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The Economic Theory Concerning Patents for Inventions¹

By ARNOLD PLANT

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1. PATENTS for inventions comprise a special form of property, created by statute law. In the United Kingdom, for instance, patents "sealed with the seal of the Patent Office [which] shall have the same effect as if it were sealed with the Great Seal of the United Kingdom, and shall have effect throughout the United Kingdom and the Isle of Man" are granted under the Patents and Designs Acts, 1907 to 1932, every patent relating to one invention only and having a duration of sixteen years in the first instance; subject to fulfilment of the conditions laid down in the Acts.

2. The statutes creating patents in the various countries impose limitations on the exercise of the property rights which they comprise, but these are not the only peculiarities of this form of property. Despite the limitations, property rights in patents are more potent than is generally true of private property. The significance of private property in the economic system was enunciated long ago with great clarity by David Hume in his *Enquiry Concerning the Principles of Morals*. Property, he argued, has no purpose where there is abundance; it arises, and derives its significance, out of the scarcity of the objects which become appropriated, in a world in which people desire to benefit from their own work and sacrifice. Systems of Justice, he went on, protect property rights solely on account of their utility. Where the security of property is adequately assured, property owners generally see to it, that scarce "means" are directed to those uses which, within their knowledge and judgment, are most productive of what they want. Such is the diffusion of private property and of the desire to use it, that it is at any rate generally true that there is not a

¹ Substantially a paper read before Section F of the British Association at Leicester, September 1933.

sufficient concentration of ownership of the supplies of a particular good, and of all the easily substitutable alternatives for it, to enable the owners to control the prices of the property they own. Neither the withholding, nor the disposal of the property of any one owner will in general affect appreciably the price of the commodity in question. Hitherto, this inability of property owners to control prices has been generally approved. If we except recent tendencies towards "planned monopolies," most proposals to interfere with property rights have been aimed in the past at prohibiting the concentration of supplies of particular commodities under a single ownership, in order to prevent the property owners from raising the price by withholding part of the supply.

3. It is a peculiarity of property rights in patents (and copyrights) that they do not arise out of the scarcity of the objects which become appropriated. They are not a *consequence* of scarcity. They are the deliberate creation of statute law; and, whereas in general the institution of private property makes for the preservation of scarce goods, tending (as we might somewhat loosely say) to lead us "to make the most of them," property rights in patents and copyright make possible the *creation* of a scarcity of the products appropriated which could not otherwise be maintained. Whereas we might expect that public action concerning private property would normally be directed at the prevention of the raising of prices, in these cases the object of the legislation is to confer the power of raising prices by enabling the creation of scarcity. The beneficiary is made the owner of the entire supply of a product for which there may be no easily obtainable substitute. It is the intention of the legislators that he shall be placed in a position to secure an income from the monopoly conferred upon him by restricting the supply in order to raise the price.

4. It may be assumed that the statutes creating these patent and copyright monopolies would not have been placed, or allowed to remain, upon the statute books in the absence of a widespread expectation of public advantage from their operation. Economists have of recent years found new difficulties in stating the effects of monopoly upon the magnitude of the national income, but it is nevertheless still broadly accepted that monopoly conditions tend to promote the diversion of the scarce means of production from a more to a less generally preferred utilisation. It is of interest, therefore, to review the expectations of those who approve of the patent system, to

consider the implications of those expectations, and the extent to which they have been realised. Are those expectations reasonable in themselves? Are the devices which have been adopted for their realisation appropriate? Has their operation resulted in objectionable consequences which may not have been foreseen?

5. As we have seen, the purpose of patents for inventions is, by giving an inventor the control for a definite period over the disposal of his invention, to make it easier for him to derive an income from it. With what objects? As soon as we enter into an examination of motive, we are, of course, venturing upon uncertain and debatable ground. It will, nevertheless, I think, be generally agreed that the ultimate aim is to encourage inventing. This is undoubtedly the expectation and hope of the vast majority of disinterested advocates of patents. The aim of all advocates, whether inventors themselves or not, is to make inventing pay better, and those at any rate who are not inventors hope for more inventions as a consequence. Even those supporters of the patent system who would describe their argument as purely ethical in character would probably agree that their ultimate concern is that inventors, *qua* inventors, should be enabled to survive. They may argue that their concern is to see that producers of inventions are not robbed of that which ought to be, even if it may not be in common law, their property; and yet their interest in inventors is very likely derived from a more fundamental belief that inventions are especially good in themselves, that the production and utilisation of inventions ought, therefore, to be encouraged, and that the way to attain that end is to extend the sphere of private property so as to increase the profitability of "inventing," and of the exploitation of inventions, as compared with other occupations. We are surely entitled, therefore, to attribute the existence of the patent law to a desire to stimulate invention.

