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6.931 Development of Inventions and Creative Ideas  
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## CHAPTER 5

### THE RIGHTS, OBLIGATIONS, AND PROBLEMS OF INVENTORS (EMPLOYEE-EMPLOYER RELATIONS)

Strongly threaded through the fabric of the invention-innovation cycle is the interplay between inventor and employer and between inventor and potential user or licensee. These relationships, including typical industrial, university, and governmental contract provisions, are herein set forth. Because the appropriation of inventions is a difficult matter to prove – though it happens every day – reference is made to one of the very rare proven instances, one that took several decades to resolve – the pioneer piezoelectric circuit inventions. This may aid in forewarning the inventor of the pitfalls in his path and in encouraging business and government to recognize rather than to circumvent or try to destroy the proprietary position of independent inventors.

In this era of conformity and considerable abdication of the right to negotiate employment terms and conditions, engineers and applied scientists appear to know little about their obligations to employers or to the firms who hire them as consultants, especially in the matter of inventions and patents. It may be in order, therefore, first to deal briefly with some general principles of law, and then to examine the policies of some of our leading institutions, industrial, educational, and governmental, as well as specific current contract provisions.

Whether an agreement between an employer and an employee relating to the disposition of patents and inventions is oral or in writing does not matter. Long ago, in England, a so-called Statute of Frauds<sup>1</sup> was enacted for the purpose of preventing litigation in cases almost impossible to resolve, involving certain kinds of oral contracts. The plaintiff would allege the terms of an oral agreement, and the defendant would deny those terms. There was no written evidence to prove the contentions of either side. How could the court resolve the dispute? The Statute of Frauds, therefore, made certain kinds of contracts unenforceable, unless in writing. American law has adopted this Statute of Frauds, but an

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<sup>1</sup>29 Chas. II.

oral agreement in which an employee undertakes to assign his invention to his employer is not included in the oral agreements that the courts will refuse to enforce under the Statute. They will enforce it if it can be proved to exist <sup>2</sup>.

While an actual assignment of a patent must conform to a specific statutory provision that requires a writing, the understanding between employer and employee as to who is to own the invention or patent may be oral. Now, how do you prove the oral agreement? One way is to examine the relation between and the conduct of the parties, which may cast light upon the rights of the several parties. The mere relation of employer and employee does not, of itself, mean that the employee is obligated to assign his invention to the employer.

As an illustration, if one is employed by a corporation as a sales engineer or as a secretary, and makes inventions extremely useful to the employer, including, even, improvements upon the employer's products, those inventions are the employee's property, in the absence of an understanding to the contrary. And it makes no difference what kind of employer is involved. The employer may be a corporation, an individual, a university, or the United States Government. The last situation was decided by the Supreme Court <sup>3</sup>:

An employee, performing all the duties assigned to him in his department of service, may exercise his inventive faculties in any direction he chooses, with the assurance that whatever invention he may thus conceive and perfect is his individual property.

Why is this so? Perhaps the best answer is another illustration. Let us suppose that a man is employed as a mill carpenter. He receives his salary in return for performing duties as a carpenter. It so happens, however, that he is observant and thoughtful, and one day has an inspiration as to how to make a new type of floor rack, which could well be used even in his employer's business. Should this invention belong to the employer for either legal or moral reasons? Certainly the employer did not include inventing as one of the carpenter's duties, and he certainly had not paid the carpenter for using his inventive abilities. Now this is the test. Was the employee being paid for the purpose of making inventions? Were his duties merely those of carpenter or was he employed specifically to make inventions?

In just such a case the court held:

It is true that at the time he made and disclosed the invention to the defendant, ... [he] was one of its employees. His work, however, was that of mill carpenter. It had nothing whatever to do with floor racks or floor rack hinges. In no sense can it be said that his invention was made in the course of his employment <sup>4</sup>.

If the understanding is that an employee is a sales engineer, a secretary, a director, and that he is employed to perform the customary duties of such

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<sup>2</sup> *Dalzell v. Dueber Manf. Co.*, 149 U.S. 315, 320.

<sup>3</sup> *Solomons v. U.S.*, 137 U.S. 342.

<sup>4</sup> *Massie v. Fruit Growers Express Co.*, 31 F. 2d 463, 466.

employment, this is not an understanding that the employee is expected to invent. In the absence of further rights defined by contract between the parties, anything such an employee may invent is his own property, no matter how he was stimulated to make the invention. This is the general rule of law.

It has previously been pointed out that sometimes government officials in the United States think they should have special rights that others do not have. This kind of tactic has been rejected by prior Supreme Courts <sup>5</sup>:

The government has no more power to appropriate a man's property invested in a patent than it has to take his property invested in real estate; nor does the mere fact that an inventor is at the time of his invention in the employ of the government transfer to it any title to, or interest in it.

This is important, because we shall see very shortly what the government short-sightedly demands today by way of special contract, both from direct employees and from people working under contract for the government.

Now, let us consider a slightly different situation. Let us suppose another case of an individual who is not employed for the purpose of inventing, but who does, nevertheless, make an invention. Assume, also, that he uses his employer's facilities and the services of other fellow employees to perfect this invention. Is it still the inventor's property? Yes – but this time the employer is contributing something to further the invention. Under such circumstances, a so-called “shop right” for the employer is created: the employer acquires a nonexclusive, royalty-free, irrevocable, personal license to use the invention himself. He cannot give this license to anyone else; it is personal with him, and he may use the invention royalty-free. The invention, however, still belongs to the employee.

Consider now a situation involving an employee of the United States Government. The employee is a naval officer, and his duties involve devising plans to protect the Philippines. If he finds a method and apparatus for adapting torpedoes to airplanes, the question arises whether his assigned duties implied making inventions such as this. If it does, the invention belongs to the government. At the very least, however, these facts

establish an irrevocable license in the government to the use of plaintiff's invention and patent <sup>6</sup>.

In another case <sup>7</sup>, an industrial chemist employed by the Public Health Service was relieved of his duties so that he might try to solve a particular problem at the Edgewood Arsenal; but he was still paid his regular salary. This is not the case of an invention made by an employee whose duties of employment do not contemplate conceiving and perfecting an invention. In such a case, the court reiterated, “the rule is that the invention is the property of the employee.” Nor is this a case where the only claim of the employer arises out of the fact

<sup>5</sup>See above, fn. 3.

