

WASTEWATER TREATMENT PATENT CONTROVERSIES: THE UNSETTLED
MEANING OF "INVENTOR"

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I. Introduction

One hundred years ago, as the Great War was breaking out in Europe, a more hopeful development was occurring in the field of public health. We is also the centennial year for the development long delayed but much needed large-scale wastewater treatment facilities in several highly industrialized countries. The development led to a pair of patent infringement cases in the midwestern United States, commenced in the 1920s and destined to last over twenty years. One was against the city of Chicago and the other against Milwaukee. The cities lost both cases to a British company whose U.S. patents named its CEO, one Walter Jones, as the sole inventor. For scientists, engineers, urban planners, and many politicians, these cases represented what they saw as an affront, with someone not even a scientist demanding patent license fees from municipal entities trying to do a public good by reducing pollution in Lake Michigan, the drinking water supply for both cities. As is common with successful inventions and the patents covering them, many other persons were cited by the defendant cities as the "true" inventors of the treatment process involved, although none of them worked for either city. We shall here explore some of the vagaries and emotions surrounding the seemingly simple chore of naming an inventor in a patent. To do so we will need to review the interesting political and legal histories of the Milwaukee and Chicago litigations.

The history of these patent cases evolved from the subject of Library 1 on this site, the interstate struggles in the early twentieth century to prevent Illinois from diverting large quantities of Lake Michigan water to flush human and industrial wastes westward into the Mississippi. Illinois saw early on that the Supreme Court was not going to allow it to take unrestricted amounts of fresh lake water for this purpose. Decrees of the Court in 1929 and 1930 confirmed that Illinois would soon need to reduce its taking of lake water and, to compensate for that reduction, to build effective treatment plants for its wastewater. That way, with effluents from the treatment plants much nearer to purity, not

so much diverted lake water would be needed. Those plants were built in Chicago and nearby towns in the 1920s and 1930s, leading to the accusations of patent infringement by a British patent owner with the somewhat unattractive name of Activated Sludge Ltd. Those plants are still operating today, and the technology involved has not changed very much in the intervening decades. Indeed, what became known as the activated sludge method is now in use in nearly all large-scale treatment plants around the world.

Through the cordial cooperation of sanitary district officials in Chicago and Milwaukee, where the cases were tried in the early 1930s, I was able in 2010 to visit and photograph the treatment plants involved, and to travel down the Chicago drainage canal that is the subject of the first of the two libraries on this web site. It carries the treatment-plant effluent from the wastewater of some eight million people and many industrial facilities. The Milwaukee plant treats wastewater from over one million people and a number of industrial facilities.¹ On a dry day it processes 200 million gallons of sewage. Its treatment capacity is 330 million gallons per day. Federal court officials in Milwaukee were similarly helpful in allowing me to see and photograph the courtroom where the case against Milwaukee was tried, and the judge's chambers where he worked out his decisions.

I have tried to write this patent litigation story in a manner understandable to those unfamiliar with the sometimes arcane doctrines of patent law, and to minimize the extensive use of footnotes commonly seen in contemporary legal scholarship. I have collected the extant historical records and court decisions and included them on this site.

A. Putting Aside the "Yuk" Factor

The subject of sewage carries with it an aesthetic reaction that can only be called negative, and a host of prejudices. These prejudices for a very long time invaded even the hallowed halls of scientific thought. Popular thought was even more prejudiced. For example, it is only in the past few years that rank and file American citizens have come to believe that bacteria are not always harmful and that we actually depend on many of them

¹ Information on the volume of industrial wastewater for a given city is difficult to come by and varies widely depending on the kinds and number of industrial facilities present. Many companies have their own treatment plants. Some still discharge wastes on land or into waterways. An estimate for the Chicago area as of 1965 indicated that public treatment plants processed industrial wastewater at a volume approximately equal to two-thirds of the domestic wastewater processed. See Maris Report, [119](#) at pdf 42.

for our survival. Prior to now, and back to the discovery in the late nineteenth century of microbial creatures and the roles of some of them in diseases, we have usually stereotyped bacteria: (i) Some of them do bad things, so we should eliminate all of them; and (ii) bacteria in sewage must be particularly harmful. Both propositions are now known to be wrong, but this thinking, prevalent even among scientists until well into the twentieth century, hindered sanitary engineering considerably, as will later be described.

Now, however, we are living in a time of global warming and, particularly in the western United States, droughts. This has led to a public reconsideration about the possibilities for treated wastewater, and to the gradual acceptance that we can (and must) actually use it for drinking. While many people continue to assume that their public water supplies consist mainly of rainwater obtained directly from the heavens, reality is pervading more and more. For example, the entire water supply for the city of El Paso, Texas, comes from treated and recycled wastewater. So too the reservoirs for the city of Houston contain only a small amount of rain runoff. Most droplets in those reservoirs have come down the Trinity River from Dallas and have been used before. True, treatment methods are far from perfect, and even raw sewage continues to enter our domestic water supplies at times. However, the risks appear to be acceptable, and in times of drought we have few viable alternatives at present.

Nearly all large-scale sewage treatment plants in the world today utilize some version of the "activated sludge process" to purify the sewage before discharging it to a river, lake, or ocean. We shall withhold description of this process until later, saying here only that it is highly effective and economical in ridding sewage of organic materials, including bacteria, the good kind and the bad. In the world of biology it is said there are no zeroes and no hundred percents, so no process provides a complete and reliable way to rid sewage of all pathogenic creatures that might cause disease in humans or animals. However, this process comes very close.

B. The Role of Aeration

For many centuries it had been observed that if wastewater is moved far enough along a river with significant flow, it is purified by contact with the air. It was generally assumed, wrongly as it turns out, that the sole active agent in this purification was the air or the oxygen in it. The slime that usually collects on the stones of a river under these

conditions was thought to be something else, either harmful or, at best, unhelpful to the purification process.

C. The Role of Bacteria In Water Purification

1. Summary of the progression

In the latter part of the nineteenth century, following the discoveries by Lister, Pasteur and others of bacteria and their role in diseases, stereotyping bacteria in human thought was at its height. The common belief was that all bacteria are our enemies and should be eradicated whenever and wherever possible. Until the twentieth century, only a few voices were raised in favor of bacteria in sewage as our helpful friends.

Not until very recent times has the negative thinking about bacteria abated, and even now the abatement is mainly among bacteriologists and medical researchers who saw that in most situations most bacteria are actually our friends, are not pathogenic, and in fact are essential residents in our innards for our survival. With this new thinking has come a modicum of public acceptance for the reality that much of the water in our excellent U.S. water supplies has come not from heavenly rains but has been used before. For example, much of the municipal water supply for the city of El Paso (population about 800,000) consists of treated wastewater. The official city site says this recycled water is used only for golf courses, parks, and cooling of industrial plants, but the city has only one square mile of surface water, and in this time of drought several news reports indicate direct streaming of effluents from wastewater treatment plants into the drinking supply via groundwater or reservoirs. Even cities whose effluents are not returned to *their own* drinking supplies are providing drinking water for downstream towns and cities by putting effluents into rivers. An example is Houston, whose reservoirs are supplied mainly by the Trinity River. The river originates in the far north of Texas, flows down through Dallas, where it collects wastewater effluents, and ends up in Lake Livingston, the main water supply for Houston. While perhaps unpleasant for Houstonians to think about, most of the water arriving at Houston's main drinking water supply (Lake Livingston) is not rainwater or water from pristine ground or surface sources, but "previously used" water from Dallas.²

² See Dave Fehling, *Dallas Wastewater Keeps Trinity Flowing, Houston Drinking*, STATEIMPACT - TEXAS, Dec. 21, 2011.

2. Early pioneers of biological treatment

As of the late 1800s only a few pioneering scientists dealing with pollution problems saw bacteria as essential tools for cleaning water. Municipal wastewater systems of any kind were unknown. Town or city sewer systems, in the few places where they existed, were for handling storm-water only, to prevent flooding. Household and industrial wastes were handled building-by-building, often by simply casting it on the ground near the house, or in a somewhat more sophisticated scheme of a cesspool or privy vault in the basement of a house. These vaults tended to overflow, particularly after the advent of indoor plumbing in mid-century.³ Ironically, the anticipated health benefits of indoor plumbing were thus canceled out by inadequate arrangements for moving excrement and water out of the house to some other suitable place of disposal. Workers known as scavengers were supposedly engaged by cities to collect wastes from homes' privy vaults and cesspools and sell it to farmers as fertilizer, but these plans often were not implemented.⁴

Municipal waste removal projects were commonly stalled due to cost concerns or undervaluing of the public health advantages to be achieved. As of 1890 only a handful of municipalities in America and Europe had begun building wastewater handling facilities, and these involved no treatment of any kind. The approach was simply to find some nearby water and send the wastes into it, hoping aeration would purify everything, or if not, at least the contaminants would go somewhere else -- out of sight, out of mind. In many instances the nearest water facility turned out to be a sewer built for storm water removal, and entirely different design based on local flood prevention. Public pressure caused cities to allow wastes to be added to these relatively small storm sewer systems, and but they quickly became overloaded with sewage, as did the rivers and lakes into which they emptied. Street gutters led to the same result, moving everything to somewhere else, a nearby body of water. A classic case was the Thames Estuary in England, which by the late 1800s had become so polluted that it brought about public outrage and numerous government investigations. It also brought forth one of the pioneers of biological treatment of wastewater, William Dibdin.⁵ In the last decade of the nineteenth century many scientists and engineers were working on cleaning up the

³ Joel A. Tarr, James McCurley, and Terry F. Yosie, *The Development and Impact of Urban Wastewater Technology: Changing Concepts of Water Quality Control, 1850-1930*, in Martin V. Melosi (Ed.), *POLLUTION AND REFORM IN AMERICAN CITIES, 1870-1930* (Univ. of Texas Press).

⁴ Id.

⁵ Christopher Hamlin, *William Dibdin and the Idea of Biological Sewage Treatment*, Society for the History of Technology (1988).

Thames, the prevailing approach being to use chemicals to precipitate suspended solids and disinfectants to kill off the remaining bacteria. Dibdin went against the grain by suggesting in 1887 and the years following that instead of killing bacteria we should embrace them, making them helpers in consuming organic material in sewage by providing them with adequate aeration. The effluent could then be further cleansed by the use of filters. The idea that not all bacteria were harmful, and could in fact be very helpful if kept alive and active, was not easy to sell. Skeptics abounded, and it was well into the twentieth century before this radical idea was put into full-scale practice. Once done, however, as Professor Hamlin points out in his history of the Dibdin efforts,⁶ it seemed obvious that these bacteria, as biological engines, should be put to this use. After all, Pasteur had suggested as early as 1860, with many others before him, that microorganisms were responsible for the destruction of organic wastes.⁷ Perhaps everything is obvious by hindsight, after it is put into practice and established as workable. It was anything but obvious in the 1890s.

3. Emergence of the "activated sludge" treatment process

By the early twentieth century the role of aeration in sewage breakdown was well known, and the possibilities for using bacteria in such a process were recognized by at least some scientists and sanitary engineers. What then was so different about the treatment method that came to be known as "activated sludge process," such that it brought about the revolutionizing of virtually all wastewater treatment facilities worldwide, and with it a pair of lengthy and fiercely contested patent infringement cases in the American midwest? As usual, by hindsight nothing about it seemed very innovative or impressive. The patents involving it were argued in the Federal courts to be invalid for lack of novelty and for obviousness, but the courts consistently held, correctly in this writer's view, that the activated sludge process was neither old nor obvious as of 1914, when the pertinent patent applications were filed by Walter Jones of the UK.

A more difficult challenge to these patents was who should be regarded as the inventor. Was it Jones or others? Contrary to what might at first appear to those who have not dealt with patent law, cases, and clients, naming of inventors is often challenging in the extreme. We have few guideposts to go by. They may be summarized this way: First,

⁶ Id.

⁷ Id. at 194.

inventorship is determined separately for each claim in the patent.⁸ A patent usually has more than one claim, as a hedge against the broadest one turning out later to be unpatentable or invalidly issued. Each claim can be separately enforced as a sort of "mini-patent," against an infringer of that claim, regardless of whether the other claims are valid or infringed. Second, a person named as the sole inventor, or as a joint inventor with another person, must have contributed something beyond the routine skills of persons working in that field at the time. This is a highly subjective call. Finally, a named sole inventor must be someone who conceived the subject matter claimed, i.e., not someone who derived the subject matter from someone else. Thus, contrary to popular belief, it has always been illegal to "take out a patent," in the sense of naming oneself as inventor, when the claimed subject matter was conceived by others and communicated to the person filing. What needs to happen in transfer situations is to name the correct inventor in the application papers, and obtain a written assignment of the application from the correct inventor to the person who wants to own the application and to own any patent issuing on it. This seems a minor detail, but it is often crucial in patent validity determinations, as we shall soon see in the cases of the activated sludge patents.

"Activated sludge" is the term now used for the agglomeration of living aerobic bacteria that forms when aerobic, i.e., oxygen-loving, bacteria, always present in sewage, are put

⁸ A patent "claim" is not at all like an advertising claim. It does not recite the benefits of the machines or methods falling within the claim language. Instead, it lists the minimum key components of a family of machines or the key steps of a method, in language as broad as possible so long as the finished claim does not embrace any machine previously known or described in public literature. The claim language will therefore embrace not only the configuration described in the text, or "specification," part of the patent (typically an early and crude configuration not fit for commercializing), but also any future, usually better, configuration that may fall within the claim language. For example, a patent on the first automobile might have claimed

a chassis, a plurality of wheels, an engine mounted on the chassis and operatively connected to at least one of the wheels, and a steering mechanism for turning at least one of the wheels.

