around" may produce new, more valuable technology.

The advantages of internalizing R&D are also applicable here. *See* discussion accompanying note 29, *infra*. Finally, the prospective licensee is not always forced to "invent around". The patentee may be willing to negotiate a license; similar technology may be available elsewhere; or the firm may elect to utilize the patented technology without paying royalties and risk a suit for infringement.

19. *See, e.g.., A. Okun, Equality and Efficiency: The Big Tradeoff*, 16-17 (1975).

20. The assertion is difficult to support with empirical data, but it is safe to say that many inventors, including a large percentage of individual inventors, would not exert their efforts without the potential reward of the patent grant. In addition, the antitrust laws may have marginally increased the allocation of resources to innovative activity. As Professor Markham has noted, "[Public policy] encourages the pursuit of monopoly reward through innovation by denying with increasing vigor pursuit of such rewards by other means." Markham, *The Joint Effects of Antitrust and Patent Laws Upon Innovation*, 56 *Am. Econ. Rev.* 291, 299 (May 1966).

21. *E.g.*, Stillerman, *Resistance to Change*, 48 *J. Pat. Off. Soc'y* 484 (1966); *see also, J. Jewkes et al, The Sources of Invention* (2d ed. 1969).

22. $1.157 billion (4.7% of sales, 51.2% of profit) in 1975. *Where Private Industry Puts its Research Money, Bus. Week* June 28, 1976, at 67, 73-74.

23. For a fast second position to be optimal, the imitation lag must be very short, the imitator's target share of the market must be very large, and the imitator's market penetration area must be high relative to that of the inventor. Baldwin and Childs, *The Fast Second and Rivalry in Research and Development*, 36 *S. Econ. J.* 18-24 (1969).

24. Various studies have found patent invalidity rates ranging from 53% to 72%. *See, R. Nordhaus, Adjudicated Patents* (1976); Dearborn and Boal, *Adjudications by Circuits and Arts Involved*, in *The Encyclopedia of Patent Practice and Invention Management* (Calvert ed. 1964); Tegtmeyer, *For Greater Patent Validity*, 19 *Am. U.L. Rev.* 21 (1969); Federico, *Adjudicated Patents, 1948-1954*, 38 *J. Pat. Off. Soc'y* 245-249 (1956).

25. Lawrence Baum discusses the various reasons for increased holdings of patent invalidity in *The Federal Courts and Patent Validity; An analysis of the Record*, 56 *J. Pat. Off. Soc'y* 758 (1974).

26. *Id.* at 766-770.

27. *E.g.*, Pfizer, Inc. v. Lord, 456 F.2d 532 (8th Cir. 1972), *cert. denied*, 406 U.S. 976 (1972); Picard v. United Aircraft Corp., 128 F. 2d 632, 638 (2d Cir. 1942) (Frank, J., concurring), *cert. denied*, 317 U.S. 651 (1942); Great A&P Tea Co. v. Supermarket Equipment Corp., 340 U.S. 147 (1950); Graham v. John Deere Company, 383 U.S. 1 (1966). However, Judge Frank felt that:

"To denounce patents merely because they create monopolies is to indulge in superficial thinking. We may still want our society to be fundamentally competitive." Picard v. United Aircraft Corp., *supra* at 643.

28. Research has become more expensive; it requires more expertise, and takes longer to achieve results. For instance, in 1965 the chemicals and allied products industry obtained 5.3 patents per $1 million (constant 1967 dollars) invested in R&D. The figure went down to 4.7 in 1970 and to 3.9 in 1973. In addition, the number of man-years required to develop a patent increased from 5.1 to 5.6 to 7.4 for those same years. *More Money and Work Yield Fewer Patents*, 54 *Chem. & Eng'r News*, July 26, 1976, at 15.

In the face of such obstacles, independent inventors, such as an Edison, are slowly becoming the exception, rather than the rule. A greater percentage of patents each year are being initially assigned to corporations by inventors in their employ and correspondingly fewer to individuals. Orkin, *The Legal Rights of the Employed Inventor: New Approaches to Old Problems*, 56 *J. Pat. Off. Soc'y* 719, 740 (1974).