<sup>6</sup>*Moffett v. Riske*, 51 F. 2d 868, 870.

<sup>7</sup>*Houghton v. U.S.*, 23 F. 2d 386.

that the employee used the property of his employer and the services of other employees to develop his invention, and has assented to the employer's use of the latter. Here, the court again reiterated, "the invention is the property of the employee, subject to an irrevocable license on the part of the employer to use it"; that is, a "shop right."

The case presented here is rather that of an employee who makes an invention while employed to conduct experiments for the purpose of making it. The court drew no distinction between work for the Public Health Service and that performed at the Edgewood Arsenal and paid for by the government. Thus, concluded the court,

he did merely that which he was being paid his salary to do. Under such circumstances, we think there can be no doubt that his invention is the property of his employer, the United States.

It is interesting to contrast this case with that involving two engineer employees of the Radio Section of the Bureau of Standards<sup>8</sup>. These men were assigned to various radio-research projects for the government. They conceived an idea in the very same radio field that was of use in commercial equipment, namely of constructing a power pack for operating from the mains to supply plate voltage for radio receivers without resort to B-batteries. They obtained patents for this invention and granted an exclusive license thereunder to the Dubilier Condenser Corporation, but reserving to the government a nonexclusive license, because of their use of government facilities for perfecting this invention. The government, believing that it was entitled to complete ownership of the patents, not just a nonexclusive free license, brought suit to obtain a court decree to such effect. As the court explained:

The United States is not content with such licenses and seeks in these three suits ... to obtain a decree compelling the defendant's right, title, and interest in the patents.

The test applied by the court was whether or not the inventions arose as a result of the employment of the engineers to solve certain problems for the government. The court concluded that their superior had given no specific instruction to engage in any research problem involving the inventions in controversy. That is the important point. While the engineers were instructed, as part of their employment, to engage in certain research projects and problems in the radio field, these had nothing to do with eliminating batteries in radios. The court found, accordingly, that

the most that can be said is that Lowell and Dunmore were permitted by Dr. Dellinger, after the inventions had been brought to his attention, to pursue their work in the laboratory and perfect the inventions which had theretofore been made by them.

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<sup>8</sup> *U.S. v. Dubilier Condenser Corp.*, 49 F. 2d 306.

The court refused to hold that all patents of research workers in the Radio Section of the Bureau of Standards belong to the United States, unless there was a special agreement. Only those patents dealing with inventions made within the specific scope of the employment would become government property.

### 5.1 University and Government Relations

In the light of these principles of law, it is in order to examine the manner in which various educational and business entities contract with their employees. Consider first Harvard University. Harvard has adopted the attitude, fully consistent with the general law, that a student or a professor is not employed nor given facilities for the purpose of inventing, and so any inventions that he may make become his own property, which he may do with as he desires. There is, however, one exception adopted under President Lowell's time under the impetus of a certain unpleasantness in connection with the respirator invention of Dr. Philip Drinker. No member of the university may now take out a patent that is concerned primarily with the field of public health or therapeutics without the consent of the President and Fellows of Harvard College (the legal name of the governing body of the university). While embarrassment may be created in other fields, apparently nothing is quite so touchy, from the public relations angle, as public health.

In connection with government contracts, however, Harvard's policy is considerably modified. The United States Government requires in its contracts with Harvard that the latter assume certain obligations, among them that its staff and other people working at Harvard under government contracts shall grant the government certain rights. The general Harvard-employee agreement, in connection with work under a government contract, commences as follows:

In order to enable Harvard University to fulfill its obligation under Contract between the President and Fellows of Harvard College and the United States Government and as a condition of my employment.

...

Then comes a term used over and over again in government contracts – “subject invention.” Most government departments require that if, during the performance of a contract, an employee under the contract conceives an invention for the first time, or first actually reduces it to practice by constructing and operating it successfully under the contract, the government shall have a free right to practice that invention and to have the invention made for it by other people. Hence, in this employee agreement, a so-called “subject invention” is defined in the following terms:

Any invention, improvement, or discovery (whether or not patentable) conceived or first actually reduced to practice by me ... either (A) in the performance of work called for or required under said contract, or (B) in the performance of ... work ... which was done upon an understanding in writing that a contract would be awarded.

In connection with such invention, the employee agrees and thereby grants

to the United States Government irrevocable, nonexclusive, non-transferable and royalty-free license to practice, and cause to be practiced by or for the Government throughout the world, each "Subject Invention."

The employee also agrees to disclose the invention promptly to his contracting officer. Under this particular contract, the employee has an option<sup>9</sup> either to file the patent application himself or to give the government the opportunity to do so. The employee may thus have the commercial nongovernmental rights to his invention if he exercises the first option.

It will be recalled that certain bars to obtaining a patent reside in the publication of the invention, or public use or sale in this country of the invention, more than a year before the application is filed. Under this government contract, therefore, the employee agrees to notify the project director, not later than eight months after any such publication, public use, or sale of his invention, that he does not intend to file an application. The government will then have four months in which to file an application, if so minded. Furthermore the government demands the right to reproduce copyrightable material, data, plans, specifications, without any interference whatsoever; and such rights are granted together with the patent licenses under these contracts. A similar agreement is executed by the project director himself, the terms of the employee agreement being directly incorporated by reference into his own.

Now let us turn to the Massachusetts Institute of Technology. The Institute has a little different philosophy. It concurs with Harvard only to the extent that inventions or developments made by the staff members, and not related to any Institute program of research with which the members may be concerned and to which the Institute does not contribute any funds,

shall be the exclusive property of the individual producing the invention or development. The Institute will not construe the payment of salary or the provision of normal academic environment as constituting grounds for equity by the Institute in such invention.

Formerly, if a staff member or student made an invention in which the Institute had an equity, patent applications were usually filed through the Research Corporation of New York City, a nonprofit organization that endeavors to promote inventions in order to obtain funds for further research. Net income from the inventions, after expenses, was divided equally between the Research Corporation and the Institute, the latter employing such receipts to further its own educational and research policies. The inventor normally received 12 per cent of the gross royalties that the Research Corporation negotiated under the invention.