6. In order to examine the effects of the patent system on invention it is, therefore, necessary first of all to ask what determines the amount of invention that takes place, and we must start with a working definition of "invention." To give it a wide enough meaning—much more comprehensive, by the way, than that to which patent law has come to be applied—invention is the devising of new ways of attaining given ends. We might widen the definition still further, by including the devising or suggesting of new ends themselves as inventions, but this would probably involve too great a departure from

ordinary usage. We may all agree that a new machine for making cigarettes is an invention but that a suggestion for the abandonment of cigarette-smoking in favour of something else is not. If we definite invention as the devising of new ways of attaining given ends it will be best to make the "given ends" as concrete as possible by excluding from the category of "invention" any change in consumers' taste.

7. This somewhat comprehensive definition of invention enables us to include, as we surely must, all new ways of attaining given ends, although many may not be immediately, if ever, adopted. A new device, employing a recently discovered and revolutionary scientific principle, may be mechanically excellent, and yet not capable of commercial exploitation. The time and extent of its adoption will depend upon price conditions. Changes in relative prices may lead to the abandonment of one much utilised process and the substitution of another, devised long since but never before adopted.

8. A useful distinction has been drawn by Professor Pigou between different types of change in economic conditions (and has been applied to inventions by Dr. J. R. Hicks), distinguishing those which are "autonomous," occurring spontaneously rather than in response to any environmental impulse, from those which are "induced" by environmental changes and owe their origin therefore to circumstance. Different writers have assessed very differently the relative importance, as regards their number, of inventions which fall into these two categories, and when we carry the analysis a step farther, and attempt a classification, within the second category, of the various circumstances which may induce invention, still more difference of emphasis is revealed in the views of the various authorities.

9. Spontaneous or "autonomous" inventions include those which arise from the existence of what Professor Taussig calls the "instinct of contrivance." So far as these are concerned, necessity is not the mother of invention; the act of inventing rather is a necessity in itself. The inventor cannot help it. Just as some people, who may never be recognised as poets, continue to pour out volumes of verse, so others may spend their time or part of it in devising contrivances or inventions. Sir Josiah Stamp in his stimulating essay on *Invention* (Watt Anniversary Lecture, Greenock, 1928, reprinted in *Some Economic Factors in Modern Life*) inclines to the view that the flow of invention is largely explained in this way. 'The

inventor,' he says, 'is still *sui generis*, and emerges from the ranks of engineers, physicists, and chemists, not indeed as a "sport," but as a special product, which is touched by no "economic spring." The sense of curiosity and the idea of fame play a greater part than the economic reward.' Not all of the inventors, however, whose output is involuntary, are impervious to prospects of gain. Like artists, some may turn their talent to profitable use. The amount and rate of flow may be invariable, but its direction may be influenced by inducements of one sort or another. Inventing may be spontaneous, but the nature or form that it takes may be controlled by circumstance. It will probably be generally agreed that the number of "involuntary inventors" whose output is completely unaffected by economic conditions is at least as small as that of artists who work without regard to the saleability of their output.

More definitely in the category of "spontaneous" inventions are those which are made by accident, for the most part no doubt as the chance by-product of activity directed to some other purpose. Every scientific worker knows how frequently an enquiry leads to discoveries which answer questions very different from those which prompted the investigation. Undoubtedly, in the field of invention, contrivances are accidentally hit upon in the same way; but in all probability, the majority of these "chance" inventions are also indirectly "induced"—one stage removed, as it were—for the greater part of the activity out of which they arise is influenced by circumstance. Of a somewhat similar character, again, are the inventions of "amateurs" who, when inspecting the specialised technique of a particular field of production, being prompted by curiosity rather than hope of gain, are enabled by their unusual possession of experience of some other technique to suggest improvements and new devices which fail to occur to the minds of practitioners themselves. The timing, at least, of such inventions is undoubtedly largely fortuitous.

10. Induced inventions owe at any rate their nature, if not their volume, to the circumstances of time and place. One very potent cause affecting the amount of inventions is clearly the rate of growth of scientific knowledge. The greater the volume of new scientific discoveries, the more rapid will become the rate of application of these discoveries by inventors to purposes of production. Invention does not, of course, wait upon the completion of scientific discovery. As William Edward Hearn wrote seventy years ago, in what is surely still

the best theoretical discussion "Of the Circumstances which Determine the Extent of Invention" (in his *Plutology*, ch. xi): "The knowledge that is imperfect for the purposes of speculation is often a sufficient guide for the daily business of life." "Even at the present day," he adds, "many processes of our most successful arts have not yet received a scientific explanation. . . . But in all empirical arts, the limit of improvement is soon reached."

11. A second influence on the nature, if not on the volume, of new invention is specialisation and the division of labour.

The specialisation which has been made possible by the great increase in the number of scientific workers has in itself tended to increase the rate of scientific discovery. Similarly, the division of labour in production has exerted an influence on invention. Adam Smith made the point perhaps too forcibly (*Wealth of Nations*, Book I, ch. i) when he observed that "the invention of all machines by which labour is so much facilitated and abridged, seems to have been originally owing to the division of labour." W. E. Hearn and, following him, W. S. Jevons (*Principles of Economics*) both criticised the extravagance of Smith's language, calling attention to the number of important inventions which have emanated from unexpected quarters. Yet they did not deny the obvious truth that specialisation in product and the division of labour make possible the detailed consideration of technological processes, and that inventions of new processes do arise out of such continuous and intimate consideration of detail. Whether there is in consequence a net addition to the *volume* of invention, as distinct from a change in its nature, is another matter.