It also is clear that corporations do not, as a usual course, buy up the inventions of individuals but rather prefer to internalize their R&D because of tax advantages, the threat of antitrust laws, and the economies realized through close cooperation between their R&D and production staffs in readying new products and processes for the market place. *See*, Sanders, *Patterns of Commercial Exploitation of Patented Inventions by Large and Small Corporations, 8 P.T.C. J. Res. & Ed.* 51 (1964) [hereinafter cited as Sanders].

29. *See* note 28 *supra*. Also, the increasing necessity for inventive activity to be sponsored by the government, universities, and industry has spurred criticism that the rewards of the patent system have been directed away from the inventor. Part of this concern seems to be founded on ethical grounds (Machlup's "natural-law" thesis), but much of the substantive criticism is grounded on a fear of corporate economic power. For the most part this latter objection as it relates to the patent system is probably unfounded. Studies on the commercialization of patents by corporations are somewhat inconclusive, partly because some firms are reluctant to release such data to researchers and partly because their internal accounting procedures do not allocate income and expenses by patent.

Based on questionnaires, Sanders advanced several conclusions. *See* Sanders, note 28 *supra*. First, small firms have a higher proportion of their patents in use. Second, large corporations tend to license a larger proportion of their unused patents than do smaller corporations. Third, larger firms seem to use the invention earlier, relative to the date of issuance of the patent. Fourth, small firms claim more frequently that patented inventions increased their sales, whereas the large firms more often say that the inventions reduced their costs of production.

30. Edison, Jewett, Waldemar Kaempffert, Gerard Swope, R. P. Fish, and various Commissioners of Patents. The American Chemical Society asked its thousands of members to report any cases, and none were reported. In 1912 the Oldfield Hearings on Compulsory Licenses heard 60 witnesses in 27 public hearings but none claimed to know of a case of suppression. *Joint Economic Comm. (Gilfillan), 88th Cong., 2d Sess., Invention and the Patent System* 90 (1954) [hereinafter cited as Gilfillan].

31. *Investigation of Concentration of Economic Power: Final Report and Recommendations of the Temporary National Economic Committee*, S. Doc. No. 35, 77th Cong., 1st Sess. 36, 249, 269 (1941), *cited in Collins et al., Patent Policy, Technological Innovation and Government Contracts: A Selective Critique* 3 (1974).

32. *E.G.*, United States v. Standard Oil Co., 1940-1943 *Trade Cas.* ¶ 56,198 (D.N.J. 1942), modified, 1940-1943 *Trade Cas.* ¶ 56, 269 (D.N.J. 1943); United States v. General Electric Co., 1946-1947 *Trade Cas.* ¶ 57,448 (D.N.J. 1946); United States v. Aluminum Company of America, 1940-1943 *Trade Cas.* ¶ 56,200 (S.D.N.Y. 1942); United States v. Merck & Co., 1944-1945 *Trade Cas.* ¶ 57,416 (D.N.J. 1945); Morton Salt v. G. S. Suppinger, 314 U.S. 488 (1942).

33. Arnold, *The Abuse of Patents*, in *Patent Property and the Anti-Monopoly Laws* 565-580 (Barnett ed. 1943) [hereinafter cited as Arnold].

34. United States v. Standard Oil Co., 1940-1943 *Trade Cas.* ¶ 56,198 (D.N.J. 1942), *modified*, 1940-1943 *Trade Cas.* ¶ 56,269 (D.N.J. 1943).

35. The classic study of the rubber crisis can be found in *Staff of Senate Comm. on the Judiciary (Solo), 85th Cong., 2d Sess., Synthetic Rubber: A Case Study in Technological Development Under Government Direction* 1-130 (Comm. Print 1959) [hereinafter cited as *Synthetic Rubber*].

36. Langner, *We Depend on Invention*, in *Patent Property and the Anti-Monopoly Laws* 581-596 (Barnett ed. 1943) [hereinafter cited as Langner].