At present, arrangements with the Research Corporation have been terminated, and it remains to be seen what new policies will be adopted. The actual

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<sup>9</sup>Army, Navy, and Air Force contracts.

paucity of patents stemming from the millions of dollars spent in research at M.I.T. should cause consideration over the kind of policy that will stimulate the staff to carry new discoveries and techniques to the patentable invention stage. As at Harvard, the Institute staff must execute the previously discussed invention and copyright agreements, in connection with government contracts.

A little different situation arises in connection with contracts with the Atomic Energy Commission. It will be recalled that the law prohibits the granting of patents in the field of atomic energy when those patents relate primarily to the production of fissionable material, processes, or instrumentalities used in the production of such material, or in weapons themselves. Consequently, the AEC takes a somewhat stronger position and declines to let the inventor himself file for a patent. Instead, it claims the right to decide who shall own the invention. Under an AEC patent clause, therefore, the following provision is set forth:

Whenever any such invention or discovery results from such work paid for in whole or in part from Commission funds ... the Commission shall have the sole power to determine whether or not and where a patent application shall be filed.

Even if the contractor spends his own money under an AEC contract to make an invention, the AEC demands certain rights. Under those circumstances, the Commission

shall retain at least a nonexclusive, irrevocable, royalty-free license under said invention, discovery, application for patent.

Under the National Aeronautics and Space Act of 1958, the administrator, through appropriate determinations and unless he waives the government's rights, is empowered to claim for the United States the *exclusive right* to invention under this program. If these restrictions remain, only history can record whether American industry and the American inventor will be actually stimulated and challenged by these provisions, or by the system of monetary awards for significant scientific or technical contributions to aeronautical and space activities, that Section 306 of the Act empowers the administrator to grant. Recent congressional hearings have not, in my view, resulted in any real change of attitude.

## 5.2 Summary of Current Governmental Agency Regulations Concerning Patents

The Department of Defense, as provided by Section IX of the Armed Services Procurement Regulations, acquires a royalty-free, nonexclusive license to make and have any inventions arising under its research and development contracts, and acquires no license or other patent rights on contracts involving the delivery of supplies or products. Similar policies govern contracts of the Veterans' Administration, the Post Office Department (which agrees not to use its license to compete with the contractor or its commercial licensees), and the General Services Administration. Under the Research and Marketing Act, the Department

of Agriculture requires that inventions resulting from its research and development contracts be either dedicated to the public or assigned to the government for the issuance of royalty-free, nonexclusive licenses to qualified parties.

The Department of Health, Education and Welfare reserves the right of the government to determine the ownership and the disposition of inventions flowing from its research and development contracts. In the case of industrial research contracts in the field of cancer chemotherapy, on the other hand, the right to patent may be left with the contractor, but with that right vested in the Surgeon General to protect the public interest, as, for example, by assuring royalty-free, nonexclusive licenses to own the public. Nonprofit institutional contractors may also own patents on inventions arising under a research and development contract, subject to stipulations necessary to protect the public interest.

While the Department of the Interior has a present policy of attempting to have patents assigned to the government, it will, in the case of recalcitrant contractors, accept a royalty free, irrevocable, nonexclusive license. The Department of Commerce also follows a flexible course as to whether the government is to own patents or obtain a royalty-free nonexclusive license. In the case of Maritime Administration research and development contracts, the same provision is applied to marine research, but the patent provisions of the Atomic Energy Act of 1946, as amended, are employed where nuclear material or atomic energy is involved. That Act, under which the Atomic Energy Commission also operates, requires the retention by the government of the sole power to determine and dispose of patent rights.

The National Aeronautics and Space Act of 1958, previously alluded to, was modeled after the Atomic Energy Act of 1946, as amended, and requires even more broadly that the Administration itself shall be deemed to have made or conceived any invention or discovery “made or conceived under any contract, subcontract, arrangement, or other relationship with the Administrator, regardless of whether the contract or arrangement involved the expenditure of funds by the Administrator.”

Merely discussing an idea with the Administrator would, if this Space Act provision is literally interpreted, be a “relationship” or “arrangement” that would vest all rights in the government. It is small wonder that many representatives of American industry, science, and law have protested this wording of the statute<sup>10</sup>, and that proposed revisions are under consideration. Indeed, the principal finding of a recent thorough two-year study by the Denver Research Institute is that only negligible commercial inventions have spun off from the multi-million-dollar NASA research programs: about six patent applications filed each year of the life of NASA for developments from NASA-funded contracts. How long does government have to wait to learn that few companies with real competence and backbone will produce under this kind of so-called stimulus?

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<sup>10</sup> “Property Rights and Inventions made under Federal Space Research Contracts,” Hearings before the House Subcommittee on Patents and Scientific Inventions of the Committee on Science and Astronautics, 85th Congress, 1st Session (1959).

An analogy to Soviet philosophy is striking evident, as discussed in a Congressional report on proposed revisions <sup>11</sup>:

Contrasts were drawn between the American patent system and its operation, on the one hand, and the Soviet patent system and its method of operation, on the other. The argument goes about as follows: Whereas the American patent system depends upon free and open competition for commercial markets, the Soviet system depends upon a determination by the Government as to the economic or commercial necessity of producing an article as a basis for its industrial operation. There is some similarity between the so-called patents of the Soviet system and the wording of sections 305 and 306 of the National Aeronautics and Space Act of 1958 (which are substantially the same as patent and compensation or award provisions of the Atomic Energy Act). The Government ownership provisions of the NASA and AEC statutes, if carried out literally, would correspond to the "public patents" provision of the Soviet system in that there can be no private commercialization of the inventions with Government approval. The "compensation or award" provisions of the NASA and AEC statutes correspond to the "private patent" provisions of the Russian system in that the inventor will not be rewarded unless the Government allows commercialization or use of the invention in the interest of the public.

### 5.3 Industrial Employment Agreements

Let us now turn to industrial organizations. Two typical illustrations of employer-employee contracts are provided by the General Electric Company and the Radio Corporation of America. The General Electric Company does not treat inventing engineers as a class separate from other employees. It provides a sweeping provision "in consideration of my employment *in any capacity*" If one wants the position, therefore, he agrees that "all inventions made or conceived by me . . . from the time of entering the Company's employ until I leave" will be the sole and exclusive property of General Electric. There is a qualification, however. Only two fields of invention are so included, namely inventions which are along the "lines of business, work or investigations of the Company . . . or which result from or are suggested by any work which I may do for or on behalf of the Company." The employee then agrees to assist GE in obtaining the patent and to keep adequate written records of the invention, the records to remain the property of the company.