This claim would cover not only the earliest autos, but also the ones we drive today and all the autos in between. Of course such a patent would now be long expired and would not interfere with our present cars. A patent's term was for a long time seventeen years. Today the term is variable, typically about 18 years, beginning when the patent is granted and ending twenty years from the application filing date. In other words, twenty years minus the few years spent in the Patent & Trademark Office in getting the patent granted. In the case of an inventive method or process, the same rules apply, except that the claim recites a combination of action steps, like mixing, conveying, heating, and precipitating various things.

to work by adding lots of oxygen to them, in the presence of organic matter, which the bacteria then voraciously digest. The digestion causes the bacteria to multiply rapidly. If we then put in a quiet environment they will settle out as clumps of living creatures that can be used again, hence the name "activated." The bacteria, fresh from their organic meal, are powerfully alive, and, unlike early thinking, we want to keep them that way for quite a long time, so they can again be put to work on new incoming sewage. The activated sludge process, then, in its simplest terms, refers to

(i) introducing sewage into a tank;

(ii) impregnating the sewage with a finely divided *mixture* of abundant oxygen (typically tiny bubbles of air) *and* a quantity of activated sludge (aerobic bacteria obtained collected from some earlier activity), causing the sludge to rapidly consume organic matter in the sewage, thus clarifying and purifying it and producing still more sludge;

(iii) moving the tank's purified contents to a quiet second tank where the sludge can settle to the bottom;

(iv) drawing off the clarified liquid from the top of the second tank and sending it somewhere else, either for another cycle of purification or as discharge effluent from the treatment facility; and

(v) recycling some of the settled sludge back to the first tank, where it is again finely mixed with air and used to attack new incoming sewage.

The five-step process can be done in one of two overall ways, batch or continuous. You can stop the process during the settling phase and draw off the clarified liquid before recycling sludge back to the aeration tank, then doing it all over again, a procedure known as batch or fill-and-draw. For effective large-scale operations, however, the process needs to be run continuously, so that new sewage is constantly entering the aeration tank and mixed with air and activated sludge recycled from the settling tank, attacking newly introduced sewage.

The portion of the sludge that is not recycled in this way eventually needs to be removed from the system, lest the settling tank become overloaded with these friendly and helpful creatures. The sludge is removed in various ways, conveyed somewhere to be dried,

broken up into pellets, and sold as garden fertilizer. If things go well, profits on sales of the fertilizer are enough to pay for the construction and operation of the entire treatment plant.

In biology, it is said that no process is totally complete all the time, and this is true of the activated sludge process as well. It removes over 90% of contaminants, but not all.⁹ Most remaining bacteria are likely to be harmless, it is possible that a few are pathogenic to humans or animals, even if the treatment process is repeated in several cycles. One way to deal with this problem is by chlorinating the effluent of the treatment plant before discharging it to its next destination, such as a lake or ocean. This is the approach used by Milwaukee. Another way is to route the effluent into a long waterway where it can be further oxygenated and cleaned in the natural way, by the atmosphere. This is the approach used by Chicago, using the 36-mile drainage canal described in Library 1 on this site, which discharges into the Des Plaines River and conveyed from there into the Illinois and Mississippi rivers.

Two further words before we delve into the early history of activated sludge and the inventorship controversies that arose over it. First, despite the phenomenal success and acclaim which greeted the activated sludge process on the part of many sanitary engineers and scientists, construction and full-scale implementation in municipal treatment plants was in many places rather slow. This was due to the fact that cities had in the first two decades of the twentieth century invested in the older treatment technology called "filtration" or "trickling." This typically meant simply pouring sewage on land acquired for that purpose, and letting it seep through the ground, which would "filter out" the impurities. (The thinking of the time erroneously identified the soil particles as filtration agents. Actually, it was a biochemical process using the air entrained between the soil particles to break down the organic compounds.) The purified residue would become part of the groundwater. This worked reasonably well except for the smell and the slowness of the process, which limited the amounts of sewage that could be handled. It was politically difficult for city authorities that had invested in these slow and offensive trickling facilities at taxpayers' expense to suddenly announce that a faster, much more effective, and even wholesome-smelling process had been discovered and that new facilities ought to be built to utilize it. As a result, a number of major U.S. cities did not commence operating full-scale activated sludge treatment plants until the 1930s.

⁹ In the early experiments in England, to be detailed below, the solids removal was 94-96%. See Arden testimony, [2C12](#) at pdf 3.

Flow-rate limits are often crucial. Most cities and towns, then and now, use combined sewer systems, ones that convey both rainwater and sewage in the same pipes. Both pass together through the treatment plant, even though the rainwater needs little or no treatment. The arrangement saved money in not having to construct a new, separate sewer system for sewage, it had the disadvantage that in wet weather more liquid -- rain and sewage -- may come through the pipes than a treatment plant can handle. In that situation something must give. Either the pipes must be valved to limit the inflow to the plant, with the rest backing up into neighborhood streets and homes, or some of the plant's inflow must be diverted, untreated, to somewhere else, commonly a nearby body of water. Combined sewage systems continue to pose this same problem in wet weather. Municipalities today hope it will not occur very often.

II. The Inventorship Controversy

A series of patent applications relating in various ways to the activated sludge treatment process were filed in England during the period 1913-15, with corresponding applications filed in the United States shortly thereafter. The patents issued in the 1914-1917 era, with terms of seventeen years from issuance. The named inventor in all of them was one Walter Jones, owner of the mechanical design and fabrication company Jones & Attwood, of Stourbridge, in the UK West Midlands. The company's main business at the time was the design and construction of heating and water-piping systems for buildings. We shall say much more about Mr. Jones later. The applications and the resulting patents were assigned to an affiliate company, Activated Sludge Ltd., formed for the purpose of holding and enforcing the patents and seeking U.S. and British municipal customers for whom Jones & Attwood could supply tanks, piping, and related equipment for large sewage treatment plants, at that time in their infancy in world history. Activated Sludge Ltd. (hereafter ASL), and its U.S. subsidiary Activated Sludge Inc. (ASI), to whom the American patents were eventually assigned, were commissioned to license the package of Jones patents to willing cities, usually in exchange for a single upfront lump-sum payment based on the savings accruing from use of the patented methods and apparatus. Extant documentation does not reveal the exact formulation of the offered licenses, but they were most likely about \$50,000 for a lump-sum paid-up license.¹⁰

¹⁰ See Judge Lindley's opinion in the damages phase of the Chicago litigation, [2D21](#), at pdf 14.

Many cities signed up for such licenses, but two conspicuously did not: Chicago and Milwaukee. Their refusals led to two of the most costly and contentious U.S. patent infringement suits of the early twentieth century. (As far as we can tell, no city in the U.K. challenged the patents and none was sued for infringement.) The Chicago suit came first, in 1924. The Sanitary District of Chicago had opened its first experimental-size activated sludge treatment plant at Des Plaines in 1922; another at Calumet in 1923; and a full-scale plant at the North Side Works in 1928.¹¹ The infringement suit was filed on September 19, 1924, in the U.S. District Court for the Northern District of Illinois, which includes Chicago and the sanitary district.¹² However, due to procedural complications over the ownership of the U.S. patents involved, the case took a long time to get going on the merits.¹³ Meanwhile, the Milwaukee case, though filed several years later, was nearing trial. The judge in Chicago decided to wait it out and see what the outcome was to be in the Milwaukee court on the validity question.

Milwaukee began operation of its first experimental activated sludge plant in 1915 and its first full-scale one, at Jones Island, in 1925. The Jones Island facility is still in operation today, and photos of it are included in this library.¹⁴ Early patent license discussions came to naught, with Milwaukee's chief sanitary engineer, T. Chalkley Hatton, persistently contending that the activated sludge process had been invented earlier by a number of other scientists and engineers, particularly emphasizing several working in Manchester, England, from whom Hatton claimed Jones had learned of the process. Hatton asserted there was nothing new or original in the claims of the Jones patents, and that they were accordingly invalid. ASI commenced its infringement suit against Milwaukee on June 25, 1928, in the U.S. District Court for the Eastern District of Wisconsin.¹⁵ Trial was in the spring of 1929, and post-trial briefs were filed in 1930.¹⁶ Judge Ferdinand Geiger handed down his lengthy opinion in 1933.¹⁷ He found on the evidence submitted that Walter Jones was correctly named as the inventor on the patents in suit, ordered a separate

¹¹ District court damages opinion, [2D21](#).

¹² Complaint, [2D4](#).

¹³ The original complaint named one Guthard as exclusive licensee under the patents, for four midwestern states, including Illinois; it also named as a co-plaintiff the original British owner of the patents, Activated Sludge Ltd. Id. A procedural dispute about ownership of the U.S. patents, including a trip to the Seventh Circuit court of appeals, was finally resolved in 1929, with the American assignee Activated Sludge Inc. now substituted the proper patent owner and plaintiff. [2D5](#).

¹⁴ [2C1](#), [2C36](#).

¹⁵ Complaint, [2C3](#).

¹⁶ [2C22](#), pdf 11.

¹⁷ [2C20](#), [20.1](#).

hearing on damages, and was about to issue an injunction prohibiting Milwaukee from continuing operations at its Jones Island treatment plant, the sole treatment plant in operation at the time. Milwaukee appealed, but the Seventh Circuit court of appeals a year later affirmed Judge Geiger's rulings, except it ruled that the city should not be enjoined from operating its activated sludge plant at Jones Island, as that would necessitate, at least for a time, pumping all of Milwaukee's sewage into Lake Michigan, with enormous consequent health hazards, not only to that city but to all the cities on Lake Michigan, since all drew their drinking water from the lake.¹⁸ The Supreme Court declined to review the damages award.¹⁹

Before studying the factual detail of the Milwaukee and Chicago litigations, it might be helpful to review a few basics of patent law as it stood at the time of these cases. Naming the correct inventor, or co-inventors, was an absolute requirement for patent validity up until the 1952 patent act.²⁰ Prior to that time, a patent naming a sole inventor, when the actual inventors were more than one person, *i.e.*, co-inventors, was void.²¹ This rule of law may sound straightforward to apply, and in some circumstances it is. For example, where only one worker is involved from beginning to end of the project, there can be no question of joint inventorship. However, few projects work that way. We then must delve into rather metaphysical analyses, claim by claim of a patent application, to determine who had the first complete conception of the subject matter falling within that claim's language. While joint conceivers need not have had their respective thoughts at the same moment, they must in some manner have collaborated to conceive the result. We ignore anyone whose contribution to the result was merely ministerial, such as that of a draftsman who prepares formal drawings when a complete structure has been described or sketched to him by others. Perhaps most importantly for a practical patent system, we

¹⁸ [2C24](#), [2C25](#).

¹⁹ [2C27](#).

²⁰ The applicable patent law at the time of the *Activated Sludge* cases was located in the Revised Statutes. R.S. § 4892 specified that the person or person believed to be the original and first inventor must so state in the application. If this was not done, the application could be amended in various ways to fix the deficiency while it was still pending, see *In re Roberts*, 263 Fed. 646 (App. D.C. 1920), but there was at the time no viable way to fix it after issuance. In infringement litigation, R.S. § 4920 provided a complete affirmative defense for any accused infringer who could prove that the named inventorship was erroneous ("That he was not the original or first inventor . . . of the thing patented.") That situation was eased in the 1952 patent act, where 35 U.S.C. § 256 provided for post-issuance correction of inventorship, if the facts so justified, by either the PTO or a court order. The law also specified that a patent would not be invalidated if the inventorship "can be" corrected in that manner.

²¹ See, e.g., *McKinnon Chain Co. v. Amer. Chain Co.*, 268 Fed. 353 (3rd Cir. 1920).

bear in mind that a complete "conception" includes not only the desired functions and results but also a structure for carrying them out. With such an arrangement there can be considerable room for judgment and later dispute about who should be blessed with the denomination of "co-inventor."

We now look at the various contentions of inventorship raised in the activate sludge litigation. The personalities and their backgrounds are part of a dramatic picture of what was happening in the sphere of wastewater treatment around 1914.

A. The Fowler-Ardern-Lockett Work

Milwaukee raised at the trial a number of contentions regarding prior inventorship of the claims of the Jones patents. They all center around a scientific paper delivered by Edward Ardern and William Lockett on April 3, 1914, at a technical meeting of sanitary engineers and chemists,²² and their scientific mentor, Professor Gilbert Fowler of Manchester University. The Ardern-Lockett 1914 paper contains a rather concise history of prior efforts at sewage purification, and then a description of the wastewater treatment work done in Manchester by the authors in the period 1912-14. The paper became the main focus of the Milwaukee trial evidence, of the inventorship contentions, and of Judge Geiger's decision in the case. We shall now look at the paper on the premise urged by both sides and adopted by the court, i.e., that the Jones patents in issue actually claim the activated sludge process disclosed in the Ardern-Lockett paper. The central litigation issue was who *first* conceived the process?

Professor Gilbert Fowler, age 41 in 1912, graduated in chemistry from the University of Manchester in 1886, and engaged in teaching and research there in the years following, particularly working on bacteriological treatment methods. He received his doctorate in 1904, with his thesis on purification of Manchester sewage.²³ From 1899 he had held, in addition to his university post, various senior appointments from the Manchester Rivers Committee, working on wastewater treatment methods. Manchester was a major shipping port and textile manufacturing center, but it is located considerably inland, connected to the sea by a 36-mile canal opened in 1894. By 1900 the canal and adjacent rivers were heavily polluted with industrial and human wastes, and the Rivers Committee was charged with finding solutions.

²² [2C9](#).