12. It is true that the growing mechanisation of industry withdraws ever more of the active and trained minds from actual machine operation and may in that way reduce the number of inventions that would otherwise be made in that field, but it would be a very incomplete account of the effects of the division of labour on invention that stopped there. Specialisation has, of course, released the more able and ingenious and mentally alert workers from routine tasks for the performance of just such special tasks as inventing. It has made possible the career of professional "inventor." It has moreover resulted in the increased wealth of communities, which has made possible the increase of knowledge by the endowment of research, and the spread of knowledge and the training of ability by the endowment of education. These in

turn have increased on the one hand the field for invention, and on the other hand, the number of active inventors.

13. Increasing wealth, the division of labour, the progress of science, then, are clearly circumstances which induce in these various ways the invention of new processes and devices. It remains to add another circumstance, which provides the incentive for the making of particular inventions, and that is the existence of favourable price conditions. Dispute there may well be as to the effect of price changes, and of the consequent emergence of new opportunities for profit and new probabilities of loss, on the *volume* of invention that takes place as a whole in a given period, but as to the important *directive* influence of price conditions upon by far the greater part of inventive effort there can be no doubt at all. Hearn wrote: "The principal circumstance which affects the progress of inventions is the strength of the motive for their use. When the demand is sufficiently strong, the supply generally overtakes it. . . ." The price conditions which induce invention in particular fields are those which offer a special return to inventors in those fields. The inventions may be induced either by the possibility of quite exceptional profits to those who can cut costs still further during times of flourishing trade, when an industry is already profitable, or by the imminence of certain loss to entrepreneurs who have fixed investments in industries which are depressed, and whose only hope is an innovation which will reduce expenses below receipts. During the post-war years, for instance, inventions have been induced by price conditions in both the coal industry and the rubber industry on the one hand, and in the motor-car and radio industries on the other.

14. Hitherto, the interest of economists in the relation between inventions and industrial fluctuations has been concentrated mainly on the part played by inventions in the causation of fluctuations. (Cf., e.g. Mr. D. H. Robertson's *Study of Industrial Fluctuations*, and Professor Pigou's *Industrial Fluctuations*.) The problem of the reverse effects of business fluctuations on the flow of inventions is a no less fascinating subject of study, about which a number of unargued and contradictory statements have been made. It is important to distinguish between the making of an invention and its adoption. Sir Josiah Stamp, in the paper already referred to, says: "On the whole I incline to the view that the periods of rapid and important invention tend to be periods of larger differential

profits." The view is not supported in the paper by evidence or argument. Professor Pigou in his *Industrial Fluctuations* (ch. iv, p. 43) is concerned mainly to refute the proposition that fluctuations in general business activity may be initiated by variations in the rate at which ordinary minor inventions and improvements are made. He argues that even in the case of major inventions it is the decision to exploit inventions rather than the making of the inventions itself that is the major cause of disturbance, the time and intensity of exploitation being largely determined by the state of business confidence. "There is," he says, "... a strong probability that invention as a whole will fluctuate very much less than invention in any given representative occupation,"—i.e. he implies that there is a transfer of inventive activity from one industry to another, expansions in one field being compensated more or less by declines in invention elsewhere; and he states definitely that "there is evidence that in slack periods technical devices and improvements accumulate in the sphere of knowledge, but are not exploited till times improve." The nature of the evidence is not stated. It presumably relates to the statistics concerning the rate of exploitation rather than of invention itself. Such an accumulation of inventions during depressions is compatible with increasing, stationary or declining absolute rates of invention, being purely relative to the rate of exploitation, which one might reasonably expect to decline when business confidence is at a low ebb. It is of interest to notice, however, that elsewhere in the same study (p. 12) Professor Pigou asserts that "in periods of depression the amount of *intelligence* put into production is, in general, larger, partly because relatively inefficient business men are compelled to sell out to others, but mainly because those who remain in business 'are put on their mettle, and exert themselves to the utmost to invent improved methods, and to avail themselves of the improvements made by others.'" This would imply an increased rate of both invention *and* exploitation during depressions, at least on the part of those who remain in business.¹

¹ I cannot trace any attempt hitherto at statistical investigation of the relationship between disturbances in industrial activity and variations in the rate of invention. Professor Pigou, having in mind, of course, the reverse connection, considers that "it is not in fact possible to demonstrate a close statistical correlation between the making of industrial inventions and *neighbouring* disturbances in general industrial activity." That may well prove to be true. I am myself much disposed after somewhat close and prolonged study to hope that the detailed records of patent applications available over a long period in this and other countries can be made to throw light on this and the other related questions. The returns are available separately for different

15. In the meantime certain conclusions may be hazarded concerning induced inventions; firstly, that every price change, by creating cost difficulties in certain fields and opportunities for profit-making in others, provides a double stimulus to invention, and secondly that the larger the price change the greater will be the stimulus to invent. Thirdly, during periods of disturbance of the general level of prices, a more general stimulus to inventions and to the exploitation of existing inventions may be expected, for we know that individual price relationships are disturbed whenever, for monetary reasons, the general price level shifts. Fourthly, any government measures designed especially to reward inventors, whether by subsidisation or by the patent system, i.e. the grant of monopoly rights over the utilisation of their inventions, may be expected, because of their influence upon price conditions, to affect the flow of inventions. It is with the patent system that we are here primarily concerned. Despite the publication of a large body of specialist literature, in the nineteenth century in particular, on the merits of patent systems, they have received scant attention by economists in the standard treatises.