Another important clause covers matters with which a company, as distinguished from a university, is vitally concerned. Some things, as I have previously noted, are not susceptible of patent protection, or there is no purpose in patenting them. Know-how and trade secrets are in this category. The general rule

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<sup>11</sup> "Proposed Revisions to the Patent Section, National Aeronautics and Space Act of 1958," march 8, 1960 (Mimeo).

is that a confidential relationship exists between employer and employee, and that the employee is not free to disclose trade secrets, even after leaving the employer.

In an interesting recent case, for example, the makers of Rise instant shaving cream, the Carter Company, sued the Colgate Company for patent infringement and for unfair competition in hiring one of the key employees (the inventor) away from the Carter Company and using the trade secrets that the employee had acquired<sup>12</sup>. The court not only sustained the patent, but also awarded attorney's fees and costs because of the wanton character of Colgate's action in hiring away an employee and using trade secrets that he had obtained in his prior employment.

In order to have this protection in writing, and not be compelled to rely on the general rule alone, however, the General Electric Company employment agreement states that, as a condition of employment, the employee agrees "not to disclose at any time either during or subsequent to my employment, any information, knowledge or data of the Company . . . relating to formulas, business processes, methods, machines, manufactures, compositions, inventions, discoveries or otherwise, which is of a secret or confidential nature<sup>13</sup>."

In the second example, the corresponding employment agreement of the Radio Corporation of America does not apply to all employees. The patent agreement is restricted to employment in a capacity where the employee is "reasonably expected to make new contributions and inventions." So if one is employed as a janitor or a secretary at RCA, he still has the common-law right to inventions, even if stimulated by what he has seen in the RCA laboratory. The employee who is expected to invent agrees to assign all inventions, made during employment, that relate to the business or interests of the company, or that result from tasks assigned by the company. In order to safeguard its obligations under government contracts, however, RCA requires that even if it employs a person in an occupation where he is not expected to invent, and where there is normally no obligation to assign inventions, RCA obtains rights under two exceptions; if the employment is under a government contract, and if the work is intended to lead to the granting of a government contract. The RCA agreement, like that of other companies, excludes all inventions made prior to employment with the company.

A few words now about the way in which the employer compensates the inventor for his inventions. Recently a very liberal policy was reported to have been adopted by a relatively small company<sup>14</sup>, that not only pays a token sum of \$25 when patent application is filed and another \$50 when the patent is granted, but also agrees to pay to the employee, as a stimulus to invention, royalties starting with 10 per cent of the net cash royalties that may come from licensing others. Most companies, of course, have no such policy. GE pays a bonus of \$100, partly in cash and partly in company stock, upon the filing of the

<sup>12</sup>*Carter v. Colgate Palmolive Company*, 230 F. 2d 855.

<sup>13</sup>The terms "confidential" and "secret" are used in the ordinary sense and not in the government security sense.

<sup>14</sup>*Electronic Manufacturing* (a monthly newssheet), Oct., 1957, p. 115.

application. RCA also pays \$100 upon the filing of the application. This is based upon the belief that it is frequently impossible to determine what important contributions may have been made to the development by employees other than those whom the law identifies as “inventors.” To attempt to approximate an evaluation for “inventions” only and to make individual payments based on such evaluations to “inventors” could, it is stated, result in inequities and could hamper team play, a result which, in turn, would slow down progress. Instead, reward comes at GE by promotion in position and salary.

Another interesting topic is the situation when engineers and applied scientists approach outside companies, asking them to consider ideas and inventions with a possible view to negotiating a license agreement. Two illustrations will suffice to show the reason for the present attitude of the large companies.

An individual suggested an advertising idea to the manufacturer of Chesterfield cigarettes, indicating that he expected reasonable compensation if the company used it. The company never replied, but several years later its advertising agency, which purportedly had never seen the submitter’s idea, hit upon a very similar proposal. The company adopted this proposal and was thereupon sued by the original submitter for misappropriation of his idea. A sizable jury verdict for the plaintiff was sustained by the Supreme Court of Indiana.

The second case is that of a manufacturer of three-way light bulbs. In order to avoid adverse publicity, and because it was difficult to prove independent conception, it settled a suit out of court for a reported \$150,000 with a stranger to it, but who had some years earlier voluntarily sent it a similar idea.

In order to protect themselves, therefore, many companies will absolutely refuse to receive any disclosures from outsiders, unless the disclosure is covered by a filed patent application, or unless the submitter agrees that there is no confidential relation involved in the disclosure and that he will rely upon his patent rights alone. Only under these conditions will these companies receive for examination an outsider’s invention.

#### 5.4 The Problems and Dangers in Negotiation – One of the Rare Proven Cases

The dangers inherent in making such disclosure need examination, however, as well as the shameful record of certain large companies in dealing improperly with eminent men of science and of the engineering profession, in order that the risks involved may be understood.

Professor Frederick V. Hunt describes some of these risks in resume form<sup>15</sup>. His account, which constitutes an important part of the history of radio, will now be supplemented by additional information relating to past experiences in connection with inventions submitted to the Western Electric Company and to the International Telephone and Telegraph Company. These are among the very, very few instances where such conduct was actually exposed; and even here it took several decades to prove.

We shall begin with the piezoelectric crystal and circuit inventions of Professor Walter G. Cady, formerly of Wesleyan University. Dr. Cady’s name is

<sup>15</sup>Frederick V. Hunt, *Electroacoustics*, pp. 23 - 25.

extremely well known in the electronics field as one of the pioneers in stabilizing electric oscillations with the aid of quartz crystals. During World War I, he was one of a number of American scientists engaged in trying to solve the submarine problem. He heard about the work of Professor Paul Langevin, in France, who had found that he could employ Curie's discovery of piezoelectricity for submarine detection: if sound energy from a submarine strikes a quartz plate, the piezoelectric effect will produce a small voltage that can be detected. Conversely, if an alternating voltage is applied to the crystal, the crystal will be forced to vibrate and to transmit sound into the water. This was the kind of apparatus with which Cady and a number of others were concerned at New London.