²³ [2C11](#).

In 1904 Professor Fowler's arrangement with the Rivers Committee was revised. He was designated Consulting Chemist (the highest-ranking person in that field), continuing as the senior-most chemist for the city, but with freedom to engage in private practice as well.²⁴ He remained Consulting Chemist until his resignation in 1916, and the 1912-1916 sewage treatment work at Manchester's Davyhulme facility, which housed a significant research laboratory, was certainly fostered and controlled by him. The facility became a center of wastewater treatment research, eventually using a full-scale activated sludge process. As a result, Professor Fowler is credited by many later writers as the "inventor" of the activated sludge process. But it is not entirely clear what features, if any, of the process were actually first conceived by him. From his testimony for the plaintiff in the Milwaukee case, his style seems to have been largely one of stimulating the directions of research by others rather than one of hands-on management.

Fowler made a trip in 1912 to the United States, during which he visited the laboratories of the Lawrence Experimental Station in Massachusetts. He was particularly interested in the work of Mr. Harry Clark there. Clark had done bottle-size experiments on treating sewage by aeration -- basically bubbling air through a bottle half filled with air and half with sewage -- and noting the sewage clarification that resulted over time. There was some sort of unidentified green slime accumulated on the sides of the bottle, possibly algae. The Milwaukee record is unclear as to exactly what Clark thought at the time about what was happening, but Fowler thought it might be a bacterial, rather than algae, action. To him the key point was that the whole liquid content of the bottle was being constantly intermixed with the bubbling air. Upon returning to England he told his assistant at his private laboratory at the university, Ernest Mumford, what he had observed at Lawrence, and suggested they perform experiments along the same line, but using chemical precipitants to hasten the removal suspended solids with aeration. The prevailing view among scientists was that aeration alone would not work fast enough for large-scale operations, and that some sort of chemical additive was needed to cause rapid and full, or nearly full, precipitation of organic components of sewage. Accordingly, Mumford tried an "iron organism" that he had found earlier, the nature of which was unknown except that it was a living organism that also contained some iron acquired from rusting ships and the like. It had been designated M.7 in recognition of Mumford's finding it. Fowler suggested that Mumford try it as an additive in aeration of sewage.

²⁴ Id. at pdf 3.

Mumford's experiment and its results were described in a 1913 paper he published with Fowler.²⁵ The results were of some interest, but the experiment was regarded as basically unsuccessful, and the M.7 project was abandoned soon afterward.²⁶ Fowler had, however, not lost interest in the prospect of using some sort of living organism as the precipitant for purifying sewage. He turned to his subordinate chemists at Davyhulme, Ardern and Lockett, urging them to experiment in a manner similar to that of Clark, but excluding algae by preventing light from entering the bottle. Testifying in 1928 as a witness for the plaintiff, Activated Sludge Inc., Fowler did not claim personally to have been the inventor of the activated sludge process, but he clearly did place the locus of that invention at the Davyhulme laboratory with Ardern and Lockett, not at the facilities of Jones & Attwood, which were in Stourbridge, some 75 miles distant. Fowler stated:

I have a very clear thought as to what the *activated sludge process is that was discovered at Davyhulme*. According to the ordinary methods of the purification of sewage or effluents, the liquid is caused to trickle over a fixed surface . . . known as a filter. On this fixed surface a deposit forms, which deposit is the active and living agent of purification. The activated sludge process discovered at Davyhulme takes that active and living skin . . . from the filter and moves it throughout the bulk of the liquid. Therefore, instead of having a fixed [location] surface with imperfect aeration, you have a continually moving [bacterial] surface, infinite in extent and constantly renewable, that is done always in the presence of air. That gives you the theoretical conditions for perfect aeration, and that is the new process of activated sludge known as the activated sludge process.²⁷

Edward Ardern, born in 1882, was 32 years old at the time of the initial work and 46 at the time of the Milwaukee trial. Although young, he was a chemist long associated with the City of Manchester and its wastewater agency, the Rivers Department, which was administered by the Rivers Committee. He became Resident Chemist at the large Davyhulme sewage works in Manchester in 1904, at the same time his mentor, Professor Fowler, was appointed Consulting Chemist there. Ardern testified to an experiment done at Davyhulme on November 24, 1913, involving sewage in a barrel or tub, to which a

²⁵ [2C8](#).

²⁶ Lockett testimony, [2C13](#) at pdf 21.

²⁷ Id. at pdf 6, emphasis added.

high-pressure air line was connected for the purpose of stirring up the contents.²⁸ The barrel was placed in the Davyhulme laboratory "with the idea of gradually creating a store of active sludge, having in view further developments in out-door experiments."²⁹ Asked to define the activated sludge process -- a label first coined by him and his assistant, Lockett -- he answered:

I should say that the process consisted of keeping an active biological sludge in intimate contact with sewage in the presence of air.³⁰

This, it turns out, was a remarkably concise and correct snapshot of the process as it has since become known. "Keeping," for example, captures the idea of maintaining the sludge in continuous contact with the sewage and air. "Intimate contact" connotes small particles rather than large chunks of sludge.

Ardern and Lockett continued their experiments for the rest of 1913 and into early 1914. Ardern referred in his testimony to the famous paper by himself and Lockett, which Ardern read at the April 3, 1914, meeting of the Manchester Section of the Society of Chemical Industry,³¹ reporting the nature and results of their experiments. The paper created a major stir in the sanitary engineering world and is usually regarded as the first description of the activated sludge process. It has resulted in many commentators over the past century stating that Ardern and Lockett were the inventors, or discoverers, of the process. Ardern referred to this paper frequently in his Milwaukee testimony.

There can be no real question that Ardern and Lockett, and perhaps their mentor Fowler, were the first to perform the biochemical steps of the activated sludge process. However, their performance was only on a laboratory scale, using the start-and-stop procedure called fill-and-draw to settle out the sludge in the same tank were the aeration had occurred. They were not successful in implementing a continuous-flow process with feedback of sludge from a settling chamber to the aeration chamber, as would be needed for any significant volume municipal treatment facility. Some practical work still remained to be done.

²⁸ Ardern testimony, [2C12](#).

²⁹ Id. at pdf 2.

³⁰ Id.

³¹ The paper was later published, on May 30, 1914, in the Journal of the Society of Chemical Industry, [2C9](#).

Ardern testified to a number of missing pieces in the practical application of the process:

We had absolutely no notion, even when we published this paper [May 1914], that it was going to be a practical means.³²

In attempting to move the process from one-at-a-time, fill-and-draw procedure to a continuous flow version, the Ardern-Lockett experiments were not a success. They thought about it, but as indicated in their second paper on the subject, published in December 1914, they had not figured out how to do it.³³ Ardern suggested as much in his Milwaukee testimony on cross-examination:

Q. You have no hesitation in saying that you and Dr. Fowler and Mr. Lockett together, or one of you three, were responsible for the activated sludge work that has been carried on in England, initially, have you?

A. That is very wide, you see. I have some difficulty in answering that question. What I would say emphatically is that we were responsible for the production of a sludge which in the right conditions could be obtained on a working scale and which would give a purified effluent. [W]e had never got a process in the sense that it was a process of which we could say: "This can be adopted for the improvement of Manchester sewage."³⁴

William Lockett worked under Ardern and Fowler, and like Ardern was an employee of the City of Manchester. He was 22 at the time of the initial work³⁵ and was a research chemist for Manchester's Rivers Department. He reported to Ardern at all times relevant to our story, first when Ardern was himself a research chemist under Fowler and when the famous Ardern-Lockett paper was written, and later, after 1915, under Ardern when he moved up to succeed Fowler. Lockett had spent his professional life in the field of sewage investigation.

In his testimony in the Milwaukee case he took somewhat more personal credit for the activated sludge discovery than did his colleagues. Lockett testified that, although he had

³² Id. at pdf 3.

³³ Paper at [2C9](#). Ardern testimony at [2C12](#), pdf 9.

³⁴ [2C12](#) at pdf 13.

³⁵ [2C13](#).

no records to prove it, he performed some of his aeration experiments in 1913.³⁶ This seems very likely true, given the early 1913 encouragement from Professor Fowler. However, in all likelihood these were simple aeration experiments of the usual type, where sludge of an unknown kind becomes deposited in a bottle; the sludge is treated as a mere by-product, probably useless, rather than as the active aerobic bacterial cleaning agent it was eventually found to be.

In his main body of experiments, Lockett testified that the sewage coming into the laboratory bottles was placed "right on top" of the sediment from prior runs.³⁷ This leaves some question whether he had that fine intermixing of sludge, sewage, and air that proved essential to the successful running of the activated sludge process. A large amount of surface contact is necessary for the bacterial action to consume the suspended solids in the sewage and thus cleanse it. Use of aeration alone, or even with big chunks of activated sludge mixed in, will not provide enough surface contact area.

Lockett, along with Ardern, saw early on the possibility of converting their laboratory fill-and-draw process (stopping the aeration for a time to allow for settling, after which the partially purified supernatant liquid would be drawn off, while the sludge, which tends to flocculate, sinks to the bottom; then starting a new cycle) into a continuous process, where no stoppage is required and new sewage is continuously introduced to the system, clarified effluent is continuously drawn off, and activated sludge is fed back to the aeration chamber for reuse. Obviously such a continuous system would be essential for any full-scale public treatment facility; the starting and stopping features of a fill-and-draw system would be incompatible with the constant need of a city for wastewater flow and treatment. Lockett's testimony confirms his and Ardern's attempts to move to a continuous process, as described in their second article on activated sludge, published in December 1914.³⁸ It was a failure, apparently due to inadequate tank design.³⁹

As we have said earlier, aerobic bacteria (those that thrive, eat, and multiply in the presence of oxygen but not otherwise) were known before; and aeration to purify sewage was known before; and at least a few scientists, such as Dibdin, knew that these creatures would precipitate of their own accord in a watery environment and would, so long as supplied with oxygen, remain alive. Feeding this living precipitate back in tiny pieces for

³⁶ Id. at pdf 3.

³⁷ Id.

³⁸ [2C9](#).

³⁹ Lockett testimony, [2C13](#) at pdf 23.

reuse in sewage mixed with tiny bubbles of air was perhaps not known. It was later discovered as a crucial feature of the activated sludge process. Whose idea was it? Certainly Professor Fowler had a role as initiator and supervisor of the Manchester research, but he freely admitted that the experimental work was actually done by his subordinates, Ardern and Lockett. He did not attempt to ascribe the discovery of the general biochemical process to Mr. Jones or to the Jones & Attwood company. As we shall soon describe, Walter Jones himself readily conceded that he knew nothing about biology or bacteria, and never claimed to have been first to think of the biochemical steps or reactions needed for the activated sludge process. He did, however, have a substantial role in designing the equipment for its practical implementation, which in patent law terms could possibly make him the inventor, depending on what patent claim language is being considered. Unfortunately, Mr. Jones died shortly before the Milwaukee and Chicago litigations began, so his testimony could not be taken.

B. Mr. Walter Jones

As mentioned earlier, the named sole inventor in all four of the patents in suit in the Milwaukee case was Walter Jones. He was not a scientist and did not have a university education, but he was nonetheless an astute designer of metal equipment and an extraordinarily forward-thinking businessman on social issues, particularly the circumstances of working people. Jones was born in 1846. His firm, Jones & Attwood, grew out of a bicycle-manufacturing operation founded by his father in 1836. Upon the death of the elder Jones in 1866, Walter, then age 20, took over the business, located in Stourbridge, in the West Midlands of England, south of Birmingham and near the Welsh border. Walter greatly expanded the operations, initially in the then-new field of hot water heating for buildings, in which J&A was a pioneer. In 1890 Jones published a textbook on the subject.⁴⁰ Meanwhile, in 1876, one Jabez Attwood joined Walter Jones to form the company bearing their names until the close of the twentieth century. We know almost nothing about Mr. Attwood except that the partnership lasted only ten years, after which Jones bought Attwood out and continued on his own, but still under the joint name, Jones & Attwood, Engineers and Ironfounders.⁴¹ By 1900 the Stourbridge facilities were greatly expanded.⁴² An engineering journal reported in 1903 that the firm had over

⁴⁰ See the history of Jones & Attwood by David Randle, [2B2](#), at pdf 6.

⁴¹ Id. at pdf 6-7.

⁴² See engraving, id. at pdf 7.

200 employees and was "now firmly established as one of the most important and successful in the district."⁴³

Walter Jones developed metal products in many other areas, including ventilating, lighting, and horticultural equipment. By 1906 the company catalog listed over 1,000 items, and its business name added the words "and Sanitary Engineers."⁴⁴

Jones was not only a dynamic developer of products, but also a person of advanced social thinking. He horrified other businessmen of the time by introducing the radical concept of an eight-hour workday, while paying his workers the full rate for the usual nine hours.⁴⁵ A local newspaper article in 1903 noted Jones's "intense practicability and irresistible perseverance," and attributed his success to a combination of "pluck, foresight, mental strenuousness, determination, and an infinite capacity for taking pains."⁴⁶ It described the large array of products the company had by then developed, many said to have been invented by Jones on which patents were being sought.

In addition to technical and business accomplishments, the civic and social-progress efforts of Walter Jones were legion. The local newspaper reported some of them in 1903:

He is a member of the Mechanical Engineers, he has been President of Heating and Ventilating Engineers For eighteen years Mr. Jones served his fellow townsmen on the Council, on the Main Drainage Board, and for four years was Chairman of the Urban District Council. Many of the local improvements owe their origin and development to Mr. Jones. He took the initiative in the gas works purchase, public baths, etc., and it was largely owing to his energy and strong determination that these undertakings were successfully carried out. His practical interest in all questions affecting the working classes is abundantly shown. He was elected President of the recently-formed Working Man's Club in Stourbridge, and has been for the last three years President of the Midland Counties' Mutual Benefit Society.