16. The patent system may, on the one hand, be expected to affect the making of inventions in two ways. The first is to divert inventive activity into those fields in which the monopoly grant will be expected to prove most remunerative. It may, secondly, affect the total amount of inventive activity. The patent system may, on the other hand, exercise another effect of perhaps equal importance. It may influence the ability or willingness of entrepreneurs to make use of new inventions after they have been made.

17. It will be convenient to consider first the effect of the patent system on the amount of inventive activity. Considerable difference of opinion on this aspect of the question is revealed by the scant references made by economists who go out of their way to praise the patent system. On the one hand there is the view, perhaps best represented in our own time by categories of industry (in this country, for instance, over a long period, there are 146 categories), those concerning provisional applications provide excellent evidence of the date at which inventions are made, and the subsequent history of the patents can be used for a study of the timing of the actual exploitation. In particular instances, the influence of adversity as well as of prosperity within an industry upon the display of inventiveness can easily be traced beyond reasonable doubt. With due care it may be possible also to draw conclusions with regard to the relation between the display of inventiveness and industrial fluctuations in general. The work is progressing, but further discussion must be reserved for another occasion.

Professor J. B. Clark in his *Essentials of Economic Theory* (ch. xxi), that without the patent system there would be very little inventing, and very little adoption of inventions by producers, at all. "If an invention became public property the moment that it was made," he says, "there would be small profit accruing to any one from the use of it and smaller ones from making it. . . . The system which gave a man no control over the use of his inventions would result in a rivalry in waiting for others rather than an effort to distance others in originating improvements. This fact affords a justification for one variety of monopoly. . . . Patents stimulate improvement, and the general practice of the nations indicates their recognition of this fact." For the expression of a very different view we may turn to Professor F. W. Taussig (*Inventors and Money-Makers*), who throws doubt upon what he designates as the view of the older utilitarians, that "men contrived simply because this was conducive to gain, and would not contrive unless prompted by the experience and prospect of gain," and suggests instead that invention may arise mainly as a spontaneous manifestation of a human "instinct of contrivance." If this is so, "we may be led to conclude," he adds, although it is not his conclusion, "that the patent system, for example, is a huge mistake." Later, he observes that "the defenders of patent legislation often descant on the public benefit from inventions as if there were a special moral desert on the part of the projectors and patentees. They put their case badly. What deserves emphasis is the influence of calculated profit in directing the inventor's activity, spontaneous though it be, into channels of general usefulness." The patent system is commended because it directs rather than increases inventing activity. Professor Pigou puts the same view still more definitely (*Economics of Welfare*, 2nd edition, Part II, chapter viii): "The patent laws aim, in effect, at bringing marginal private net product and marginal social net product more closely together. By offering the prospect of reward for certain types of invention they do not, indeed, appreciably stimulate inventive activity, which is, for the most part, spontaneous, but they do direct it into channels of general usefulness." The only supporting evidence is a reference back to Professor Taussig.

18. The economists of the early nineteenth century who considered the question were as definite as Professor J. B. Clark that inventions would practically cease if the patent system were abandoned. Jeremy Bentham was in no doubt at

all (*Rationale of Reward*): "With respect to a great number of inventions in the arts, an exclusive privilege is absolutely necessary in order that what is sown may be reaped. . . . He who has no hope that he shall reap will not take the trouble to sow." John Stuart Mill's argument was similar. (*Principles of Political Economy*, Book V., ch. x, s. 4.) As Professor Taussig said, the utilitarians assumed that the patent system was responsible for the greater part of inventing activity. The question which they one and all failed to ask themselves, however, is what these people would otherwise be doing if the patent system were not diverting their attention by the offer of monopolistic profits to the task of inventing. By what system of economic calculus were they enabled to conclude so definitely that the gain of any inventions that they might make would not be offset by the loss of other output? By no stretch of the imagination can the inventing class be assumed to be otherwise unemployable. Other product which is foregone when scarce factors are diverted in this way completely escaped their attention.

In the view of Bentham, the patent system "produces an infinite effect, and it costs nothing." Jean Baptiste Say, although subsequently more critical, made a similar mistake in his *Traité* (Prinsep translation, Book I, ch. xvii): "Privileges of this kind no one can reasonably object to; for they neither interfere with, nor cramp any branch of industry, previously in operation." The withdrawal from them of scarce resources is ignored. To John Stuart Mill, again, the only public loss was merely the postponing of a part of the increased cheapness which the public owe to the inventor.