After the war, Cady continued his investigations with these quartz devices and made several inventions which were lumped together into two patents<sup>16</sup>. When it was appreciated that more than one invention actually was involved in each of these patents, applications for so-called "reissue patents" were filed.

A reissue patent may be granted under the following circumstances. If one has, through inadvertence, made a mistake in his patent, or has failed to appreciate or understand the true scope of the invention, he may in certain instances refile that patent. This does not result in extending the patent "monopoly" since the reissue patent dates from the issue of the original patent, but at least the patentee will have an accurate patent.

This is what happened to Cady, so that his original patents were released as a group of reissue patents<sup>17</sup>. Included in these inventions were what have become known as the crystal stabilizer and the crystal-controlled oscillator. Figure 6 shows in Fig. 3 of the patent drawing an electron tube 4 having an input tuned circuit comprising coil 7 and condenser 9 and an output circuit having a coil 8 coupled to the coil 7 to form an "Armstrong oscillator," the frequency of which is controlled primarily by the values of the coils and the condenser. Cady discovered that if a piece of quartz were connected into this circuit at 12, then, in a very narrow range of adjustment of this oscillating circuit, a phenomenon took place in the circuit (region 4 in Figs. 5 and 6 of the patent drawing) where the crystal seemed to lock the frequency. If the condenser 9 was adjusted a bit further, the crystal lost control, so that the crystal could stabilize the oscillator only over a very limited range. That is the stabilizer invention.

Cady also found that if he employed a long bar of quartz, as shown at 12 in Fig. 2, connecting one end of the quartz to the input 1-4 of the first tube of a train of amplifiers and the other end of the quartz to the output 5 of the last amplifier, the quartz bar 12 would itself mechanically couple energy between output and input, and sustain oscillations without the use of coils and condensers, and at a frequency controlled and determined by the dimensions of the

<sup>16</sup>U.S. Patents Nos. 1,450,246 (April 3, 1923) and 1,472,583 (Oct. 30, 1923).

<sup>17</sup>Reissue Patents Nos. 17,245 (four-electrode crystal stabilizer); 17,246 (four-electrode crystal oscillator); 17,247 (crystal stabilizer for "Armstrong" oscillator); 17,355 (piezoelectric crystal resonator); 17,356 (piezoelectric crystal wavemeter); 17,357 (crystal resonator coupled to another medium); 17,358 (filter embodying piezoelectric crystal); and 17,358 (crystal resonator coupling two circuits).

bar of quartz. In view of the inherent necessary size of the four-electrode crystal bar, the frequency of oscillations was not very high. This was, nonetheless, the first crystal-controlled oscillator.

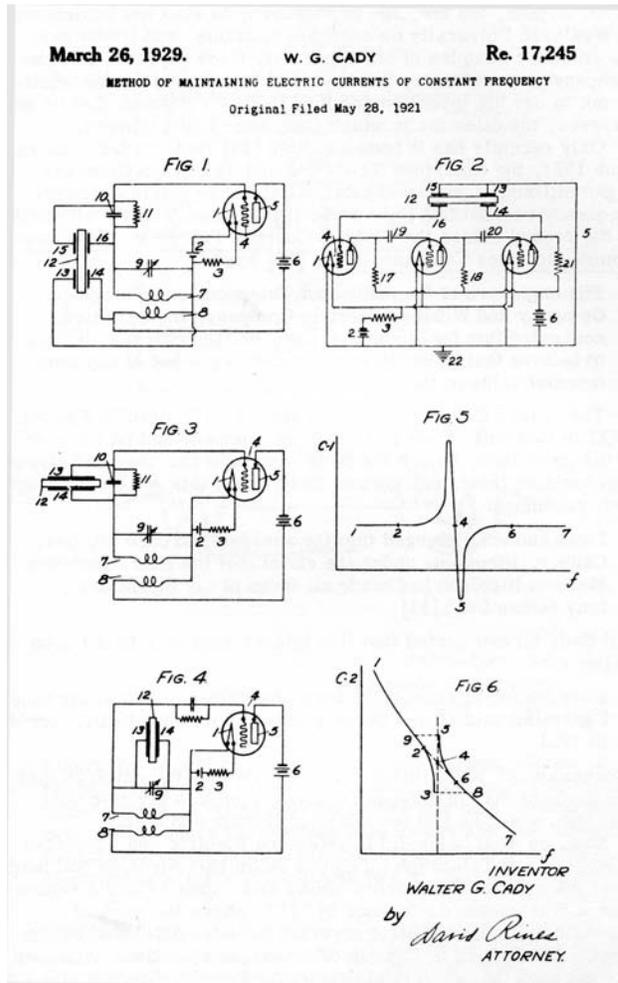


Fig. 5.1: Cady's patent drawing. (This image is public domain and is not protected by copyright.)

And so, very excited about these developments, Cady went to the logical corporate giants in the field of communications and solicited the interest of the American Telephone and Telegraph Company and the Western Electric Company, Inc., in his inventions. He freely disclosed all of his patent application, permitted the company engineers, including his former student, H. D. Arnold, the director of research, to visit his laboratory at Wesleyan University on several occasions, and freely gave the company samples of his apparatus. Cady expected that the company was evaluating this material in order to decide whether or not to use his invention and thus to take a license. Let us see, however, the dilemma in which Cady soon found himself.

Only recently has it been admitted <sup>18</sup> that, as far back as June 1924, the American Telephone and Telegraph Company began utilizing a quartz-crystal oscillator to obtain constant-frequency oscillations for a radio transmitter. Cady's affidavit in the record before the District Court in *Pierce v. American Communications Company, Inc.* <sup>19</sup> says:

The engineers of the American Telephone and Telegraph Company and Western Electric Company, Incorporated, concealed this fact from me, and, on the contrary, led me to believe that piezoelectric crystals were not of any commercial value to them.

The letters Cady has received appear as Plaintiff's Exhibit CXXI in this suit. They state that the company had no interest in the inventions, though the facts now show that they had already appropriated them, unknown to Cady. As if this were not enough, Cady continues:

I was suddenly plunged into the said Interference 50, 545, Cady v. Nicolson, under the claim that the said Alexander McLean Nicolson had made all three of my inventions . . . long before I did <sup>20</sup>.