37. United States v. General Electric Co., 1946-1947 *Trade Cas.* ¶ 57,448 (D.N.J. 1946) (filed Jan. 27, 1941).

38. Arnold, *supra* note 33, at 574-577. Beginning its research in fluorescent lighting in 1935, GE was able to develop a marketable lamp in three years. For a case study of the invention, *see* Bright and MacLaurin, *Economic Factors Influencing the Development and Introduction of the Fluorescent Lamp*, 51 J. Pol. Econ. 429-51 (1943).

39. United States v. Bausch & Lomb, Optical Co., 1940-1943 *Trade Cas.* ¶ 56,052 (S.D.N.Y. 1940).

40. Letter from Henry L. Stimson to Bausch & Lomb Co., Aug. 20, 1940.
41. Langner, *supra* note 36, at 592.
42. A. Schlesinger, *The Imperial Presidency* 100 (1973).
43. 54 Stat. 885, 886 (1940).
44. R. Berger, *Executive Privilege* 84 n.128 (1974).
45. Arnold, *supra* note 33, at 577. In fact, however, Standard Oil contacted the Army and Navy Munitions Board on October 9, 1939, with a proposal to develop a synthetic rubber industry, but it was discarded for fear that the cooperative company arrangement would not survive an antitrust attack. *Synthetic Rubber*, *supra* note 35, at 5-6.
46. Gilfillan, *supra* note 30, at 99.
47. 146 F.2d 941 (9th Cir. 1944).
48. The state heavily taxed manufacturers, wholesale dealers, and retailers of oleomargarine. In 1925 it petitioned Congress to suppress the manufacture and sale of oleomargarine throughout the United States, and in 1931 it passed a joint resolution seeking to restrict use of the product by national legislation on the grounds that oleomargarine was lacking in vitamins and hence not beneficial to children. *Id.* at 941, 945 n.2, 954-956.
49. *Id.* at 956.
50. Various early 20th century economists estimated the utilization rate of inventions at from 1 to 80%, although there was no empirical data to support these assertions. *See, e.g.*, Holman, *The Utilization of Government-Owned Patented Inventions*, 7 P.T.C. *J. Res. & Ed.* 130 (1963), *citing J. Schmookler, The Rate and Direction of Inventive Activity: Economic and Social Factors* 167-168 (1962). Quite different results have been found in recent empirical studies. Rossman and Sanders, *The Patent Utilization Study*, 1 *P.T.C. J. Res. & Ed.* 74-111 (1957) (54% utilization rate); *O. Bachman, et al., Patents and the Corporation* (2d ed. 1959) (54% utilization rate).
When all the available evidence is considered, it seems that: (1) patents today are more likely to be worked; (2) in foreign countries with annual renewal fees, patents are renewed for longer periods of time; and (3) there has been an increase in the quality of patents.
51. Average 1973 costs per R&D scientist or engineer in some representative high-technology industries were as follows: petroleum refining and extraction, $60,700; motor vehicles and motor vehicles equipment, $86,100; aircraft and missiles, $70,800; optical, surgical, photographic and other instruments, $64,800. *National Science Foundation, Research and Development in Industry* 46 (1973).
52. Windus, *A National Freight Car Information System*, *Traffic Q.*, Jan. 1976, at 23-29.
53. The continued reliance on policies (including tax expenditures and regulated prices) which keep the market cost of petroleum artificially low can only tend to increase our dependence on that source of energy. If all costs are not related directly to current products, inventors have less incentive to apply their talents due to the technological difficulties and the low profit potential. Consumers, likewise, have less incentive to switch to a new technology if the perceived cost of doing so is higher than present costs. *See also* the discussion accompanying note 7 *supra*.
54. *National Research Council, New Experiments in Research and Development Incentives* 7 (1975).
55. See Section IV C *infra*.
56. *Supra* note 5.
57. It has been estimated that for each dollar spent for inventive activity, ten dollars is required for development of a working model and one hundred dollars to create productive facilities and marketing channels to place a product on the commercial market. Holst, *Government Patent Policy — Its Impact on Contractor Cooperation with the Government and Widespread use of Government Sponsored Technology*, 9 IDEA 285 (Summer 1965).
58. 1 *National Commission on Technology, Automation and Economic Progress, Technology and the American Economy* 4 (1966). *See also J. Jewkes et al., The Sources of Invention* (2d ed. 1969) [hereinafter cited as Jewkes], for specific case histories which chronicle the development from idea to commercial embodiment of many famous inventions.
59. It was the realization that approximately 95% of the patents held by the Federal Government were not being utilized that led President Nixon to offer exclusive licenses to industry. Presidential Memorandum and Statement of Government Patent Policy, 36 Fed. Reg. 16887 (1971).
60. The threat of the antitrust laws has a substantial bearing on the trends. For a discussion on the increasing use of trade secrets, see Section V C4 *infra*. The Committee Examining the British Patent System found that larger firms were tending to bypass the patent system. *The British Patent System* 10 (1970).
61. S. 1283, 93d Cong., 1st Sess. § 112(c) (1973): (c) Whenever the Chairman determines that —