The article concluded by saying the Jones had "accomplished a splendid record of work by sincerity and honesty of purpose, aided by more than the ordinary man's share of

⁴³ Id. at pdf 8.

⁴⁴ Id. at pdf 11.

⁴⁵ Id. at pdf 9.

⁴⁶ BLACK COUNTRY NEWS, 1903, p. 16, [2B3](#) at pdf 1.

natural talent."⁴⁷ These comments are included not to show that Walter Jones was the inventor of the activated sludge process, but that he seems to have been an honorable man in every sense, and not someone likely to knowingly falsify official papers. When he died in 1924, shortly before the Chicago and Milwaukee cases began, the condolence letters characterized him as someone whose "hosts of friends who will always remember him as a man without reproach."⁴⁸ The Stourbridge Town Council adopted a condolence resolution characterizing Walter Jones, for many years a member of the council, as "a generous benefactor to the Borough and a public man who devoted many years of unstinted service for the public welfare."⁴⁹ Interestingly, one of the condolence letters placed in evidence at the Milwaukee trial was from Edward Arden, one of the persons identified by Milwaukee's counsel as a true inventor from whom Walter Jones stole the process and the patents. Arden's 1924 letter to Jones's daughter said that "Mr. Walter Jones was a man of such outstanding personality that he was admired and respected by all who came in contact with him"⁵⁰

Notwithstanding the extraordinary character of Walter Jones, the question here remains: What, if anything, was the Jones role as possible "inventor" of the patent claims in issue in the Milwaukee case? As we shall see, Judge Geiger, and the court of appeals following his judgment, attributed virtually all of the process to Jones. That sweeping conclusion is, however, not borne out by the available evidence. As noted, Jones died prior to the commencement of the litigation, so his testimony could not be taken in the case. We do, however, have some indications of a role in developing not the science but the equipment needed for practical implementation of the activated sludge process. The closest knowledge of this is probably from Professor Fowler, who was the main interactor between Jones & Attwood and the experimenters at Davyhulme. Fowler and Jones first met on October 24, 1913.⁵¹ Returning to the Fowler testimony,⁵² we find a number of interesting things. Fowler said he knew Walter Jones well. When asked by the plaintiff's attorney what Jones's contribution to the activated sludge process was, Fowler said:

It was after I first met Walter Jones that real progress took place *in the translation* from what had been a merely scientific and laboratory discovery into a practical commercial process; when I say "commercial" I mean one

⁴⁷ Id. at pdf 5.

⁴⁸ [2B5](#) at pdf 3.

⁴⁹ Id.

⁵⁰ Id. at pdf 2.

⁵¹ Coombs testimony, [2C14](#) at pdf 2.

⁵² [2C11](#).

that is *capable of being carried out in a practical manner on a large scale*.⁵³

This is a most important point regarding possible inventorship. The role of Walter Jones was characterized as being in the scale-up of what had been a laboratory-scale process. Fowler elaborated:

It was only after I had come into touch with Mr. Walter Jones that devices were used which kept the sludge in a fine state of division, that is to say, prevented large adherent masses accumulating anywhere, which moved it throughout the liquid in a regular path⁵⁴

This fine division, mentioned earlier herein, may have been a Jones contribution. Fowler characterized Jones in more general terms as well:

I should be inclined to describe him rather as an inventor than as an engineer; as a man in a smaller way but of the same type, for example, as Edison That Mr. Jones had great inventive faculties I was quite able to see for myself, because I went round the [Jones & Attwood] works with him.⁵⁵

These complimentary remarks by Professor Fowler seem consistent with the rest of the record, but they should be taken with two grains of salt. First, the remarks do not detail to the language of any of the asserted patent claims. Rather, they are glowing testimonials to an exceptional man who may or may not be labeled an "inventor" of specifically claimed processes or apparatus. Second, Fowler was financially involved in several ways. He had accepted consulting employment with Jones & Attwood throughout the period in question, receiving £200 per year. He also received shares in Activated Sludge Ltd., the parent company of the plaintiff here, worth £1000. The corporate history of Jones & Attwood attributes this amount as the value of 1000 shares of ASL, or about 4% of the company. Although separately managed to some extent, ASL remained closely connected

⁵³ Id. at pdf 6, emphasis added.

⁵⁴ Id. at pdf 7.

⁵⁵ Id. The markings on this page, and on others from the archival record of this Milwaukee case, were made by persons unknown, and long ago, most probably by Judge Geiger or one of his assistants. They could also have been made by counsel working on the appellate briefs, or by the appellate judges or their helpers.

with Jones & Attwood, which held majority share ownership.⁵⁶ Its main functions were to seek orders for treatment-plant equipment to be made by Jones & Attwood, and to enforce the patents involved. For this latter purpose all the patents were assigned to ASL, with the U.S. patents being later assigned to a Delaware subsidiary, Activated Sludge Inc., plaintiff in our two litigations.

In keeping with the glowing remarks about the character of Walter Jones is the evidence given by all the witnesses, and confirmed by remarks of Mr. Jones while he was alive, that he never claimed inventorship of any aspect of the laboratory work of Ardern and Lockett. We can now turn, finally, to the details of that work as reported in their May 1914 paper, and compare the information there reported to the actual language of the patent claims asserted in the Milwaukee case. This is an undertaking which both sides seemed rather studiously to avoid throughout the litigation, preferring instead to lump all the developments into a single pile labeled "the activated sludge process" and then argue about who invented it. Why they took this approach is not known, but most likely it was chosen as the single characterization that (i) embraced all the patents in the case and their various claims in one seemingly simple phrase; and (ii) could be understood by federal judges generally unschooled in patent law.⁵⁷ As we shall see, that is exactly the approach followed by the courts in this case.

C. The Famous Ardern-Lockett Paper of May 1914

We turn now to the most reliable indicator of the nature of the Ardern-Lockett experiments, and of the possible role of these two men as co-inventors for claims of the patents in suit in Milwaukee, i.e., the widely cited paper of May 1914. It was the central focus of their testimony in the Milwaukee case, and the document which they said correctly characterized what they did in the period in question.⁵⁸

The paper⁵⁹ describes laboratory-scale experiments on Manchester sewage. To begin, the authors briefly outlined the past history of sewage aeration, by Clark and others. Aeration was not the invention here. They turned to their experiments: The equipment involved

⁵⁶ Randle history of J&A, [2B2](#) pdf 58.

⁵⁷ Even today, despite statements ascribing patent expertise to the federal judiciary, an average federal district judge decides only one or two patent cases during her tenure on the bench.

⁵⁸ See, e.g., Lockett testimony, [2C13](#) pdf 8, "[Y]ou can take that paper as a fairly clear description of what was done."

⁵⁹ [2C9](#).

was the simplest: Three "80-ounce bottles," bottles #1 and #2 being partially filled with active (living) sludge from prior experiments, and bottle #3 with a more highly activated sludge, also previously collected. A quantity of Manchester sewage was added to bottles #1 and #3. A pressurized air line was run to bubble air through each bottle. The air apparently entered near the bottom of the bottle. They used the start-and-stop procedure known as fill-and-draw, continuing the aeration for two hours in bottles #1 and #3, then stopping it, allowing the sludge to settle into the bottom of those bottles, then drawing off the supernatant from bottle #1 into bottle #2, where it was subjected to the same two-hour treatment with sludge and air, followed by settling. In bottle #1 the process was then repeated for a second time, with new sewage, but this time using the increased amount of sludge resulting from the first run (original sludge plus new sludge from the aeration step). In bottle #3 a process similar to that of the first run in bottle #1 was carried out on its more activated sludge sample, but using six hours of aeration instead of two hours. The experimenters were therefore left with three clarified liquids, from (a) bottle #1, new sewage after subjection to extra-activated sludge from the first round; (b) bottle #2, the first-round effluent of bottle #1 after subjection to a second-round of sludge and aeration; and (c) bottle #3, from the same original sewage sample plus the extra-activated sludge, subjecting the mixture to six hours of aeration. Good effluents -- relative to past practices -- were obtained in all instances, with oxidizable-material reductions generally ranging from 83% to 91%. Of special interest to the audience of that time, no filtration equipment was involved; the process was purely biological. If this could be scaled up to urban sewage needs, treatment could be effected in a relatively small facility rather than having sewage dumped onto many acres of land for filtration. (And the resulting activated sludge, after having done its purification labor, had no odor.) Further, no expensive chemical precipitants needed to be added. The experiments showed that activated sludge tended on its own force to flocculate into chunks that were, blessedly, of a slightly higher specific gravity than that of water, and hence would precipitate on their own.

Additional experiments were described, varying the times and number of repetitions of aeration, and the geographic sources of sewage. Nothing of further interest to our litigation investigation is seen in them, but it would be wrong to leave the discussion of this paper without commenting on the thunderous (at least for engineers) reaction to it among professionals and historians over the next hundred years. The paper itself records the comments of those present on April 3, 1914, when it was presented at the Grand Hotel in Manchester. A Dr. J. Grossman said "the sludge question had entered upon a phase in which . . . it was to a certain extent capable of commercial treatment."⁶⁰ Mr. F.R.

⁶⁰ Id. at pdf 17.

O'Shaughnessy regarded "the paper as an epoch-making one, provided that the process experimentally established by the authors could be applied on the large scale at a reasonable cost."⁶¹ He followed by saying the experiments demonstrated that "there must be considerable surface contact" for the process to work. Mr. S.E. Melling "thought the process was ideal inasmuch as it resolved itself into a single-tank treatment."⁶² Professor Fowler, present for this momentous occasion, added a history of how the work had come about. These reactions are important for patent law reasons as well as for historical ones. There is a line of American federal cases holding, in effect, that laboratory experiments constitute a complete reduction to practice of inventive subject matter if they point clearly enough to future practical application. Such pointers were clearly present here, so there should be no resistance to ascribing inventorship of at least some patent claims to Ardern and Lockett on the ground that their work was merely on a laboratory scale. Yet the comments showed much work still lay ahead, and might be ground for further patentable inventions. For example, the technology was destined for a two-tank arrangement, the second being for settling and feedback of most of the newly rejuvenated sludge to the aeration tank for further good service. Fine division of air bubbles, sludge particles, and sewage would be needed to make the cleansing action fast enough to perform on a full-scale public works type facility serving a large human and industrial population. It would not do to hold each gallon of sewage in the plant for six hours, as Ardern and Lockett had done, while many more gallons were backing up outside the plant and waiting to get in for treatment.

What, if anything is not seen in the Ardern-Lockett paper but which could be important in ascribing inventorship to the patent claims in the Milwaukee case? There are a number of answers. First, whether there was in any of these laboratory experiments a fine intermixing of sludge, sewage, and air is not entirely clear, although that was certainly an objective. The paper states that it is "essential that the activated sludge should be kept in intimate contact with the sewage during aeration."⁶³ We do not know the number or size of the air-entrance points, the sizes of air bubbles involved, or the sizes of sludge pieces being moved through the liquid.

Second, absent from the Ardern-Lockett paper is any description of a separate, non-aerating chamber for settling out the sludge and drawing off the effluent liquid. Since the experiments involved fill-and-draw the technique, settling occurred in the same bottle

⁶¹ Id.

⁶² Id.

⁶³ Id. at pdf 4.

used for aeration. Perhaps most importantly, the paper disclosed no equipment for feeding sludge collected from a previous run back into the aeration tank. The professional thinking of the time was still to some extent that sludge, composed as it was of bacteria, was a bad actor that needed to be put somewhere else. Ardern and Lockett were pointing in a very different direction in saving sludge from one bottle and putting it in another, but the final link, feedback, was not yet there. No special geometry of tanks or aeration means was described in the paper, and no particular path of liquid movement during the aeration process was described, other than that the whole mixture be "agitated."

D. Some patent claims may have been invented by Ardern and Lockett

As mentioned, in United State patent law, then and now, an invention can be regarded as reduced to practice without its having been scaled up to a full-size industrial facility. Additional inventions might indeed be entailed in doing that, but we begin with the laboratory-scale achievements of Ardern and Lockett. The court record contains no evidence that Walter Jones was involved in any way in these particular achievements. One of Mr. Jones's employees, James Alger Coombs, was present at the Grand Hotel for the Ardern-Lockett presentation on April 3, 1914.⁶⁴ Coombs was a sort of salesman for Jones & Attwood's metal systems products, and as such he was in contact with many engineers, businessmen, and city officials. He testified that

We never knew anything about experiments until the papers were read, [and] we knew nothing . . . about what was actually being experimented with or what they had in mind for the future until the paper was actually read.⁶⁵

From what we have said, we can now conclude from all the evidence that at least some of the claims of the Jones patents in suit in Milwaukee may be regarded as having been invented not by Walter Jones but by Edward Ardern and William Lockett. We examine the asserted claims from each of the four patents adjudicated in the Milwaukee case. In patent litigation it is customary for the parties to eliminate certain claims of a patent from consideration by the court, usually because those claims are agreed to be not infringed by the defendant. In the Milwaukee case, the city mounted almost no defense of

⁶⁴ Coombs testimony, [2C14](#), at pdf 4.

⁶⁵ Id.

noninfringement;⁶⁶ by taking that tack it was virtually admitting that its plant at Jones Island had equipment falling within the language of the asserted patent claims or, in the case of method claims, equipment carrying out a process within the language of each claim in question. The issue was strictly one of validity of each claim, and that question turned on inventorship.