And Cady further stated that this interference was based upon claims that

were copied in exactly the form that they were in at the time I gave said copies of my patent applications to Dr. Arnold, in 1921.

"Concealment" and "interference" were thus the rewards that this eminent man of science received from this gigantic company with which he had been dealing frankly and freely.

Now, on what basis did the Western Electric and American Telephone and Telegraph attorneys claim that Nicolson had made these inventions? The record shows that, upon Arnold's return from a Washington conference in 1917, where the work of Langevin with piezoelectric crystals had been disclosed by the French and British to a group of American scientists, Nicolson was set upon the problem of developing Langevin's work. He did make some original contributions with

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<sup>18</sup>Raymond A. Heising, *Quartz Crystals for Electrical Circuits*, Van Nostrand, 1946.

<sup>19</sup>111 F. Supp. 181.

<sup>20</sup>Nicolson was an engineer in the employ of Western Electric Company, Inc.

Rochelle salt crystals as Hunt's account explained <sup>21</sup>. Figure 7 shows part of Nicolson's original patent, the application for which was filed April 10, 1918.

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<sup>21</sup>Frederick V. Hunt, *Electroacoustics*. p. 52.

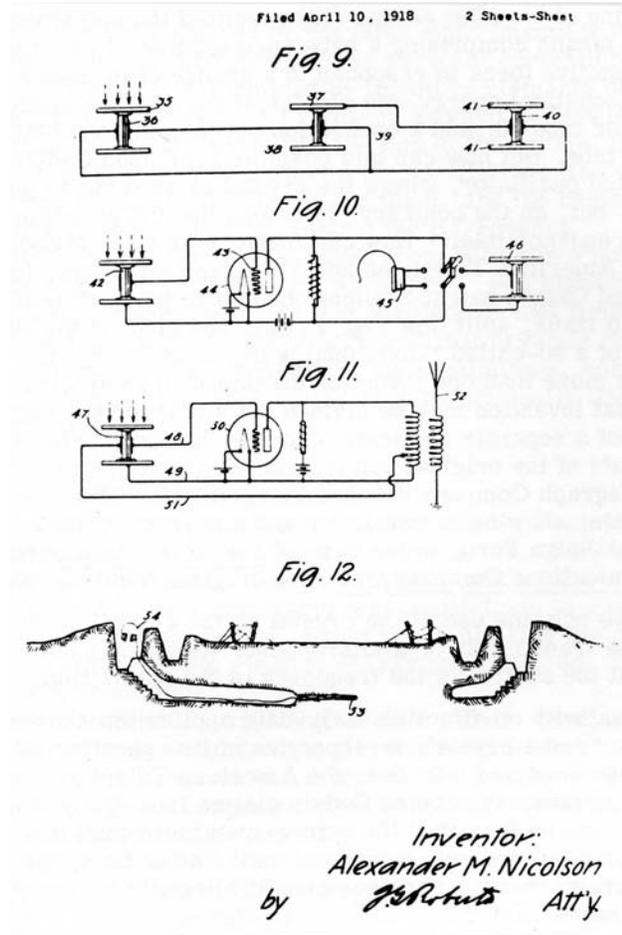


Fig. 5.2: A part of Nicolson’s original patent. Claim 12 reads, “Means for translating acoustical energy into electrical energy, a space current device having a control member, and a connection between said means and said device, said means comprising a substance capable of generating electromotive force in response to a change in pressure.” (This image is public domain and is not protected by copyright.)

In Fig. 12 of the patent, a Rochelle salt crystal 53 is placed in a tunnel near the enemy trench. The crystal is connected to a pair of earphones 54 so that the enemy movements can be detected. As one modification, the crystal may modulate an alleged electric oscillator (Fig. 11 of the patent), and an antenna may transmit the oscillation signals to a remote receiver, instead of using wires between the Rochelle salt crystal picking up vibrations and the earphones. That was Nicolson's original case. One of his first claims (12) specified the combination of crystal means comprising a substance capable of generating electromotive force in response to a change of pressure for translating acoustical energy into electrical energy, the space-current oscillator tube 50, and a connection between the translating means and the tube. But how can this possibly bear upon Cady's crystal-controlled oscillator, where the crystal is used not to pick up sounds, but, on the contrary, to determine and generate the oscillation frequency itself? How can there be an interference?

The American Telephone and Telegraph attorneys, having inspected Cady's patent applications before permitting the Nicolson patent to issue, split this Fig. 11 out, and made it the subject matter of a so-called "divisional applications." That is, where there is more than one invention disclosed in an application, the additional invention may be divided out and made the subject matter of a separate application, being, however, entitled to the filing date of the original application. So the American Telephone and Telegraph Company now had an application with an early 1918 filing date, showing an oscillator and a crystal, though, in the words of Judge Ford, in the case of *Pierce v. American Communications Company, Inc.*, the original Nicolson disclosure

shows only the use of the crystal as the equivalent of a telephone transmitter or a microphone. He teaches nothing about the control of the frequency of the oscillations.

Armed with an effective early-date application showing an oscillator and a crystal, irrespective of its operation as originally described and intended, the American Telephone and Telegraph attorneys copied Cady's claims from his patent applications, and so provoked the before-mentioned interference. As Judge Ford pointed out, it was not until "after Cady had made his disclosures" that the Nicolson circuit allegedly became a crystal-controlled oscillator.

So Professor Cady found himself enmeshed in a legal contest with the giant American Telephone and Telegraph. He thereupon sold out to the Radio Corporation of America. Hunt explains how, through improper handling, the claims that belonged to Professor Cady were later awarded to Nicolson. Thus, one finds in the Nicolson patent the claims for Cady's invention, namely a device where the circuit is stably nonoscillatory when not under the control of the crystal vibrator, and where the frequency of oscillations, when the system oscillates, is stably determined by the frequency of vibration of the vibrator.

The significance of that improper handling is evident from Judge Ford's later determination in *Pierce v. American Communications Company, Inc.*

Indeed it appears that although Nicolson may have believed he had

a crystal-controlled oscillator, in fact he did not. Professor Cady showed by his later experiments with the Nicolson circuit that oscillations were not controlled by the crystal but were determined by the other elements of the circuit. The evidence of Professor Edward L. Bowles' affidavit is to the effect that the function of the crystal in the Nicolson circuit is to modulate the oscillations (the only function he originally claims for them, and the basis for his earlier patent) and not to control their frequency.