Manufacturers, although some of them were inventors themselves, who gave evidence advocating the abolition of the patent system before a Select Committee of the House of Lords in 1851, were no doubt enabled by self-interest to perceive the loss more clearly. I. K. Brunel, for instance, believed that because of the patent laws people spent their time trying to invent, who would do better for themselves at other things. In particular, he maintained that workers wasted their time and ruined themselves, trying to think out patentable inventions, when development would be much quicker if they were not thus distracted from making improvements and refinements of a non-patentable kind. In the 'sixties James Stirling, famous in another connection for his rebuke of John Stuart Mill at his capitulation to a sentimentally "soft school of

political economy," emphasised the dangers of an overstimulation of inventions by the patent system. Yet at the beginning of this century Professor J. B. Clark was still writing: "If the patented article is something which society without a patent system would not have secured at all—the inventor's monopoly hurts nobody. . . . His gains consist in something which no one loses, even while he enjoys them." No inkling here that the patent inducement to invent diverts scarce human effort from other production, and that the subsequent exploitation of patents again interferes with the disposition of scarce factors which would obtain under competitive conditions.

19. If the views of Professors Taussig and Pigou, that the *amount* of inventive activity is in the main unaffected by the inducement offered by patent monopolies, come to be substantiated, the traditional case for the system will have been destroyed without further need for criticism; but it would surely be unreasonable to accept their view without strong supporting evidence. It seems unquestionable not only that a very considerable volume of inventive activity must definitely be induced by price conditions, but also that that activity is diverted by price movements from other types of endeavour as well as from other fields of invention. Entrepreneurs faced with new difficulties or with new opportunities will divert not only their own attention, but that of every technician who can be spared, from the business of routine production to that of urgent innovation. They will not rely exclusively upon those types of professional inventors whose autonomous output pours out in a stream of unvarying size, and some of whom may be prepared, in return for the inducements which the entrepreneurs can offer, to transfer their spontaneous activity to their service. It cannot be assumed that all who are capable of innovation spend their whole lives in inventing. Many of them are also able administrators and production controllers; some in the past have been clergymen and barbers, and in our own time there is a steady flow of technicians from the research laboratories of pure science into those of industrial invention and out again. Price changes, particularly if prices appear likely to take a new "set," may therefore be expected to lead to an increase of invention and a decline in other activity.

The patent system makes possible this type of price movement. It enables those who have the monopoly of the right to use a patented invention to raise the price of using it for the whole term of the patent, within the limits fixed by the elas-

tivity of demand, and in that way to derive a larger profit from the invention than they could otherwise obtain. The effect must surely be to induce a considerable volume of activity to be diverted from other spheres to the attempt to make inventions of a patentable type.

20. It will be convenient at this stage to consider both kinds of diversion together, i.e. from other kinds of activity into invention, and from one kind of inventive activity to attempts to make such patentable inventions as will, in the expectation of the inventor or of those directing his efforts, produce the greatest possible remuneration under a régime of monopoly. It will be recollected that Professors Taussig and Pigou declare the merit of the patent system to be the inducement it offers for the production of inventions of greater "general usefulness" than would otherwise be made.

It will be clear first of all that there is one class of inventions, on the making of which the patent system can exert no effect at all, namely those arising spontaneously, whether by accident or as manifestations of an "instinct of contrivance," in persons whose inventing is uninfluenced by all economic stimulus. It is hardly likely that this class is very important in volume or in kind.

The making of all other categories of patentable inventions may, however, be induced by the patent system. It does not follow, of course, that they will necessarily all be made in response to this inducement, for in the absence of patents a sufficient price incentive might be present, in open market conditions, to direct inventive activity to the same field; but in so far as the inducement is furnished only by the expectation of a patent monopoly, a diversion of resources takes place and other production is foregone. What grounds are there for concluding that the output induced by this type of monopoly has any greater claim to be regarded as "generally useful" than that which would have been induced in its absence by the price conditions of the open market? I suggest that such a conclusion runs counter to all general presumptions concerning the disposition of scarce productive resources in a régime of monopolistic control as contrasted with open competition. The nearer that market conditions approximate to pure competition, the less likely does it become that any *entrepreneur* or property owner will find it possible to influence prices by withholding supplies, and the more likely in consequence does it become that all resources, being put to the uses which maximise

the incomes of their owners, will yield their greatest aggregate product. In perfect competition all production will take place at lowest cost per unit produced. How can it be argued that any departure from such a condition, induced by the grant of monopoly power to raise prices and increase a sectional income by restricting output, will achieve greater "general usefulness"?

The only conceivable line for such an argument to take would seem to be that *ultimately* the inventions of a patentable type which will be made in response to the grant of a temporary monopoly will possess a sufficiently greater general usefulness than would result from the other inventions or other output immediately foregone, to outweigh the immediate loss. There surely exists no scientific reason for making any such claim for *patentable* inventions in general, as compared with alternative output. It is conceivable that exceptional cases may arise, in which a new mechanism becomes socially desirable for a specific and very special purpose, and that prolonged research and experiment seem inevitable for its perfection, while no remuneration is likely to be forthcoming in the interim from models which are not wholly successful. In such cases, special inducements might be necessary to secure the end in view. Thus, for example, if a flying machine were needed capable of non-stop flights round the Equator, and machines with smaller ranges were of no utility, entrepreneurs might not be forthcoming and there might be a case for a special fund to finance the making of the invention. A patent system applicable to inventions in general clearly cannot be justified, however, by exceptional circumstances of this kind. Economics, in short, has not yet evolved any apparatus of analysis which would enable us to pronounce upon the relative productivity of this particular infant industry—the production of inventions; nor does it provide any criteria for the approval of this method of special encouragement.