1. The Jones '540 patent

The first of the four patents in suit, U.S. patent 1,947,540,⁶⁷ or for short the '540 patent, was issued in 1917 and expired in 1934. This patent claims the benefit of the filing dates of two Jones UK applications,⁶⁸ one filed October 11, 1913, and the other January 10, 1914, both of which are prior to the oral presentation of Ardern-Lockett at Manchester. The first was even before the initial Fowler-Jones meeting on October 24. The trial evidence makes fairly clear that the U.K. applications, and the U.S. '540 application described to equipment that Jones designed for the Fowler-Mumford M.7 process earlier in 1913.⁶⁹ However, patent scope is not determined by the specifically described equipment and methods, but by the language of each claim at the end of the patent. Claims are drafted in order to be as broad as possible, covering not only the described structures and methods, but also many variations on them, so long as none of these variations appears in the prior literature.

The written description portion of the '540 patent describes aeration used for activating bacteria, so in that sense it is similar to what we have characterized as an activated sludge process, but it lacks any discussion of settling and saving sludge, preferring instead to keep it in constant motion. And, of course, since no sludge is created there is no feedback

⁶⁶ Milwaukee's brief on appeal, [2C22](#), confirms this strategy by the city. Under the heading of infringement, it merely recites how the city's treatment plant operates (pdf 2), with no significant attempt to distinguish it from the claim language of any of the asserted claims. There was a brief indication on appeal ([2C22](#) at pdf 121) that the city contended it was not infringing because its plant was continuous operation, rather than fill-and-draw -- a weak contention as the claims are generic to both operations. The contentions were essentially all on invalidity.

⁶⁷ [2B6.2](#).

⁶⁸ The meaning of claiming the benefit of a foreign filing date is this: Under the Paris Convention, member countries accord a sort of "pretend" filing date to an application in any of their respective countries, treating it *as though* it had been filed on the date of the earliest filing in another country (usually the home country), provided the applicant follows up with filings in other member countries within one year. See 35 U.S.C. § 119 (2012).

⁶⁹ [2C8](#).

of sludge to an aeration chamber. The description focuses on the use of multiple small-bubble air sources, called diffusers. However, as mentioned, it is not the written description that defines the scope of the patented subject matter, but rather the language of a particular claim. We therefore turn to the claims of the '540 patent. Claims 2, 3, 7, 11, and 13 of this patent were asserted to be infringed by Milwaukee, and hence they were the only claims adjudicated by the courts. Since each claim stands on its own as a sort of mini-patent, as an insurance policy in case the broadest claim turns out to be invalid in the courts, patent practitioners write many claims ranging from broad to narrow in an application.⁷⁰ If a later infringement defendant is operating within the language of any one valid claim, infringement is established and the patent owner wins the case, regardless of whether any other claims are valid or infringed. For simplicity we shall analyze only the broadest asserted '540 claim, which appears to be claim 7, and a somewhat narrower one, claim 11. (The remaining asserted claims are reproduced in the note below.⁷¹) These two method claims read as follows:

7. The process of treating sewage and the like, consisting in causing an up and down flow, and a lateral flow in the liquid, and returning the sludge to the upflow.

11. The process of treating sewage and the like, which consists in introducing air locally into the mass of liquid at a plurality of points, and

⁷⁰ If they were assured that the most broadly worded claim will ultimately be found valid at the highest judicial levels, there would be no need for any narrower claims. But that is never knowable. The extent of the prior literature is never fully located at the time of filing and prosecuting a patent application; and many issued claims are later ruled invalid by courts due to factors like obviousness (the claimed apparatus or method would have been obvious to a worker of ordinary skill at the time of filing) or even lack of novelty.

⁷¹ Claim 2: The process of treating sewage and the like, consisting in causing a local upflow in the liquid, supplying air into the liquid in its upflow, and causing this liquid and the sludge or solid matters contained in it to flow to a point of the part of the flow which is being supplied with air.

Claim 3: The process of treating sewage and the like, consisting in causing a local upflow in the liquid, and supplying air locally into the liquid in its flow, causing the sludge or solid matters to pass to a point of the part of the flow which is being supplied with air, and removing the clarified liquid from the body.

Claim 13: The process of treating sewage and the like, consisting in delivering locally to the lower portion of a mass of sewage a plurality of successive increments of infusions of minute bubbles of air; causing the sewage at the points of delivery of increments of air to rise by the infusion of air therewith; and causing the sewage freed of the air to fall and come under the influence of succeeding increments of air.

thereby setting up upcurrents in the sewage over the air supply localities, and permitting the sewage to flow outward from the upper part of one of the upcurrents, and descend and flow into the path of another upcurrent.

Claim 7 appears to cover (i.e., to embrace, along with other specific processes) not only the process described in the Jones '540 patent but also the M.7 process done earlier in 1913 and published by Fowler and Mumford. If a patent claim is broadly worded such that it embraces not only new configurations or methods but also an old one, it is completely invalid and cannot later be saved by editing in the court. That is most likely the situation with this particular claim.

Claim 11 is also broad, but it is more nuanced. It recites multiple air injectors, spaced apart from each other in an aeration arrangement that allows the liquid being purified to move from one injector to the next, where it is again pushed upward. This is something that as far as we know was not done in the M.7 process, and perhaps was never done before the Jones filings. The claim once allowed and issued was, then and now, presumed valid by law,⁷² or at least the burden of proving otherwise was always on the challenger. The processes covered by this claim appear to have been invented by Walter Jones. The bottle process used in the Ardern-Lockett experiments would not have been covered by this claim; they did not involve multiple airjets moving the liquid up, down, and up again at a different location. No focused validity challenge was directed specifically at this claim by Milwaukee. Both sides in the litigation seemed instead to lump all the claims together into a single "activated sludge process" and argue about who invented it. Upon the available evidence, this claim was valid.

Curiously, Milwaukee did not present any serious argument on the subject of whether any of the asserted claims were or were not infringed by the operations of the city's treatment plant at Jones Island. We do not know whether this was an advocacy tactic to keep the

⁷²There was no explicit "presumption" articulated in the patent statute at the time of this case. However, such a presumption had long been established in the case law. See, e.g., *Agawam Co. v. Jordan*, 74 U.S. 583, 597 (1886). Moreover, the applicable statutory provision for defending against an infringement suit, R.S. § 4920, enacted in 1874 and amended in 1897, had the same effect by placing the burden of proof of invalidity facts on the accused infringer. The section stated that the defendant, provided he gave notice thirty days prior to trial, "may prove on trial any of the following matters," followed by a list of validity-defeating events, including that the named inventor was "not the original and first inventor or discoverer of any material and substantial part of the thing patented." The equivalent "presumption" wording was first statutorily introduced in the 1952 patent statute, which declared that patents were "presumed valid." 35 U.S.C. § 282 (2006).

court focused on the invalidity issue, or whether the Jones Island treatment plant had such up-down-up air jet arrangements. In any event, the courts would soon find infringement of all the claims, treating the point as though it were conceded.

Given the diffused nature of Milwaukee's evidence on the inventorship question, and the burden of proof imposed by the patent statute, it is difficult to conclude anything other than what the courts concluded: This claim was both valid and infringed. Since infringement of one valid claim constitutes patent infringement, on this ground alone Milwaukee would have been liable in the case.

2. The Jones '587 patent

The second patent in suit in the Milwaukee case was Jones's U.S. patent 1,282,587, or the '587 patent. The application leading to this patent was split off, or divided out of, the original application by a decision of the patent examiner, in order to examine separately the apparatus claims, leaving the original application with only method claims. In patent law such a divided-out application is entitled to the same effective filing date as the original application, and also entitled to the UK filing dates of October 11, 2013 and January 10, 2014, both dates being prior to the Ardern-Lockett presentation in March 2014. Claims 2 and 8 were asserted in the case against Milwaukee:

2. In an apparatus for purifying sewage, comprising a tank, means for introducing air or oxygen at the lower part of the tank, said tank being of a size above the air-introducing means to provide a material-receiving area above and laterally of such means and beyond the direct influence of the air from such means, the tank being inclined adjacent and laterally of the air introducing means to induce a flow of material to such means from that portion of the tank beyond the influence of such means.

8. In apparatus for purifying sewage, a chamber; a plurality of air supply devices in the bottom of the chamber separated a substantial distance from one another, a surface between said air supply devices without air supply means, adapted to cause the material deposited thereon to pass to and above air supply devices; substantially as set forth.

Claim 2 recites the sloping-floor tank arrangement, one that encourages deposited solids to move toward an air injector so that they can be again moved into the airstream and

thus kept in continuous agitation. Like the claims of the '540 patent, this claim is not phrased narrowly to cover only the activated sludge process. It does not require collection of sludge in a quiet settling tank prior to feedback of such sludge into the aeration zone, or drawing off of clear, largely organic-free, effluent from such a settling tank. Instead, all of the sludge is constantly whirled back into contact with incoming sewage in a single aeration chamber.

Claim 2 could involve a tank of the kind used in the Fowler-Mumford experiments, published August 22, 1913,⁷³ some two months before the earliest effective Jones filing date of October 11. The claim's validity therefore depends on what sort of tank equipment was earlier used by Fowler-Mumford and who designed it. The early Fowler-Mumford M.7 experiments and published paper were aimed primarily at eliminating the costly on-the-ground filtration of sewage then in vogue in England but not very effective, and shifting over to the use of chemical precipitants that might possibly be less expensive and more effective. It will be recalled that their process relied on an iron-containing bacterial precipitant called M.7. The work was abandoned in 1914, but it had in the meantime been described in a printed publication. The publication was part of the prior literature and therefore might be used to invalidate a claim of later patent applicants if it disclosed a system having all features of the claim.

The published paper does not describe the aeration tank used. A settlement period is mentioned, signaling that the method was fill-and-draw rather than continuous. To carry out the process described in the paper, twelve hours would be needed, six for aeration and six for settling⁷⁴ prior to drawing off the effluent into a local stream. The paper was chemistry-focused, and the asserted technological advance was in the organism used for precipitation.⁷⁵

Ernest M. Mumford was deceased at the time of the 1928 Milwaukee trial, but his widow, Gladys Mumford, also a chemist, testified for the plaintiff, Activated Sludge Inc., at the trial. She and her husband both owned shares in the British parent company, Activated Sludge Ltd.⁷⁶ Mrs. Mumford worked for Fowler in a laboratory that sometimes did

⁷³ [2C8](#), published in the U.K. journal THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER.

⁷⁴ Id. at pdf 3.

⁷⁵ Id.

⁷⁶ Mumford testimony, [2C15](#), at pdf 2.

contract work for Jones & Attwood. Mrs. Mumford testified that she saw the M7 tank in the summer of 2013, but she did not give details of its construction or who designed it.⁷⁷

On this weak extant record we would have to conclude that claim 2 of the Jones '574 patent had not been proved invalid. No evidence disproving the inventorship of Walter Jones for this claim was forthcoming at the trial. The claim language was not specific to the M.7 process and might have been used later in the actual two-tank activated sludge process. Claim 8 is quite similar to claim 2 in scope, and it would similarly be properly held valid on the evidence introduced.

3. The Jones '542 patent and its reissued version

We now move to another, year-later filing by Walter Jones, this time with U.K. filing date of November 19, 1914. It resulted in the issuance in late 1917 of United States patent 1,247,543⁷⁸ and reissued in 1921 as Reissue patent 15,140.⁷⁹ In U.S. patent practice a reissued patent is sought because the original is thought to justify the allowance of either broader claims or narrower ones, where those claims, due to oversight, were not presented during prosecution of the original patent. The original has to be surrendered when the reissue is granted, and the patent term is not extended by reissue.⁸⁰ The reissue enjoys the same effective filing date the original patent had. What happened here in the reissue was the addition of four claims that were not present in the original patent. In the Milwaukee case, original claim 3 and reissue claims 7-10 were asserted to be infringed. Claims 3 and 8 are illustrative for our purposes:

3. The process of purifying sewage or analogous liquids, consisting in gradually supplying the crude sewage to a body of bacterial sludge or solid matter, aerating or oxidizing it while so being supplied, then allowing the

⁷⁷ There was apparently a drawing that might have disclosed this construction, but the court sustained an objection to its admission into evidence. *Id.* at pdf 5.

⁷⁸ [2B9.2](#).

⁷⁹ [2B9.4](#).

⁸⁰ At the time, and until 1995, U.S. patents were issued for a term of seventeen years, beginning on the issuance date. Today a patent's term still begins on the issuance date, but it normally expires twenty years from the United States filing date. See 35 U.S.C. § 154 (2012). Under either regime reissue does not extend the patent's term, but adds additional claims not present in the original grant.

liquid to remain quiescent, and gradually drawing off the purified liquid from near the surface, and leaving the sludge or solid matters.

8. The method of purifying sewage and other impure liquids by the activated sludge process, by separating the sludge from the sewage or liquid which has been treated, aerating such sludge so separated for increasing the activity and efficiency of the bacteria of the sludge, and treating fresh sewage or liquid with such re-invigorated sludge.

These claims go to the heart of the case; they represent the broadest expression of the family of activated sludge processes. Their language would cover either single-tank fill-and-draw operations or two-tank continuous flow with sludge-feedback operations. Claim 8 is somewhat narrower than claim 3, in that it specifies aerating the separated sludge separately, before applying the "re-invigorated sludge" to incoming sewage. This is a step not performed in modern treatment plants. We suspect it was not done in Milwaukee's early plant either, but the city chose not to make a noninfringement issue on the point. Its litigation strategy was to try to invalidate all the asserted claims of all the Jones patents, the only way the city could be sure to avoid infringement liability.