(1) (A) in the implementation of the requirements of this Act a right under any United States patent, which is not otherwise reasonably available, is reasonably necessary to the development or demonstration of an energy system or technology pursuant to this Act, and
(B) There are no reasonably equivalent methods to accomplish such purpose, and
(2) the unavailability of such right may result in a substantial lessening of competition or tendency to create a monopoly in any line of commerce in any section of the country, the Chairman shall so certify to a district court of the United States, which shall review the Chairman's determination. If the district court upholds such determination, the court shall issue an order requiring the person who owns such patent, or rights thereunder, to license it on such reasonable and nondiscriminatory terms and conditions as the court, after hearing, may determine.
62. The Harbridge House study found that only 15 of 1618 patents owned by government contractors were unavailable for licensing to other firms. *ERDA, The Patent Policies Affecting ERDA Energy Programs*, Att. A-4, at 15-16 (1976).
63. United States v. Dubilier Condenser Corp. 289 U.S. 178, 186 (1933).
64. "Enormous profits" per se should not be society's concern if there are corresponding benefits of the miracle invention which are reasonably available to all and a net benefit to society is thereby achieved.
65. *ERDA-48*, *supra* note 4, at IX-2.
66. *Id.* at IX-1 and -2.
67. One study of 82 individual investors in the venture capital market showed that 59% of the investments were straight equity; 32%, convertible debit; and 8%, straight debt. Another study of 354 organized investors showed that convertible debt was involved in 76% of the financing deals. *A. Bean et al., The Venture Capital Market and Technological Innovation* 37 (1974) (paper prepared for National Science Foundation).
68. *A. Okun, Equality and Efficiency: The Big Tradeoff* 48 (1975), *citing L. Goodwin, Do the Poor Want to Work?* 112 (1972).
69. *Id.* at 48-49.
70. *Arthur D. Little, Inc./Industrial Research, Inc., Barriers to Innovation in Industry, Opportunities for Public Policy Changes* 22 (1973).
71. For a summary of the economic studies on the relation between firm size and innovative activity, *see C. Kitti and C. Trozzo, The Effects of Patent and Antitrust Laws, Regulations and Practices on Innovation*, vol. I, at 118-144 (1976) (Paper P-1075 prepared for the Institute For Defense Analysis).
72. ERDA's title-with-waiver policy is designed to make new technology available to the entire private sector, except in those situations where exclusive rights appear necessary for commercialization. Hopefully, the new technology developed under ERDA's auspices will encourage the private sector to invest additional funds in improvement technologies. In a few situations, a contract with one corporation might spur the other members of the industry to invest to remain competitive. However, ERDA should never allow itself to unfairly assist one company to the detriment of the competitive market. ERDA has entrusted the functions of publicity and coordination to its Office of Commercialization, which is to provide the necessary interface between government and the private sector. ERDA 76-1 *supra* note 1, at 75-76.
73. Analogy to the defense industry should be drawn with care. DoD has traditionally been its own consumer with little actual interest in the transfer of technology to the private sector.
74. *Harbridge House, Inc.*, I *Government Patent Policy Study, Final Report* I-13 thru-26 (1968).
75. *ERDA-48*, *supra* note 4, at IX-2.
76. *Cf.* International Licensing Agreements.
77. *See Generally* Smith, *Why License?*, in *M. Finnegan and B. Brunsvold, The Law & Business of Patent & Know-How Licensing* A-1-66 (1975).
78. *See*, Baxter, *Legal Restrictions on Exploitation of the Patent Monopoly: An Economic Analysis*, 76 *Yale L.J.* (1966).
79. *See, e.g.*, Transparent-Wrap Mach. Corp. v. Stokes & Smith Co., 329 U.S. 637 (1947); International Nickel Co. v. Ford Motor Co., 166 F. Supp. 551 (S.D.N.Y. 1958); United States v. Wisconsin Alumni Research Foundation, 1970 *Trade Cas.* ¶ 73,015 (W.D. Wis. 1970).
80. McLaren, *Licensing of Patents and Technology-Application of the United States Antitrust Laws*, in 1 *M. Finnegan and R. Goldscheider, The Law and Business of Licensing* 249 (1975).
81. *Supra* note 61.
82. 395 U.S. 653 (1969).
83. Among the declaratory judgment actions reaching the Circuit Courts of Appeal are Beckman Instruments, Inc. v Technical Development, 433 F.2d 55 (7th Cir. 1970); Robin Products Co. v. Tomecek, 465 F.2d 1193 (6th Cir. 1972); Modrey v. American Gage & Machine Co., 478 F.2d 470 (2d Cir. 1973) (summary judgment for payments due under license reversed, with the court noting that the licensee could raise issue of invalidity on remand); and Atlas Chemical Industries, Inc. v. Moraine Products, 509 F.2d 1 (6th Cir. 1974)
84. Thiokol Chemical Corp. v. Burlington Industries, Inc. 448 F.2d 1328 (3d Cir. 1971). *Contra*, Product Eng. & Mfg., Inc. v. Barnes, 424 F. 2d 42 (10th Cir. 1970); *cf.* Kyson Industrial Corp. v. Pet., Inc., 459 F.2d 1010 (6th Cir. 1972) (state court action for breach of contract could not be removed solely due to questions of patent validity).
85. American Stabilizer Co. v. Sybron Corp. 526 F.2d 542 (3d Cir. 1975).
86. 524 F.2d 1097 (7th Cir. 1975).
87. USM Corp. v. Standard Pressed Steel Co., F. Supp. 184 U.S.P.Q. 476, 478 (N.D. Ill. 1974).