21. The contention still remains for consideration that the patent system is necessary in order to secure the exploitation, if not the production of inventions. The main argument is that entrepreneurs will be reluctant to invest in plant which others may also acquire for purposes of competition. It need not detain us for long. It cannot be assumed that patentable inventions in general necessitate new investment in such large units that fears of duplication will provide a frequent deterrent to entrepreneurs. It is still exceptional for a single specialised productive unit to be sufficient to meet the bulk of the demand

for a product. Neither can it be assumed that inventors would cease to be employed if entrepreneurs lost the monopoly over the use of their inventions. Businesses employ them to-day for the production of non-patentable inventions, and they do not do so merely for the profit which priority secures. In active competition, the condition in which new devices are most promptly imitated, no business can afford to lag behind its competitors. The reputation of a firm depends upon its ability to keep ahead, to be first in the market with new improvements in its products and new reductions in their prices.

A hundred years ago it was also argued as a merit of the patent system that it provided an inducement to inventors to make public the nature of their inventions so that they would eventually be generally available for wider exploitation. When businesses were small, and processes might remain one-man or family affairs, secrecy and monopoly might indeed persist longer in open competition than under the patent system, just as it is reputed to do still within the Maskelyne family of conjurers. But the conditions of industrial production have changed in this respect. With large-scale manufacture, few valuable processes can now be conducted on so small a scale that prolonged secrecy is feasible. Possibly—it is a question requiring intimate technical experience—there may exist chemical processes in which the nature of the product defies analysis and reconstruction of the method of manufacture, and in which the nature and proportions of the ingredients can effectively be maintained as the secret of a few people; but such cases, if they indeed exist outside the pages of detective fiction and sensational literature, must surely be exceptional, and unlikely to be eradicated by the inducements of temporary patent protection.

22. If the theoretical basis of the patent system is indeed as uncertain as this analysis suggests, the actual provisions of patent legislation cannot but be arbitrary. It is impossible to share Jeremy Bentham's enthusiasm. To him "an exclusive privilege is of all rewards the best proportioned, the most natural, and the least burthensome." . . . "[A patent] unites every property which can be wished for in a reward. It is variable, equable, commensurable, characteristic, exemplary, frugal, promotive of perseverance, subservient to compensation, popular, and revocable." I propose to refer to a number of features of the patent system as it exists which are of particular relevance to the preceding discussion.

23. There is first the question of the types of innovation which are covered by the patent law. A very great deal of invention goes on outside its range, without any inducement beyond that provided by the operations of the open market. One need only point to the so-called fashion trades, in which the rate of invention reaches probably its highest point, and to the non-patentable refinements and improvements every day being added to all kinds of industrial product. In the last three hundred years there has been an enormous amount of litigation in this country concerning the nature of "a new manufacture." To the student of economics it makes instructive reading. "Biological inventions"—innovations in plant-breeding for the production of special types, for instance, which are of undoubted economic significance in the agricultural and pastoral industries—are excluded. They may be freely adopted by competitors. Yet they continue to be made. Medical practitioners, partly no doubt on account of traditional altruism and partly as the result of the lead, if not the drive, of their professional associations, make very little use of the patent laws; and yet the work of medical invention goes on. The whole field of scientific discovery lies outside the scope of the system, although inventors and manufacturers may owe the fortunes they have made from patented products in the main to the workers in pure science whose discoveries they have applied. The task of distinguishing a scientific discovery from its practical application, which may be patentable—as for example in the field of wireless—is often baffling to the most subtle lawyer. Associations of interested and discontented scientists do not fail to press their claims for inclusion. There are the notorious Ruffini proposals, for instance, for the grant of monopolies to scientists covering their published discoveries. Similarly, in the field of minor industrial inventions, there is strong pressure for an extension of the patent system, to supplement the registration of designs by a short-period patent protection of particular arrangements of mechanism, on the lines of the German Gebrauchsmuster. How can it be shown that the "patentable" class of innovations possesses so much greater usefulness than all these others that it should be specially encouraged by monopoly?

24. Secondly, there is the system of reward itself. It operates in favour of only one or one group of the many participants in the progress of an invention from the birth of the scientific discovery to the emergence of the patent monopoly. The

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scientific discovery itself may be the culmination of the research and of the tentative hypotheses of many scientific workers: the possibility of applying it in a particular device may occur almost simultaneously to large numbers of industrial technicians; priority in the formulation of the provisional patent application may be a matter of days or of minutes. But one application alone can satisfy the requirement of this man-made law that the patent shall be granted to "the first inventor," who receives a monopoly of the use of it for sixteen years, in this country, with the possibility of an extension for another ten. The grant of a monopoly renders almost nugatory the labours of all the rest, for any refinements they may subsequently invent in this type of device will, if patented, be much reduced in value by the requirement that acknowledgment shall be made, in the patent specification, of the prior "invention." Lotteries in open competition there may well be; but the lottery of the patent system awards but one prize, and that a monopoly, while those who subscribe most of its value may be precluded from qualifying for the prize.