This reissued patent had an effective filing date no earlier than November 19, 1914, well after the Ardern-Lockett presentation and publication. It therefore raises the central question in the Milwaukee case: Who were the inventors of the subject matter claimed here? From what we have thus far developed herein, it would appear the answer is that Ardern and Lockett were the co-inventors of the claim, unless their work be disregarded as merely theoretical and not practical. Their work was publicly reported on March 30, 1914, more than seven months prior to the earliest Jones filing date for this patent (original and reissue), and over six months before Jones first met Professor Fowler on October 24 of that year. Walter Jones, the superb metal systems designer, forward-thinking employer, and civic-minded person, never claimed to have been first to think of the biologic aspects of the activated sludge sewage treatment process. In fact, he said he never knew anything about the science involved until it was explained to him by Professor Fowler. Could Jones nonetheless have properly been called the inventor for these patent claims? The testimony at the Milwaukee trial was to the effect that Professor Fowler gave Mr. Jones "permission" to "take out" patents on the process.⁸¹ This is a common popular misconception of patent law, and apparently neither Fowler nor Jones appreciated that the permission was meaningless. A patent application must name the

⁸¹ See, e.g., Fowler testimony, [2C11](#) at pdf 9.

correct inventor in the paperwork. The application can then be assigned to anyone the inventor chooses. That person then becomes the owner of the application and of any patent issuing out of the application, but does not become the inventor. Failing to keep this seemingly overformal legal proposition in mind often leads to patent invalidity.

Jones then put the matter in the hands of British patent agents to accomplish what Fowler suggested. Jones would not likely have scrutinized or challenged any fine print about "inventor" in the British patent application papers.⁸² The UK document in the litigation record recites only that

We, Walter Jones J.P. and Jones and Attwood Limited, Engineers, all of Titan Works, Amblecote, Stourbridge, in the County of Worcester, do hereby declare the nature of this invention to be as follows

This form would likely not suggest that Mr. Jones had to attest that he personally conceived the subject matter involved. For his U.S. applications Mr. Jones was obliged to sign a form oath document for each of his applications, swearing that he

verily believes himself to be the original, first and sole Inventor of the Improvements in and connected with the purification of sewage and analogous liquids, described and claimed in the annexed specification . . .

⁸³

followed by a long litany of legalistic-sounding sworn recitations about what events he believes have *not* happened, namely any of the novelty-defeating events, such as the information having appeared in a printed publication more than two years before the U.S. filing date, or having been known or used by others "before his invention thereof," or having been on sale in this country more than two years before the filing.⁸⁴ Even this modest declaration would have raised the same issues as those faced by Walter Jones,

⁸² From the patent records in evidence in Milwaukee, the U.K. Jones declaration for the complete U.K. application stated, as a prelude to the written description of the invention, merely that the applicants (Jones and his company): "do hereby declare the nature of this invention, and in what manner the same is to be performed," [2B9.4](#) at pdf 3. The UK rules at the time required a statement of inventorship, but such statement does not appear in the record for any of the patents in suit. The much more elaborate inventorship oath required by the U.S. patent law does appear, at [2B9.3](#) at pdf 10 and 14.

⁸³ [2B9.3](#) at pdf 10.

⁸⁴ See 35 U.S.C. § 115(b) (2012). In recent years the United States has considerably relaxed what the inventor must say, boiling it down to only reciting the belief in being an original, not necessarily the first among several independent conceivers.

because, under the Milwaukee version of the facts, he was not an inventor (conceiver) at all, but learned everything from others. The point here is that at the time of the Jones filing the inventorship recitations were quite complex and difficult to understand for anyone not schooled in the details of patent law.

Getting the inventorship wrong in those days could be fatal to validity. If it happened by mistake and was caught while still in the Patent Office, a substitute application could be filed naming the correct inventors.⁸⁵ But if nothing was done, a null and void patent would issue. Moreover, even if the error were caught early, for Walter Jones to correct the application to name Ardern and Lockett would have been problematic, because they were not Jones & Attwood employees but of the City of Manchester, and they had no legal obligation to assign the application to Mr. Jones or his company. The patent when issued would have been owned by Ardern and Lockett or by their employer, the City of Manchester.

What was the federal court in Wisconsin to do about these many allegations of improper inventorship? To answer that, it perhaps would be best to turn to the writings of the jurist called upon to decide the question, U.S. District Judge Ferdinand Geiger of the Eastern District of Wisconsin, the judge presiding over the case of *Activated Sludge, Inc. v. City of Milwaukee*. He concluded on the evidence presented that Walter Jones was the original and first inventor on all four patents in suit.

III. The Milwaukee Court Case

A. The Beginning

The infringement case against Milwaukee was brought in federal court on June 15, 1928, on what was then called "the equity side," meaning essentially that it would be decided by a judge without a jury. The complaint was boilerplate in form, asserting that Walter Jones was the original and first inventor for all the patents involved, that in each instance he lawfully filed for U.S. patent protection, that the patents had been duly issued, and that he had assigned them to the plaintiff, Activated Sludge, Inc., a Delaware corporation, and

⁸⁵ If it went undetected until after issuance, it could perhaps be corrected by reissue procedure, but that course of action was unknown until a Patent Office decision on the point in 1971. See *Ex parte Scudder*, 1971 WL 16488 (Pat. Offc. Bd. Apps. 1971).

that Milwaukee was infringing them.⁸⁶ Milwaukee in its answer denied all the significant allegations of the complaint.

The case was assigned to Judge Ferdinand Geiger.⁸⁷ He was born in Wisconsin in 1867. Following 24 years in private practice in Milwaukee he was appointed to the bench in 1912 by President Taft. He was 65 years old at the time of the trial, which began on May 20, 1929.

Activated Sludge was represented in the case by patent attorney Lynn Williams of the Chicago patent firm Williams & Bradbury. The lead role for Milwaukee was in the hands of Wallace R. Lane, partner in another Chicago patent firm, Parkinson & Lane. Lynn Williams and Wallace R. Lane, who had the two opposing lead roles throughout the case, were thoroughly experienced patent litigators. Each later became president of the Chicago Patent Law Association. Lane, although a Chicagoan, was engaged by Milwaukee probably because he had been vigorously representing Chicago in the earlier-filed but later-tried infringement suit and knew the evidence, the patents, and the opposing counsel well.

Testimony offered in the Milwaukee case was largely by way of depositions taken in England before a local commissioner, under a formal request of Judge Geiger for taking testimony abroad. The lawyers had also agreed that the testimony would be usable in both the Milwaukee case and the Chicago case. A few witnesses also testified live at the Milwaukee trial.

B. Decision

The trial was concluded in June 1929 and post-trial arguments were heard that same month, but it lay undecided for nearly four years thereafter. Finally, on February 7, 1933, Judge Geiger issued his opinion, a closely-spaced 75-page typewritten document.⁸⁸ Why did it take so long to decide? One reason might be that he was at the time the sole federal judge for the Eastern District of Wisconsin, so he may have had more pressing cases to decide. Another possibility is that he deferred deciding the case in the hope that it would settle, as the great majority patent cases then and now do, although that usually happens

⁸⁶ Complaint, [2C3](#).

⁸⁷ Court portrait of Judge Geiger at [2F1](#). His courtroom is shown in [2F2](#).

⁸⁸ [2C20](#). For an easier-to-read printed version, see [2C20.1](#).

before trial. The most likely reason for the delay, however, is a judicial tendency, sometimes seen even today, to procrastinate in coming to grips with complex cases that raise numerous technical questions that might be difficult to deal with. The first fifteen pages of Judge Geiger's opinion are devoted to an explanation of what is going on in the activated sludge processes as seen in that case. He discussed the key role of aerobic bacteria and the absence of need for chemical precipitants in settling them to the bottom of a tank after they had digested solids suspended in the incoming sewage.

On the question of inventorship in the context of a modern, multi-participant project, Geiger put the question succinctly: "[T]he question really is, at what point, and through whose work, in the chronology of development can the definition of inventive act be framed?"⁸⁹ Despite the long list of persons contended by Milwaukee to be the "true" inventors of the activated sludge process, the judge noted that the most eminent biochemists, bacteriologists, and sanitary engineers in the country had been brought to trial and had opined one way or another on the subject, but had all essentially agreed on what the subject matter at issue was.⁹⁰ Unfortunately, in the view of this writer, the judge compressed the patented subject matter into what he called "the process," rather than analyzing the wording of each of the patent claims at issue. While these claims all related in some way to the activated sludge process as defined here, the various aspects of method and apparatus defined in the claims were lost in the compressed view taken by Judge Geiger. This was probably not his fault; he was led to this compressed summary, rather than to claim-recitation details, because both sides argued the case that way. The tenor of the extant documentation, and especially the later briefing in the court of appeals, adopts the compressed summary approach, as though these patents dealt with a single development only. So Judge Geiger, after dutifully laying out the wording of the claims in issue, never alluded to these boundary words again. Everything was about who invented "the process."

Having adopted this single-issue view of the case, Judge Geiger then laid out the list of alternative persons contended by Milwaukee to have invented this process. This was an understandable litigation strategy for the city, for it tended to show that the patents were invalid because so many scientists and engineers seemed to have found "the process" before. On the other hand, it tended to force Judge Geiger to select one "winner" from the pack of competent people, a choice difficult for anyone who is looking back 16 years to the times in question. It may be safer to go with the presumption of validity accorded to

⁸⁹ Geiger opinion, [2C20.1](#) at pdf 3.

⁹⁰ Id.

an issued patent, carrying with it the presumption that the inventorship was correct -- that it was Walter Jones. This is exactly what happened. We now describe how the judge came to that result.

Milwaukee's list of alleged prior inventors included, among many others, Harry Clark, of the Lawrence Experimental Station in Massachusetts. The plaintiff, Activated Sludge Inc. (hereafter ASI), conceded that Clark's early work had been the impetus for discovering the activated sludge process; but as discussed earlier, he did not find all the steps to complete the process, and he missed the key feature. ASI characterized the novelty of the activated sludge process as bringing the bacteria to the sewage, rather than bringing the sewage to the bacteria as Clark had done.

Fowler and Mumford, working at the University of Manchester, were also alleged by Milwaukee to be the inventors. Judge Geiger dismissed their M7 experiments as being too limited, requiring the use of iron-containing precipitants.

The court's conclusions regarding the Ardern-Lockett work are a bit murkier. Judge Geiger found that the initial Jones filing in October 2013 "shows a clear conception of the bio-chemical theory and of the necessary pursuit of steps . . . to increase aerobic activity" and to prevent the permanent sticking of solids on the walls of the aeration tank.⁹¹ Actually, that filing discussed no bio-chemical theory, although it did mention that the objective was to increase the activity of aerobic bacteria in the purifying of sewage and that a large total contact surface area would be needed for air bubbles to carry out that function. The filing certainly did not disclose the no-precipitant-needed, two-tank arrangement of what became known as the activated sludge process.

The judge rejected Milwaukee's contention that the triumvirate of Fowler-Ardern-Lockett should be regarded as the co-inventors, and credited Walter Jones as sole inventor for all claims of all patents in suit. This finding was a result of lumping all four patents, and their various asserted claims, together as one and trying to find a single inventor or single set of joint inventors for all. Primarily the judge relied on Jones's early British filing dates -- October 11, 2013 for the provisional application and January 10, 1914 for the complete application -- as showing a complete

⁹¹ Id. at pdf 15.

conception of a process for continuity of aeration and intimacy of contact as a condition of maintaining bacterial activity -- aerobic -- and in their rather clear negation of permanency, fixation or settlement of solids.⁹²

That characterization of the Jones UK filings is correct as far as it goes, but it does not involve complete conception of the activated sludge process. For example, the activated sludge process actually relies on the settling out of some solids, i.e., settling of flocculated bacteria after being energized by consumption of sewage-suspended solids. Negation of the "settlement of solids" is therefore not the activated sludge process.

The judge mentioned that Jones's UK filing was on April 11, 1914, a month before the Ardern-Lockett paper was published (but after their March presentation). This Jones filing adds nothing to the inventorship analysis. Judge Geiger also relied upon the UK filing date for Jones's next patent, US 1,247,542. The application for this one was filed in the UK on November 19, 1914, well after the Ardern-Lockett paper was published, and the counterpart was filed in the U.S. the following October. With such late dates it is difficult to see how anything about the sequence of inventing can be deduced. Yet Judge Geiger noted that these filings showed a "clear conception of the theories developed" in bacterial research and in apparatus design. That may be true, but it does not track the time sequence of events and therefore does not provide ground for attributing the inventorship to Walter Jones.

The judge probably was aware that he was on rather shaky ground here. He conceded the Ardern-Lockett paper published in May 1914 was "an important item of evidence."⁹³ He did not, however, find that the paper was ground for awarding inventorship to its authors. Instead, he confirmed Walter Jones as the inventor of the full-fledged activated sludge process for two reasons: (1) The paper was merely a recitation of laboratory work, and did not, in patent law terms, disclose conception of a practical-scale treatment method or facility;⁹⁴ and (2) the experimentation reported in the paper was, in the judge's view, actually masterminded by Walter Jones behind the scenes, utilizing the lab-worker authors as helpers.⁹⁵ The first of these reasons has some plausibility, for the caselaw line between laboratory and practical is a rather fine one, and a decision could go either way. The second had no support in the record, other than the testimony that Fowler and Jones

⁹² Id. at pdf 16.

⁹³ Geiger opinion on the merits, [2C20.1](#) at pdf 17.

⁹⁴ Id. at pdf 17.