88. *See, e.g.*, Stern, *Antitrust Implications of Lear v. Atkins*, 15 *Antitrust Bull.* 663 (1970); Note, *Patent Law — Patent Validity: The Public is the Third Party*, 51 *Denver L.J.* 95 (1974); Comment, *Licensee Estoppel and Royalty Payments After Lear: Inconsistencies Within the Lower Courts Circumvent Lear Rationale, 28 Vand. L. Rev.* 399 (1975).
89. *E.g.*, Product Eng. & Mfg. Inc. v. Barnes, 424 F. 2d 42 (10th Cir. 1970); Robin Products Co. v. Tomecek, 465 F.2d 1193 (6th Cir. 1972); Modrey v. American Gage & Machine Co., 478 F.2d 470 (2d Cir. 1973); Kraly v. National Distillers and Chemical Corp., 502 F.2d 1366 (7th Cir. 1974).
90. Kraly v. National Distillers and Chemical Corp., 502 F.2d 1366 (7th Cir. 1974); Crane Co. v. Aeroquip Corp., 504 F.2d 1086, 1092 (7th Cir. 1974). *Contra*, Broadview Chemical Corp. v. Loctite Corp., 474 F.2d 1391, 1395 (2d Cir. 1973); United States ex rel. Shell Oil Co. v. Barco Corp., 430 F.2d 989, 100102 (8th Cir. 1970); Schlegel Mfg. Co. v. USM Corp., 525 F.2d 775 (6th Cir. 1975).
91. 395 U.S. 653, 670 (1969). Justice Brandeis on another occasion expressed the same idea, "The general rule of law is, that the noblest of human productions — knowledge, truths ascertained, conceptions, and ideas — become, after voluntary communication to others, free as the air to common use." International News Service v. Associated Press, 248 U.S. 215, 250 (1918) (Brandeis, J., dissenting).
92. 53 *U.S. Dep't of Commerce, Survey of Current Business* 28, 11, 7, 10 (June, 1973).
93. For discussion of the effect of compulsory licensing on trade secret protection *see* Section VC4 *infra*.
94. *See* Section II E *supra*.
95. Mere nonuse of a patent does not constitute such misuse as to warrant the withholding of injunctive relief. Continental Paper Bag Co. v. Eastern Paper Bag Co., 210 U.S. 405 (1908); Special Equipment Co. v. Coe, 324 U.S. 370 (1945).
96. Such a statute would have to be consistent with Art. 5(a) of the international (Paris) Convention for the protection of Industrial Property, which provides in relevant part: (2) Each country of the Union shall have the right to take legislative measures providing for the grant of compulsory licenses to prevent the abuses which might result from the exclusive rights conferred by the patent, for example, failure to work.
(3) Forfeiture of the patent shall not be prescribed except in cases where the grant of compulsory licenses would not have been sufficient to prevent such abuses. No proceeding for the forfeiture or revocation of a patent may be instituted before the expiration of two years from the grant of the first compulsory license. (4) An application for a compulsory license may not be made on the ground of failure to work or insufficient working before the expiration of a period of four years from the date of filing of the patent application or three years from the date of the grant of the patent whichever period last expires; it shall be refused if the patentee justifies his inaction by legitimate reasons. Such a compulsory license shall be nonexclusive and shall not be transferable, even in the form of the grant of a sublicense, except with that part of the enterprise or goodwill using such license.
97. Patent misuse has been found to include practices which amount to attempting to extend the collection of royalties based on use of a patent beyond its expiration date, Brulotte v. Thys Co., 379 U.S. 29 (1964); restricting a licensee from dealing in unpatented competitive products, F.C. Russell Co. v. Consumers Insulation Co., 226 F.2d 373 (3d Cir. 1955); and tying sales or leases of unpatented equipment to a patent license, U.S. Plywood Corp. v. General Plywood Corp., 370 F.2d 500 (6th Cir. 1966), *cert. denied*, 389 U.S. 820 (1967).