Defendant has introduced pages from Nicolson's note book written in 1918 . . . Dr. F. W. Kranz, who signed these pages as witness, testified that Nicolson at that time said nothing to indicate he had discovered that crystals could be used to control the frequency of the oscillations, nor did Nicolson make any such claim when he originally filed his application in 1918.

#### 5.5 Professor Cady Was Not Alone

The A T & T, however, was not partial only to Professor Cady. Take the application of Professor Langevin, who was thousands of miles away in France. Langevin's application showed a quartz crystal driven by alternating-current oscillations in a coil to generate sounds. Conversely, sound waves striking the crystal would be converted into electric energy and received. This was Langevin's invention.

So into the Nicolson application went a claim reading, "An oscillating circuit comprising a piezoelectric device." This is, of course, what Langevin had invented. An interference was declared. Langevin complained that French representatives, Majors M. Fabry and H. Abraham, had disclosed his invention to a whole group of scientists, including Dr. Arnold and others of the Western Electric Company, as before mentioned, before Nicolson's 1918 filing date. But again A T & T prevailed. Nicolson was awarded priority, because Langevin's long-distance stipulated proofs were not technically sufficient. Thus, the Court of Customs and Patent Appeals <sup>22</sup> ruled:

The record in the case so far as the testimony on behalf of both parties is concerned is very informal and very unsatisfactory . . . deficiency occasioned by an inferior record.

The court was forced to reject as unproved the facts of the actual disclosure at the 1917 Washington meetings (as testified to by Professor Cady in *Pierce v. American Communications Company, Inc.*). In the court's words, quoting the Board of Appeals,

Whether or not Langevin had the invention or had imparted knowledge of it to Fabry or Abraham, the fact remains that no documentary evidence has been produced showing what was disclosed at the Washington meeting.

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<sup>22</sup>110 F. 2d 687, 690.

It is extremely significant that the A T & T and Western Electric attorneys did not use Dr. Frederick W. Kranz, formerly of their employ, as a witness in this interference. Dr. Kranz's statement in *Pierce v. American Communications Company, Inc.*, is most revealing:

In 1918, Nicolson and I occupied adjoining desks. . . . I recall a conference at the laboratory about 1917 in the course of which Dr. Crandall informed us of the work of Professor Paul Langevin, of France, involving the use of piezoelectric crystals as sound transmitters and receivers. . . .

Having been successful in appropriating the inventions of Professors Cady and Langevin, why should not A T & T attempt to appropriate the commercially practical and most important crystal-controlled oscillator inventions of the late Professor George Washington Pierce, former Rumford Professor of Physics and Gordon McKay Professor of Applied Physics at Harvard? The Pierce oscillator is of two principal types (Figure 8): first, as shown in Fig. 2 of the patent, an appropriate two-electrode crystal 2 connected between the grid 26 and the anode or plate 30 of the electron tube 24; and, secondly (Fig. 11 of the patent), the two electrode crystal 2 connected between the grid 28 and the filament or cathode 26.

But Nicolson's mammoth Rochelle salt crystal for responding to sound waves has at least three electrical connections and one can trace some kind of connection to each of the tube electrodes. Why, therefore, should not Pierce's invention, too, be claimed by Western Electric on the basis of the Nicolson application and by A T & T on the basis of an application of an A T & T engineer, Bailery? So A T & T copied Pierce's claims and provoked interferences. This time, however, it came up against an applied scientist who was prepared to fight in defense of his rights.

There were years of litigation which finally culminated in victory for Pierce<sup>23</sup>. When it appeared that Bailey was beaten, Western Electric urged Nicolson as the prior inventor. Pierce's attorney took the position that A T & T and Western Electric were really the same company, the former owning more than 98 per cent of the stock of the latter. He set out to prove that they had the same management control and were, in effect, the same entity. Therefore, since Pierce had beaten Bailey (A T & T), he was not compelled to have another suit against Western Electric on the Nicolson application. The contention was that the matter was *res judicate* – decided, once and for all. Not long after, an A T & T attorney, George E. Folk, visited Cambridge, thrust out his hand, and said to Professor Pierce, "Call me George."

When the basic Pierce oscillator patent issued, Professor Pierce carefully claimed therein only what represented his advance over Cady and he would take no claim broad enough to dominate Cady, though I am informed that as a result of the settlement with A T & T he could have had any of the oscillator claims that later issued in the Nicolson patent.

<sup>23</sup>Interference 67, 863, *Pierce v. Bailey v. Nicolson*.

The Western Electric Company Nicolson patent then issued, with Langevin's claims and Cady's claims, and, for years A T & T used this patent as a club to collect royalties on every crystal-controlled oscillator – collect, that is, except from those who knew the real meaning of the Nicolson patent.

Let me give an illustration. Claim 1 of the Nicolson patent that was taken from Professor Langevin, reads: “An oscillating circuit comprising a piezoelectric device.” This claim, in its true history, refers to Langevin's idea of having an oscillating circuit drive a crystal. It has nothing to do with a crystal controlling the oscillations itself. And yet, in their licensing policy, the A T & T has read this, or tried to read this, on crystal-controlled oscillators. This is what is known as “verbal infringement.” The words of the claim sound as if one were infringing, but the meaning of the claim, as shown by the file history, is not the same thing. There is, therefore, no infringement. I stress this point because very often one cannot tell, merely by reading the claims of a patent, what they actually cover.

In rewriting history a few years ago, through the eyes of the Telephone Company<sup>24</sup>, an effort was made to try to evolve the Pierce oscillator from Nicolson's maze of crystal-modulator connections. In *Pierce v. American Communications Company, Inc.*, however, Professor Edward L. Bowles discussed

the circuit diagrams of page 15 of the Heising text which are labeled “Nicolson's oscillator circuit.” In the interest of accuracy, I point out that the alleged Nicolson circuit and its variations shown on page 15 do not either accord or agree with the Nicolson circuit of patents 1,495,429, filed April 10, 1918; and the alleged divisional patent directed to Fig. 11, 2,212,845, filed April 23, 1923. This is clear from a mere cursory inspection.