⁹⁵ Id. at pdf 18.

had met in the fall of 2013, before the Ardern-Lockett experiments had been done. While Walter Jones was certainly interested from an apparatus construction and selling perspective in the research and its eventual utilization, there is no indication from any of the witnesses that Fowler, or Ardern and Lockett, were receiving instructions or suggestions from Jones regarding their experiments. It will be recalled that the experiments were done on 80-ounce laboratory bottles, with no elaborate equipment involved, so a Jones directorship seems improbable. Judge Geiger's inventorship determination was therefore supported on the single assessment that the Ardern-Lockett paper was too theoretical and impractical for them to attain inventorship status.

Even if the court's assessment of the Ardern-Lockett paper was correct, and if Jones provided the practical implementation to the process, it is difficult to find any justification for excluding Ardern and Lockett as co-inventors with Jones. This would have led, of course, to a possible claim to co-ownership of the patents by their employer, the City of Manchester. Their employment arrangements would likely have required them to assign any on-the-job inventions to the city. It would then have been up to Jones & Attwood as one co-owner, and Manchester as the other, to work out who would enforce the patents -- in the U.K. and in the U.S. -- and on what terms. Co-ownership of a patent is a dangerous thing. Under U.S. law, unless there is an agreement to the contrary any co-owner can freely license the patent in toto to anyone she chooses, without accounting to the other co-owners for any profits obtained thereby.⁹⁶

Judge Geiger inserted in his opinion a passage reflecting his aversion to elitist attitudes about inventors, attitudes which he no doubt found between the lines in Milwaukee's arguments, and which may go a long way to explaining the district court's decision in the case. Milwaukee seemed to be saying, as many commentators since then have appeared to say, that the activated sludge process, being a scientific one, must have been invented by scientists or engineers, not by mere tradesmen trying to sell their equipment. The judge's remarks are worth quoting in full:

Before leaving the situation as it developed at Manchester, it is deemed proper to give some consideration to other evidence challenging Jones's right to patents. This is counted on by defendant, with the view to attributing inventorship to Lockett or Fowler as last above discussed, and is based in part upon Jones's alleged incapacity and want of competency to

⁹⁶ See present 35 U.S.C. § 262 (2012); and *Talbot v. Quaker State Oil Refining Co.*, 104 F.2d 967 (3rd Cir. 1939).

participate in the *inventive* endeavors. I think the law respecting the right of one interested in development of patentable processes and structure to call to his aid and association others skilled in any department of a particular art, is quite well settled. . . . Now Jones was not a scientist in the field of bacteriology or bio-chemistry. He was however of large experience in problems of process and structure in sanitation. . . . With this as the situation a conclusion that, because Jones was not a scientific man he could not justly claim these inventions, is wholly repugnant to the governing principle of law.⁹⁷

This passage probably contains the central kernel of the court's ultimate decision. Geiger was offended by the insinuation that someone other than a professional scientist or engineer could be called inventor on these patents. It seems clear he was determined to rectify that view.

We have not yet addressed the part of Judge Geiger's judgment that has made the case a mainstay of the study of patent law in the United States. A few weeks after issuing the opinion we have been discussing, Geiger handed down his final decree in the case. He ruled that ASI was entitled to damages for infringement, to be determined in a later proceeding after an appeal on the validity question,⁹⁸ and to an injunction barring Milwaukee from any longer using the patented process or the patented apparatus.⁹⁹ The injunctive remedy under the patent statute is discretionary. The court is obliged to weigh a number of factors, including the impact on the public welfare, before issuing such an order. Here the impact could well have been the shutting down of the Jones Island treatment plant, probably for several years while some other treatment method was found. This would have left Milwaukee with no option but to resume discharging all its wastewater into Lake Michigan, the drinking water supply not only for Milwaukee and surrounding counties, but for virtually all the cities and towns on or near Lake Michigan in Wisconsin and in Illinois, Indiana, and Michigan. Milwaukee immediately filed an

⁹⁷ Geiger opinion, [2C20.1](#), at pdf 18-19, emphasis in original.

⁹⁸ There is a special statutory provision allowing appeals in patent cases prior to determining damages. See 28 U.S.C. § 1292(c)(2) (2012) (allowing for interlocutory appeals in patent cases where judgment is final except for the accounting). This is intended to save judicial time and resources by making sure the plaintiff is still the winner in the case before proceeding to the damages trial. Such a bifurcated approach to patent trials was the nearly universal practice prior to the 1990s, when many judges turned from it to the view that a single trial is apt to be more efficient.

⁹⁹ *Id.* at pdf 28.

appeal to the Seventh Circuit Court of Appeals. Judge Geiger stayed the injunction pending the outcome of the appeal.¹⁰⁰

C. Milwaukee's Appeal

1. Briefing and Arguments

For its appeal Milwaukee engaged additional attorneys. The first-named lawyer on the brief was Newton Baker. A Cleveland lawyer and founding partner of the BakerHostetler law firm,¹⁰¹ Baker had no background in patent law, but he was a high-visibility addition nonetheless. A former mayor of Cleveland, he had served as secretary of defense in the Wilson administration through the years of U.S. participation in World War I. Baker brought with him into the case his law partner, former federal district judge Arthur Denison. Wallace Lane, who had handled the case in the district court, remained in the case on appeal and probably played a major role due to his intimate knowledge of the evidence. But from the fact that Baker's name is first listed on Milwaukee's appellate brief¹⁰² it would appear likely that Baker had the lead role on appeal and argued the case.

The city's brief on appeal ran to an extraordinary 354 pages. By way of comparison, the general limit on length for an appellant's brief today, absent special permission from the court of appeals, is 30 pages.¹⁰³ The city's counsel were aware how such a huge brief might be viewed by the judges. They included on the title page a justification for the length: First, the record in the case was so huge that they had elected to quote heavily from the exhibits in the brief rather than asking the judges to hunt for them. Second, they alluded to the shortness of time they had been "allowed for this brief" and said it had

¹⁰⁰ See the State of Wisconsin's brief on appeal, as *amicus curiae* (friend of the court), [2C22.1](#) at pdf 7. The stay order has not been found among the extant records, but in those days most civil injunctions were suspended during appeal. The situation in patent cases changed radically in this regard in the 1980s, when the Court of Appeals for the Federal Circuit refused a stay sought by Eastman Kodak in the long-running case brought by Polaroid regarding instant photography. 833 F.2d 930 (Fed. Cir. 1986). This meant an immediate cessation of sales, shipments, and services by Kodak, and even removal of instant cameras and instant film from thousands of photo shops and drug stores around the country. From that time on, getting an injunction stayed on appeal in a patent case became the exception rather than the rule.

¹⁰¹ The firm continues today, with nearly 900 lawyers and offices in 14 cities.

¹⁰² [2C22](#).

¹⁰³ Rule 28.1, Fed.R.App.Proc. The rule allows two alternate method of measuring length: 14,000 words or 1500 lines of a specified kind of type.

become "impossible to rewrite and condense, as we could have done had time permitted." This sounds like the adage of apologizing for writing a long letter on the ground there was insufficient time to compose a short one. A possible reason for the shortness of time centers on the injunction. As mentioned above, it was suspended pending the appeal. When a court suspends an injunction it often does so on condition that the parties observe a shortened briefing period and an early argument date.

Milwaukee's brief on appeal focused, as had its case in the district court, on the inventorship issue. Through its hundreds of pages the brief took aim at Walter Jones and put up a large number of alternate persons it believed to have been earlier inventors. ASI's responsive brief ran even longer than the city's, to 406 pages (today 35 pages is the norm in the appellate rules for a responsive brief, unless the court upon motion permits a longer one). It sought to tell a completely different story, elaborating on all the troubles faced by sanitary engineers for such a long time prior to the Jones patents, the numerous failures, and how these problems were now overcome, assertedly due to the inventions of Walter Jones, assisted by some others but nonetheless under his direction as found by the district court.

ASI's brief cast particular criticism at Milwaukee's chief sanitary engineer, T. Chalkley Hatton. Mr. Hatton had to some extent inadvertently poisoned the well for his employer by attempting several years before the case began, to block allowance of the Jones applications by the U.S. Patent Office. There was at the time no formal procedure for objecting to applications on the ground of lack of novelty or of obviousness.¹⁰⁴ Hatton had apparently heard about Jones's filings and undertook to block them by a long correspondence with Patent Office officials.¹⁰⁵ None of this had amounted to anything. Judge Geiger had mentioned the Hatton attacks in his opinion, noting "these contentions failed to intercept issuance of the patents."¹⁰⁶ ASI pursued this theme in the court of appeals, the advocacy being that Milwaukee's arguments were old hat, rejected by both the Patent Office (unofficially) and the district court.

¹⁰⁴ Submissions of prior literature were allowed at the time, but due to non-publication of pending applications until a law change in the 1990s, the Patent Office gave short shrift to such submissions. It was virtually impossible to identify which application was the subject of the objection, and all examinations were done in secret. That situation is different now. Any person can submit prior literature (patents and other printed publications of known date), subject to a few timing and procedural constraints, and the patent examiner is obliged to consider the submission before allowing the application. See 35 U.S.C. § 301 (2012).

¹⁰⁵ See [2B12.1](#) at pdf 1-15.

¹⁰⁶ Geiger opinion, [2C20.1](#) at pdf 27.

The State of Wisconsin intervened in the appeal, filing an amicus curiae (friend of the court, although not a party to the case) brief arguing against the injunction decreed, albeit temporarily suspended, by Judge Geiger.¹⁰⁷ The state urged that public health would be seriously jeopardized if the sole treatment plant for Milwaukee had to be shut down due to patent infringement.

The three-judge panel hearing the appeal in the Seventh Circuit was composed of circuit judges Evan Evans, William Sparks, and Louis Fitzhenry. Judge Evans was a Wisconsin native and a graduate of the University of Wisconsin's law school. Judge Fitzhenry was an Illinois native who practiced law in Bloomington before going on the bench. The opinion-writing for the court in our case fell to Judge Sparks. An Indiana lawyer and former Indiana state judge, Sparks served on the federal Seventh Circuit court of appeals from 1929 to 1950.

2. Appellate Decision

The Seventh Circuit affirmed Judge Geiger's decision on all points save one. The exception was the writ of injunction against the city's operating the Jones Island treatment facility. The court of appeals found that was against the public interest because of the serious threat to public health attending shutting down the Jones Island plant, as argued by the State of Wisconsin in its friend-of-the-court brief in the case, so they reversed Judge Geiger's decision to grant the injunction. Beyond this the three appellate judges found no error in the district judge's rulings, particularly on the central issue of whether the city had proved Walter Jones was not the sole inventor for the claims of the patents in suit.

In reaching its decision on inventorship the court basically tracked what Judge Geiger had found. The court disposed of any inventorship status for Ardern and Lockett, on dual grounds: (i) their work was experimental and not practical;¹⁰⁸ and (ii) even if it were

¹⁰⁷ Wisconsin brief, [2C22.1](#).

¹⁰⁸ [2C24](#) at pdf 13.

practical, they were operating under the control (through Professor Fowler) of Jones & Attwood and Walter Jones.¹⁰⁹

One unexpected twist in the court of appeals decision is that it undertook to refute Milwaukee's rather belated assertions of noninfringement. This is surprising because the whole issue of infringement vel non seemed absent from the case, even at the appellate briefing phase. In scanning through Milwaukee's brief on appeal no contention of noninfringement is seen, and basically none had been set up in the district court. It must have resulted from a change of thinking between the briefing and oral argument. We have no extant record of how the oral argument progressed, but the court several times mentions Milwaukee's contentions on noninfringement, and then rejects them.¹¹⁰ Moreover, for the first time in this lengthy patent litigation the court (and presumably the parties at oral argument) actually addressed the claim language, patent by patent, in arriving at its conclusions of infringement, something they had not done on the validity question. It will be recalled that prior to this stage the parties had basically lumped all the patents together under the rubric of "the activated sludge process" and then battled over who invented "it."

As an ancillary matter, we should mention that in the district court Milwaukee had urged that the city was not responsible for any patent infringement in sewage treatment. The argument was that the Jones Island plant had been financed, built, and operated not by Milwaukee but by its Sewage Commission. The court of appeals quickly disposed of this contention, in a short opinion in 1934. For the sake of brevity we omit discussing it further here, but the court's decision is included in the library.¹¹¹

3. Milwaukee's Attempt To "Take It To the Supreme Court"

We often hear people proclaiming to news media that they will take their cases to the United States Supreme Court. There was a time when a broad right of appeal to the high court existed, but that time is long gone. With Congress's establishment of circuit courts of appeals in 1891, those courts became for most cases the court of last resort. Now

¹⁰⁹ The role of Fowler, Ardern, Lockett and others was characterized by the court as "ancillary" to the work of Jones, *id.* at pdf 14, citing the Supreme Court's decision on the contribution of co-workers in *Agawam Woolen Co. v. Jordan*, 74 U.S. 583 (1868).

¹¹⁰ [2C24](#) at pdf 17-22.

¹¹¹ [2C25](#).

getting a case before the Supreme Court is, in most areas of law, an unlikely happening, achieved by petitioning for certiorari -- asking the Court to take the case -- and having at least four of the nine justices vote to grant the petition, i.e., agree to hear it. The vast majority of petitions are denied, generally with no reasons given. It is a longshot at best.