98. Morton Salt Co. v. G. S. Suppinger Co. 314 U.S. 488 (1942).
99. United States v. General Electric Co., 272 U.S. 490, 491 (1926).
100. The FTC under Section 5 of the Sherman Act and Section 7 of the Clayton Act has on occasion, ordered compulsory licensing of patents, but only in the case of American Cyanamid v. F.T.C., 363 F.2d 757 (6th Cir. 1966) has such a decree been judicially enforced. A few consent decrees have been entered under which provision was made for compulsory licensing. In only one instance, resolving the FTC complaint against Xerox (F.T.C. No. 8909. filed Jan. 31, 1973), has mandatory licensing been required of an entire patent portfolio (Xerox's) at no or minimal royalties.
101. From 1941 to 1957, between 30,000 and 35,000 patents were subjected to compulsory licensing through antitrust consent decrees. Frost, *Compulsory Licensing and Patent Dedication Provisions of Antitrust Decrees — A Foundation for Detailed Factual Case Studies*, 1 *P.T.C. J. Res. & Ed.* 127, 135-136 (1957). Between 1957 and 1970 at least 18 consent decrees, with an indeterminate number of patents, involved compulsory licensing. 1 *T. Lindstrom and K. Tighe, Antitrust Consent Decrees*, cxli-cxlv (1974).
102. *Staff of Senate Comm. on the Judiciary (Hollabaugh), 86th Cong., 2d Sess., Compulsory Patent Licensing Under Antitrust Judgments* 1 (Comm. Print 1960). The current Harbridge House study sponsored by ERDA should add more factual data to the existing body of knowledge and add to our understanding of the effect on R&D of court-ordered compulsory licensing.
103. *Id.* at 22.
104. *Id.* at 13-14, 18.
105. *Id.* at 21.
106. Hartford-Empire Co. v. United States, 323 U.S. 386, *clarified*, 324 U.S. 570 (1945).
107. 323 U.S. at 400.
108. 323 U.S. at 415-417. In United States v. National Lead Co., 332 U.S. 219, 338 (1946), the Court did not reach the question of whether royalty free licensing, as a matter of law, was a remedy the district court could require, having found that compulsory licensing at reasonable royalties was the appropriate remedy. The court's dicta suggests this question of whether royalty-free licensing can be judicially decreed may still be open despite Hartford-Empire.
109. 1 C. Kitti & C. Trozzo, *The Effects of Patent and Antitrust Laws, Regulations, and Practices on Innovation* 110 (1976).
110. United States v. Line Material Co., 333 U.S. 287, 310 (1948).
111. United States v. Mfrs. Aircraft Ass'n, No. 72-CIV-1307 (S.D.N.Y., filed Mar. 29, 1972), 40 Fed. Reg. 30848 (1975).
112. *Where Private Industry Puts Its Research Money, Bus. Week*, June 28, 1976, at 64.
113. *Supra* note 111, at 30851-30852.
114. United States v. Automobile Mfrs. Ass'n., 1969 *Trade Cas.* ¶ 72,907 (C.D. Cal. 1969).
115. 42 U.S.C. § 1857 b-1 (1970). As previously noted, this provision of the Act has never been utilized.
116. After much discussion of the problem the Court finally decided to allow the parties to bargain in an attempt to agree on the reasonable royalty initially to be charged. 65 F. Supp. 271, 176 (1946).
117. *See, e.g.*, Faulkner v. Gibbs, 199 F.2d 635, 638 (9th Cir. 1952).
118. The preceding discussion on factors influencing the determination of a reasonable royalty is liberally adapted from Finnegan and Mintz, *The Determination of A Reasonable Royalty* in M. Finnegan and B. Brunsvold, *The Law and Business of Patent and Know-How Licensing*, 3-1-24 (1975) [hereinafter cited as "Finnegan"].