The existence of a monopoly in fact operates to divert the attention of inventors from what may well be the most fruitful field for further innovation. In the case of inventions which cannot be patented, a particularly useful device at once attracts the attention of other specialists who seek, maybe competitively, to refine and improve it and to adapt it to the widest possible use. The blocking effects of patent monopolies check these surely beneficial tendencies; competitors, instead of helping to improve the best, are compelled in self-preservation to apply themselves to the devising of alternatives which, though possibly inferior, will circumvent the patent. It is a particular case, but one which is very widespread, of the maldistribution of resources which is consequent upon the existence of monopoly.

The term of the patent grant must inevitably be arbitrarily determined, even if each invention were separately considered. A fixed period of years for all and sundry expediently avoids countless difficulties, the range of which may be gauged from the efforts of the courts to determine, in the case of applications for extensions, the "nature and merits" of an invention; in order to decide whether the patentee has been "inadequately remunerated" and the period, if any, for which an extension shall be granted. Economists will well appreciate why the Royal Commission of 1862, which included Lord Overstone,

was strongly opposed to any extensions whatever. Yet if there were a parallel provision, that any person interested might apply at any time during the life of a patent for its revocation on the grounds that the patentee was already more than adequately remunerated, some interesting legislation would certainly ensue, and the decisions of the Courts, however lacking in principle, might well be preferable to the existing fixed minimum term.

25. Special interest attaches to the provisions which have been gradually inserted in the patent laws during the past hundred years with the object of mitigating "abuses" of the system, meaning thereby such use of the monopoly power as appeared obviously in conflict with the general interest. From the 1840's, side by side with the movement for the simplification of the patent law, there continued for a generation a strong agitation for the abolition of the whole system. It had the support of *The Times* and of *The Economist*. The strong Royal Commission of 1862-4, though precluded by its terms of reference from doing more than recommend amendments, was clearly opposed to the whole system. Professor Thorold Rogers read two papers against both patents and copyrights before the British Association in 1864 and 1865; while Members of Parliament and manufacturers carried on a continuous propaganda. The movement was not confined to England; in the late 'sixties a number of economists in France, including M. T. N. Benard and Michel Chevalier, wrote against patents; in Germany, Bismarck attacked the system in 1868 in the North German Federal Parliament; in Holland, the patent law was repealed in 1869. In England, however, the Act of 1852 gave such an impetus to the patenting of inventions that in the 'seventies the attempt at abolition was gradually abandoned in favour of the more easily practicable policy of mitigating its most obvious evils. The official examiner system of search for anticipations of new claims was introduced and gradually extended; the cost of securing patents was reduced, for the benefit of poor inventors, and payments reduced in the early years so that inventors should not be compelled to allow their protection to lapse before they had had a reasonable time in which to arrange for the exploitation of their invention. International conventions were arranged to secure more reciprocity in the treatment of foreign inventions, and to reduce in that way the competition to which manufacturers under licence were otherwise liable from foreign producers

outside the jurisdiction of the laws of this country. I propose in the remainder of this paper to confine myself to two only of the modifications which have been introduced into the patent legislation of this country, viz. the sections governing the grant of "compulsory licences" and the more recently introduced "licences of right."

26. Provision has been made for fifty years now for the grant of compulsory licences in the event of certain allegations, which could be made by any person interested, being found by the competent tribunal to be true. From the first, one of the grounds has been that the patent is not being worked in the United Kingdom, and that satisfactory explanations of the failure to do so are not forthcoming. This manifestation of protection is of interest, particularly in relation to the question of the effect of such provisions on the amount of output which the patentee will find it profitable to produce, but it need not detain us here. Another ground has from the first been that the demand for the patented article in the United Kingdom is not being met to an adequate extent and on reasonable terms. The Board of Trade originally, then subsequently the Judicial Committee of the Privy Council, and now the Comptroller of the Patent Office (subject to appeal to the Courts) have in consequence had thrown upon them the duty of deciding, in cases in which the law confers a monopoly upon an inventor in order that by restricting the use of his invention he may derive an income, whether the output is "adequate" and the terms "reasonable." The competitive output being ruled out, what monopoly output and price can be more "reasonable" than that which pays the monopolist best? The handling of this problem by the appointed tribunals once more makes instructive reading for the student of economics: but the responsibility of the tribunal does not rest there. It is called upon, in addition, to settle the terms upon which compulsory licences are granted. The Royal Commission of 1862 had recommended against compulsory licences precisely because it regarded the practical difficulties of fixing the proper terms as insuperable. "On this question of price" they urged "individual opinions must be expected to vary widely." Arbitration would not be satisfactory "where neither precedent nor custom, nor fixed rule of any kind could be appealed to on either side." The Patents and Designs Acts to-day make an amusing endeavour to help out the unfortunate assessor by directing his attention to certain

guiding considerations. The first two are worthy of notice here:

[Patents and Designs Act, 1907 (as amended)
Section 24—(1) (b)]

- “(i) he shall, on the one hand, endeavour to secure the widest possible user of the invention in the United Kingdom consistent with the patentee deriving a reasonable advantage from his patent rights;
- “(ii) he shall, on the other hand, endeavour to secure to the patentee the maximum advantage consistent with the invention being worked by the licensee at a reasonable profit in the United Kingdom.”