Professor Bowles explained the details of this and, as stated by Judge Ford, showed

that although Nicolson may have believed he had a crystal-controlled oscillator, in fact he did not.

Judge Ford found, moreover, that

Nicolson still shows the same whole Rochelle salt crystal of his earlier patent, with three electrodes arranged so as to operate as two pairs of electrodes. . . . The Pierce oscillator is so designed as to oscillate only at the frequency determined by the crystal, the presence of which is necessary if the system is to oscillate at all. Nicolson, on the other hand, while claiming that his system may oscillate at a frequency determined by the natural frequency of the crystal and under the control of the crystal, is also careful to point out that by proper use of reactances it may also be made to oscillate at some

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<sup>24</sup>See above, fn. 19.

other frequency than that determined by the crystal. Clearly, this does not purport to be the same thing as the Pierce oscillator.

...Defendant ... argues that in 1918 Nicolson had already hit upon the circuit which Pierce later patented. But these only show that in 1918 he was working on circuits which may superficially resemble that of Pierce, as do those, for instance, of his earlier patent, which, however, discloses only a different function and mode of operation of the crystal. ... These pages furnish no warrant for a conclusion that Nicolson in 1918 had anticipated what Pierce was later to discover.

I should now like to recount, apropos of the plight of scientists when bringing inventions to our corporate manufacturers, the latest pronouncement relating to such activity, this time in connection with the International Telephone and Telegraph Company. And the same Professor Pierce was involved. The decision is reported in *Pierce v. International Telephone and Telegraph Corporation*<sup>25</sup>. Judge Hartshorne of the District Court for the District of New Jersey found that

Following Pierce's patent applications in the 1920's or early 1930's, Pierce at *I T & T's request*, not only opened up his secret papers to I T & T for their examination anent the possibility of its taking out a license thereunder, but he also permitted I T & T's representatives to visit his laboratory. In the complaint and at the trial the question was raised as to whether Pierce's disclosures were confidential and whether such confidence had been breached by I T & T.

The court went on to tell the kind of tactics that I T & T promoted:

I T & T doubtless used every possible means to secrete its circuit diagrams from Pierce, who had so freely showed I T & T all he knew about his invention.

And again:

Here we must bear in mind that, as seen above, I T & T had acted in a peculiarly secretive manner, particularly with respect to the man who, in previous years, had given it every assistance, in the form of access to secret documents and in personal visitations and conferences at his laboratory.

## 5.6 Conclusion

The dilemma facing the inventor who discloses inventions to outside organizations is thus pointed up by the typical (but rarely proved) specific experiences just recounted. The law, as presently applied, is inadequate; and something must be done more properly to protect the rights of inventors.

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<sup>25</sup>147 F. Supp. 934.

In the next chapter, I shall discuss some of the proposals before Congress for improving the patent system and the enforcement of patents by the courts. If an effective program can be activated, our corporate giants may be more wary about appropriating the inventions of others and wearing the inventors down by costly and vexatious litigation.

Judge Wyzanski, of the Massachusetts Federal District Court, in connection with Professor Rudenberg's electron-microscope patent <sup>26</sup>, deplored the condition of "the individual holder of patents" who is

at the mercy of large corporate enterprises which could use the invention, decline to accept the inventor's reasonable offers, allow him to sue for infringement and in the end, if beaten in the infringement suit, pay him not even a royalty high enough to cover the expenses of the litigation.

To similar effect are the words of Judge Hayes of the District Court for the Middle District of North Carolina <sup>27</sup>:

The result is not encouraging to an inventor. Indeed a patent, however valid and however flagrantly infringed, would be worthless in the hands of a person with small means if it had to survive the obstacles which have confronted the patent in suit. This is battle by the defense to ignore the patents until a court of last resort compels a course otherwise.

So the time has come for frank talk. If Congress, in these precarious times, is anxious to encourage inventors (and I have tried to show herein that many of the important advances have come and still do come from individual inventors entirely outside established research laboratories and organizations), then Congress must make the inventor more secure at the hands of the potential infringers and in the courts.

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<sup>26</sup> *Rudenberg v. Clark*, 81 F. Supp. 42, 45.

<sup>27</sup> *Davis Co. v. Baker-Cammack Hosiery Mills, Inc.*, 86 F. Supp. 180, 187.

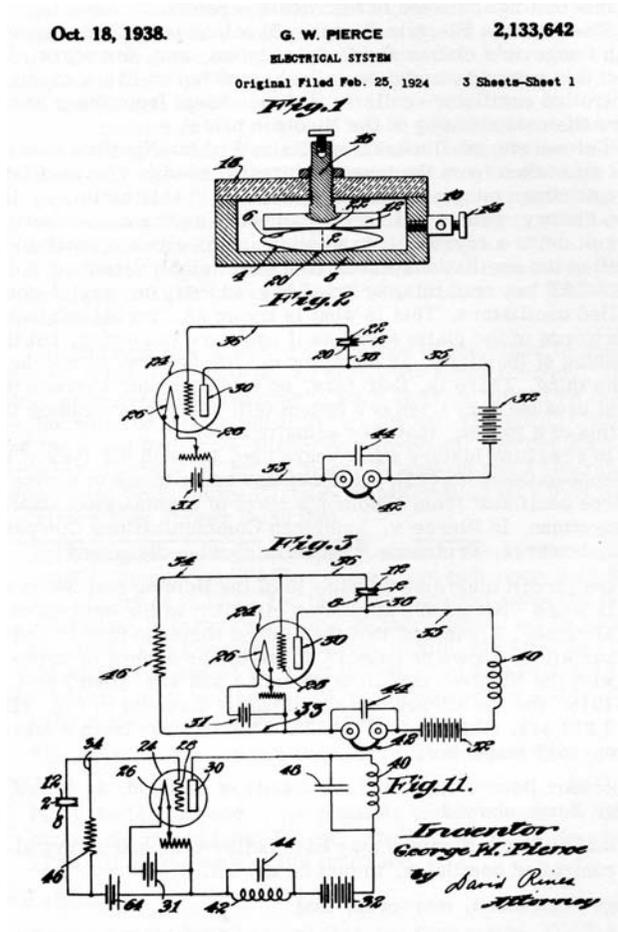


Fig. 5.3: A part of Pierce's patent. (This image is public domain and is not protected by copyright.)