119. For other factors, see the discussions on licensing and the determination of reasonable royalties, *supra*.
120. *See* note 24 *supra*.
121. This statement may be disputed by some and the available data on innovation as correlated to firm size is admittedly not conclusive. For a thorough discussion, see Jewkes *supra* note 58, at 123-130.
122. Sanders, note 28 *supra*.
123. *Id.*
124. Finnegan *supra* note 118 at E-11, 12.
125. *Supra* note 51. *See also* ERDA 76-1 *supra* note 1, at 16-19.
126. *See* pp. 57-58 *infra*.
127. 416 U.S. 470 (1974).
128. For a listing of the state trade secret laws as of 1974, *see* Stamicarbon v. American Cyanamid Co., 506 F.2d 532, 540 n. 11 (2d Cir. 1974).
129. For a collection of state cases, see Milgrim, *Trade Secrets* § 1,01[2] (1976). It is interesting to note that the Second, Third, and Eighth Circuits most consistently hold patents invalid; with the exceptions of Iowa and North Dakota, every state in those three circuits has statutory law (New York, New Jersey, Pennsylvania, Arkansas, Minnesota, and Nebraska) or substantial case law (Connecticut, Vermont, Delaware, Missouri, and South Dakota) protecting trade secrets. Of the 20 states in the Fourth, Fifth and Ninth Circuits, which have the highest percentage holdings of patent validity, only Georgia and California protect trade secrets by statute. There have been only a few cases concerning trade secrets to arise in these 20 states.
130. *See, e.g.*, State ex rel Ampco Metal, Inc. v. O'Neill, 273 Wis. 530, 78 N.W.2d 921 (1956); Curtis, Inc. v. District Court, 526 P.2d 1335 (Col. 1974) (en banc).
131. United States v. Bottone, 365 F.2d 389 (2d Cir. 1966), *cert. denied*, 385 U.S. 974 (1966) (photostatic copy can constitute stolen goods); United States v. Greenwald, 479 F.2d 320 (6th Cir. 1973), *cert. denied*, 414 U.S. 854 (1973) (stolen chemical formulas held to be "goods, wares or merchandise" within the purview of 18 U.S.C. § 2314).
132. F. Scherer, *Patents and the Corporation*, 144-46 (2d ed. 1959).
133. E. I. duPont de Nemours & Co. v. Christopher, 431 F.2d 1012 (5th Cir. 1970), *cert. denied*, 400 U.S. 1024 (1971); Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470 (1974); University Computing Co. v. Lykes-Youngstown Corp., 504 F.2d 518, 529, 533-534 (5th Cir. 1974) (noting theft by Lykes, subsidiary from UCC computer program purchaser); Clark v. Bunker, 453 F.2d 1006 (9th Cir. (1972). *See Corporate Privacy — A Remedy for the Victim of Industrial Espionage*, 1971 Duke L.J. 391; Hoyt, *The Computer as a Target for the Industrial Spy*, 1 *Assets Protection* 41 (1975); *Trade-Secrets Plot Laid to Ford Aide, Rumanian Official*, N.Y. Times, Aug. 31, 1973, at 1, col. 6 (multi-million dollar stolen Pilkington glass process to be sold for $25,000); *11 Charged in Theft of IBM Disk Designs*, Computerworld, July 11, 1973, at 27, col. 2 (designs allegedly worth $660 million); *Girl Charged in Program Theft*, Computerworld, Aug. 1, 1973, at 1, col. 3, and Sept. 19, at 2, col. 1 ($70,000 development cost programs offered for $2,000); *Cracked Code Caper: Case Closed*, Computerworld, Sept. 19, 1973, at 11, col. 1 (college students and software concern developed ways to plug into and extract data from Hewlett-Packard's computer system).
134. *See* the discussion in Section II 8 *supra*.
135. As an example, fluid catalytic cracking was developed by Esso