Possibly those responsible for this formula might be satisfied if the assessor contrived to induce both the full competitive output and the maximum monopoly profit at the same time.

It is enlightening to examine the extent to which since 1919 the Comptroller has attempted to interpret these instructions. By the end of 1931, out of less than fifty applications, many of which were subsequently withdrawn, nine grants were actually made. Three were however discharged on appeal, and in the case of the remaining six it appears that it was not necessary for the Comptroller to fix terms.

The same duty of fixing terms, failing agreement between the parties, falls upon the Comptroller in the case of Licences of Right. In the same period, 7,533 patents were endorsed, but in only seventeen cases was an application made for the settlement of terms. At the end of 1931, three of these applications had been withdrawn, one was suspended by request of the parties, and thirteen were still pending. In no case, therefore, had the Comptroller been persuaded to attempt the feat of following the instructions of the Act.

27. Licences of Right furnish us with an economic curiosity. The 1919 Act, presumably with the object of inducing monopolist patentees not to restrict so narrowly the supply of the invention during the life of the patent, offers the remission of half the fees subsequently payable to all patentees who request that their patent be endorsed “Licences of Right,” the effect being that any person may thereafter be entitled as of right to a licence to use the invention upon terms to be agreed or settled by the Comptroller. The large number of endorsements—7,533 to the end of 1931—is striking, although of course a small percentage of the total number of patents in force during

the period (about 20,000 new complete specifications being added each year). The fact that in all cases the licence fee has been fixed by agreement without recourse to arbitration by the Comptroller would suggest that the patentee secures a royalty not far different from that which he believes will adjust the total output to the amount which maximises his monopoly profit.

If we were to make the assumption that the adjustment of volume of output to given price conditions takes place promptly, and that different firms have broadly the same production costs, the position would then be that the volume of output would remain more or less the same as that which would emerge under the ordinary patent system, while the patent office would have forfeited half its revenue to little good purpose, so far as the general public is concerned. We cannot, however, assume either that production costs of different firms are identical, or that a sole licensee will rapidly expand his output and sales to the point of maximum net revenue. It therefore appears very probable that the Licence of Right system, by enabling any producer to try his hand at producing the patented article, facilitates the operation of competitive forces in concentrating output in the firms which have lowest costs, and encourages the rapid spreading of production over a number of producers, so that the aggregate output is in fact increased more rapidly to the point of maximum monopoly profit (if the patentee fixes his terms to his best advantage) than would otherwise be likely (if it does not in fact exceed that amount for a time, to the loss of certain licensees). This device almost certainly serves to increase output, for without it the monopolist would probably not as rapidly decide to grant as many licences to the producers whose costs are lowest.

Without, therefore, injuring the monopolist's interest, so long as licence terms continue to remain at the point he himself selects, the licence of right system tends to correct one of the *practical* objections to the patent system, i.e. the slowness of the expansion of the output of patented articles. If, therefore, it could be reasonably assumed that the Comptroller would continue successfully to evade the alarming task of fixing terms, there would be much to be said in favour of modifying the patent system so that licences of right became the normal practice. In the case of copyright, in which the device was first applied, the problem of terms could be settled—if crudely—by fixing a royalty of so much per cent. of the price of the book

or gramophone record or piano-roll as the case might be. So simple a solution is hardly applicable to inventions, and if disputes between patentees and licensees became frequent some other rough-and-ready rule would need to be devised.

28. Expedients such as licences of right, nevertheless, cannot repair the lack of theoretical principle behind the whole patent system. They can only serve to confine the evils of monopoly within the limits contemplated by the legislators; and, as I have endeavoured to show, the science of economics as it stands to-day furnishes no basis of justification for this enormous experiment in the encouragement of a particular activity by enabling monopolistic price control.

There is to-day widespread alarm at that increasingly rapid rate of obsolescence of industrial equipment, which is the reverse aspect of the quickening of technical progress. Everywhere we encounter the protests of owners of specialised plant and of specialised workers at the changes which convert property and specialised skill into "surplus capacity." In so far as the new enterprises compete for their resources, capital and labour, in open competition with existing businesses, economists have strong grounds for the presumption that the gains from their success will outweigh the losses. If, however, innovation is especially encouraged, to the loss of other production, by monopoly price conditions, is it not conceivable that there may be relatively "too much invention of the wrong kind," and, in consequence, "too much" obsolescence and displacement of specialised ability? Can it be that the patent system is in part responsible for our present economic troubles?