Research & Engineering Company when the company refused to pay royalties to the holder of a key patent. Fluid catalytic cracking proved far superior to the process which Esso "invented around." *Staff of the Senate Comm. on the Judiciary (Frost), 84th Cong., 2d Sess., The Patent System and the Modern Economy* 19 n.67 (Comm. Print 1957).

136. Finnegan, *Breakthrough in Commercialization of Government-Owned Patent Technology — The Federal Government As an Exclusive Patent Licensor, 6 Les Nouvelles* 797 (1971).

137. *See, e.g.*, Public Citizen v. Sampson, 379 F. Supp. 662 (D.D.C. 1974), *aff'd*, 515 F.2d 1018 (D.C. Cir. 1975).

138. Finnegan and Pogue, *Federal Employee Invention Rights — Time to Legislate*, 55 *Mich. L. Rev.* 903 at 942 (1957).

139. *Ibid.*

140. *Committee on Government Patent Policy Federal Counsel for Science and Technology, Report and Recommendations of Government Patent Policy*, November 1968, p. 10. *See also* Finnegan, *Breakthrough in Commercialization of Government - Patent Technology — The Federal Government as an Exclusive Patent Licensor*, 6 *Les Nouvelles*, 797-806 (1971).

141. 289 U.S. 178 (1933).

142. *Ibid.*

143. This passage is included in the original opinion, 289 U.S. 178, at 196, and was struck from that opinion by order of the Court appearing at 289 U.S. 706 (1933). A search in the office of the Clerk of the Supreme Court failed to reveal any briefs or other papers in support of the motion to strike. *See also* Finnegan and Pogue, *supra* note 138, at 940 and n. 122.

144. Finnegan and Pogue, *supra* note 138, at 939-940.

145. United States v. Dubilier Condenser Corp., 289 U.S. 706 (1933).

146. Pub. L. No. 93-438, 42 U.S.C. §§ 5801 et seq. (1974).

147. *See* note 61 *supra*.

148. *See* note 12 *supra*.