Undeterred by the long odds or by the losses in the two lower courts, Milwaukee labored on by seeking Supreme Court review. Newton Baker and Judge Denison of Cleveland appeared on the certiorari petition, along with Wallace Lane of Chicago, as they had done in the court of appeals.¹¹² In terms of advocacy the petition suffered from being overly lengthy, from failing to raise points with advocacy appeal until relatively late in the document, and from raising too many points (12) to be effectively advocated. The petition was denied less than three months later.¹¹³ It stands, nonetheless, as a valuable resource for the history of the activated sludge process and for the enforcement activities of Activated Sludge Inc. Filed in July 1934, Milwaukee's certiorari petition recognized straightaway that the activated sludge process had become "the best known process for its purpose [of purifying sewage]."¹¹⁴ To show the public importance of the case, and why the Supreme Court should hear it, Milwaukee's lawyers set out how successful the process had become in the twenty years since its initial development, and then tried to attack Walter Jones for imposing royalty demands on cities around the United States for its use. This does not have a ring of a terrible injustice about it, but it may have been the best argument the city's lawyers could devise under the circumstances. The petition reached supposed legal errors committed by the courts below only at the ninth printed page of the petition -- probably too late to have much advocacy traction.¹¹⁵

However, the petition tells us several important things that are not otherwise in the extant archival records. It discoursed at some length about the public perils occasioned by these patents for the city of *Chicago*, reminding the justices of the Supreme Court's role in the Lake Michigan water diversion controversies that are the subject of our Library 1. The petition said Chicago had gone over to the activated sludge process, and that ASI's royalty demands from that city would probably amount to over \$1.5 million.¹¹⁶ The ASI royalty demands were keyed to each particular facility, based on cost of construction and the population served. Small cities were being asked to pay several thousand dollars, but

¹¹² Cert. petition, [2C26](#).

¹¹³ [2C27](#).

¹¹⁴ Cert. petition, [2C26](#) at pdf 5.

¹¹⁵ See id. at pdf 7.

¹¹⁶ Id. at pdf 6.

the larger ones "up to several hundred thousand dollars."¹¹⁷ The petition provides context for these demands: the Chicago sanitary district had issued construction bonds for some \$42 million, of which the amount commonly demanded by the plaintiff ASI "would consume upwards of \$1.5 million."¹¹⁸ In truth many of these plants would actually become significant revenue producers for the cities involved, offsetting the royalties involved, but that may not have been known at the time. In all events it does not strike the modern eye as unreasonable for a patent owner to ask for a royalty of some 3.6% for the use of the subject matter of four patents. Still, Milwaukee's petition portrayed the demand as excessive.

Commenting on the extent of use of the process, the petition attached an affidavit of Mr. Langdon Pearse, a sanitary engineer with the Sanitary District of Chicago, relating that he has made inquiries around the country regarding the present and planned uses of the activated sludge process. He found that 102 facilities were using it; another 16 were under construction, and 20 more were planning to use it.¹¹⁹ This informative historical information points up the advocacy difficulty facing Milwaukee: On the one hand this is a very important invention, but on the other we want the Supreme Court to invalidate all the patents on it.

One may wonder why *Chicago* drew such large mention in Milwaukee's petition advocating reversal of the judgment against Milwaukee. The answer lies in the patent litigation chronology. It will be recalled that the patent infringement suit against Chicago was filed before the one against Milwaukee, but due to procedural problems it was not reached for trial at the time the Milwaukee case was tried. The Chicago case got going in earnest in 1929, while the Milwaukee case was awaiting decision by Judge Geiger. The Chicago case was tried, with interruptions, from 1932 to 1934, and was then decided by the district court in Chicago, but only after Milwaukee's appeal to the Seventh Circuit had led to holdings that the patents were valid and infringed. So now, at the time of Milwaukee's petitioning to the Supreme Court, the story was indeed a tale of two cities.

The Supreme Court denied Milwaukee's petition to review the case,¹²⁰ leaving the Seventh Circuit decision standing.

¹¹⁷ Id.

¹¹⁸ Id.

¹¹⁹ Id. at pdf 10.

¹²⁰ [2C27](#).

D. Time To Add Up the Damages

The refusal of the Supreme Court to disturb the Seventh Circuit's decision against Milwaukee did not signal the end of that case. Far from it. Monetary remedies -- profits gained by the infringer and possible damages to the patent owner -- needed to be assessed by the district court. Many, if not most, patent cases settle the damages issue once the underlying merits of the case are decided at the appellate level. Not so here. Milwaukee was determined to carry on the litigation, and apparently so was ASI. Monetary remedies would have to be decided by Judge Geiger.

After a hiatus of three more years, Judge Geiger, on July 21, 1937, issued a 43-page detailed opinion setting the recoverable profits -- the savings Milwaukee effected by constructing activated sludge plant versus and Imhoff tank structure -- at a little over \$3.4 million.¹²¹ We shall forego discussing the details of this calculation, but the figure is of interest in light of Milwaukee's petition in the Supreme Court as previously described, stating the ASI's royalty demands from larger cities would be "up to several hundred thousand dollars."¹²² With a judgment standing at \$3.4 million, in addition to what was probably a very large expense for attorney's fees, it looked as though Milwaukee had made the wrong choice in not taking a license under the patents in suit for a few hundred thousand dollars.

Again undeterred by Judge Geiger's ruling, Milwaukee appealed the damages judgment. By the following year, 1938, after ten years of litigation both sides had had enough. They settled the damages at \$818 million, terminating the appeal pending in the Seventh Circuit.¹²³ Presumably the settlement agreement (not included in the records now available) provided for a paid-up license under all the Jones patents; otherwise a new infringement suit for ongoing use of the patented process by Milwaukee would have been in the offing.

IV. The Chicago Case

¹²¹ Judge Geiger opinion on the accounting, [2C31](#), at pdf 42.

¹²² It will be recalled that Milwaukee's petition asserted that the projected royalty demand from Chicago, a far larger operation, could be in excess of \$1.5 million.

¹²³ [2C32](#), [2C33](#).

A. Main District Court Decision

As already mentioned several times, Activated Sludge sued the city of Chicago in 1924 for infringing the Jones patents, but the case was held up due to procedural glitches until 1929. For reasons unclear from the record, it then took five more years to reach trial, which was completed and the case submitted for decision on March 28, 1934. The case was in the Northern District of Illinois, before Judge Walter Lindley. He was an Illinois native, receiving his law degree from the University of Illinois in 1910. President Harding appointed him to a district judgeship in the Northern District of Illinois, which includes Chicago, in 1922. Much later, after all the present cases were concluded, he was elevated to the Seventh Circuit Court of Appeals by President Truman. Before becoming a district judge, Lindley's private law practice had been in Danville, Illinois, some 120 miles south of Chicago.¹²⁴

Judge Lindley inherited the *ASI v. Chicago* case from Judge George Carpenter, who had handled the preliminary phases. Trial occurred in various time periods between 1932 and 1934. It largely involved the same patents, the same evidence, and the same contentions that had been raised and decided by Judge Geiger in the Milwaukee case, with this exception: Two additional Jones patents, U.S. patent 1,286,017 and 1,341,561, which had been asserted and then withdrawn from the Milwaukee proceedings, were asserted in this case against Chicago. (The reasons for their withdrawal in Milwaukee are not entirely clear from the record. Milwaukee raised the issue on appeal, but received a terse rejection.)

Judge Lindley knew what had happened in the Milwaukee case, and he decided to play it safe. He saw the decision from the Seventh Circuit -- his own court of appeals as well as Milwaukee's -- affirming the validity of four of the Jones patents, and waited to hand down his decision until ten days after the Supreme Court refused to review that decision. Then, on October 18, 1934, ten years after the case had begun, he decided it.¹²⁵ Strictly speaking, nothing in the Milwaukee case should have been in any way binding in the Chicago case. Chicago, not having been a party in the Milwaukee litigation, was theoretically entitled to its "day in court," untrammelled by anything that had happened in that case. While this legal doctrine can sometimes lead to inconsistent results, it is thought to assure each litigant a fair trial and decision. To complicate matters, there are

¹²⁴ See the judge's bio, [2F9](#).

¹²⁵ District court opinion, [2D11](#).

some other legal doctrines working somewhat against the fair-day-in-court idea. One of these is called *stare decisis*, where a later court is supposed to pay some degree of deference to earlier decisions, even where the present litigants were not parties. The doctrine works most effectively on pure questions of law, but in reality a district judge is unlikely to go against a ruling of his own court of appeals, even for fact-based determinations, unless there is compelling evidence pointing to such a result. Judge Lindley looked for evidence differing from that in the Milwaukee record as it went up to the court of appeals in the Milwaukee case. He found none.

The judge felt compelled to track the court of appeals ruling rejecting challenges to Walter Jones's inventorship. There was basically nothing new in the challenges here in the Chicago case. For example, as to the contention that the true inventors were Fowler, Ardern, Lockett or some combination of them, Judge Lindley said:

I have recited somewhat at length these particular facts, because it seems to me they are most material in determining upon just what fact the Court of Appeals held that Jones was the first to grasp this practical application of these laws of nature, and the first to start to work upon apparatus designed to bring about successful application of such principle, resulting in great practical benefit and value. Whether, as a matter of first instance, I would have come to the same conclusion, is wholly beside the point; the court, in order consistently to attribute priority to Jones over Lockett, must have found the facts to be as they have here been related.¹²⁶

Despite the day-in-court rule, the Milwaukee decision had now become the basis for the decision against Chicago. As another example of de facto preclusion by the earlier decision, Chicago contended that certain prior art patents to a person named Moore anticipated those of Jones. Judge Lindley ruled:

Nor do I find in the fact that the Moore patents, which were before the Wisconsin court as evidence of the state of the art and before this court as evidence of anticipation, anything sufficient to warrant me in concluding that the District Court or the Court of Appeals would have reached any different conclusion, had the said patents been presented in the prior case for the greater purpose. . . . With regard to the validity of the four patents first above mentioned, then, the record here is not substantially different

¹²⁶ Id. at pdf 6.

from that before the District Court in Wisconsin and the Court of Appeals. I feel constrained, therefore, to refrain from any further consideration upon the merits of the contention of invalidity of such four patents.¹²⁷

Save for the two patents not involved in the earlier Milwaukee case, there was not much Judge Lindley thought he could do here. As for the two patents still up for decision, he found the '017 patent had not been proved invalid, but the '561 was invalid for obviousness.¹²⁸

Damages would be postponed until a patent proceeding. Meanwhile the decision would go up to the Seventh Circuit on appeal by Chicago.

B. Chicago's Appeal to the Seventh Circuit

Circuit judges Sparks and Evans were again on the appellate panel hearing the appeal, along with a third judge new to the issues. They decided, as might be expected, that their previous determinations had it right. Chicago lost the appeal.¹²⁹ Like Milwaukee, Chicago would not give up the ghost but soldiered on. It sought review by certiorari in the Supreme Court, with the high-visibility Cleveland lawyers Newton Baker and Arthur Denison again signing the petition.¹³⁰ As before, the high court promptly refused to hear the case.¹³¹ However, some interesting and otherwise unknown facts emerged in Chicago's unsuccessful petition. An article from the July 5, 1937 issue of Time magazine, appended to the petition, reported¹³² that a number of other cities had settled with ASI by taking lump-sum licenses under the Jones patents, specifically mentioning Cleveland for \$85,000, Houston for \$75,000, Indianapolis for \$73,000, San Antonio for \$58,000, Columbus for \$40,000, Peoria for \$23,000, and Cuba, Missouri for merely \$80, with suits still pending against New York and over 100 other cities. We have no records or evidence one way or the other on the accuracy of Time's reporting, but the figures seem roughly in line with other recitations. Time also stated: "Milwaukee might once have purchased rights to the Activated Sludge patents for \$25,000 but preferred to gamble on their

¹²⁷ Id. at pdf 2.

¹²⁸ Id. at pdf 8.

¹²⁹ [2D14](#).

¹³⁰ Cert. petition, [2D15](#).

¹³¹ Denial of cert., [2D16](#).

¹³² [2D15](#) at pdf 12.

validity."¹³³ This figure seems a bit low for a city the size of Milwaukee, but it points up the degree of hostility these lawsuits had stirred up; and, some might say, the hubris of some city fathers and attorneys who elected to stay in cases costing them easily over \$1 million each in attorney's fees and expenses,¹³⁴ to petition the Supreme Court unsuccessfully for relief, and to fight for nine more years before it was finally over.

C. An Unexpected Development After Decision

Even in a case not known for its swiftness, the Chicago damages decision was delayed for a remarkable length of time -- nine years after the 1937 court of appeals affirmance of the decision on the merits. This was because in 1940 the Sanitary District moved to reopen the whole case on the ground of newly discovered evidence. The supposed new evidence came in two varieties: (1) The alleged perfidy of a Sanitary District employee, who supposedly instigated ASI to bring this infringement suit; and (2) the discovery that ASI had not been the legal owner of the patents at the time suit was commenced, even though that defect was apparently fixed two years later and long before decision in the case by the district court.

No records of this rather bizarre turn of events have been found in the archives other than Judge Lindley's 1940 ruling refusing to reopen the case. The judge's opinion took up the second question first, finding that the Sanitary District had sought no discovery on who had title to the patents, had not questioned any trial witnesses about it, and was aware that in the Milwaukee case the title was found to be solid. Accordingly, no ground for reopening on this basis was seen by the court. The first prong of the District's motion was then taken up. It is a ground believed to be unique in all the annals of patent litigation: treachery of an employee of the defendant, acting in league with the plaintiff patent owner, to lure the defendant into infringing the patents. We now expand a little on this very unusual defense to infringement.

A Sanitary District employee named Dilling was said to have cooperated with Activated Sludge's then U.S. licensee Guthard (Guthard's license was terminated early on in the case by agreement, and a clean assignment to Activated Sludge Inc. was executed¹³⁵), and

¹³³ Id.

¹³⁴ Back in 1937 Chicago's expenses in the case had been estimated at \$600,000. Chicago Tribune, July 31, 1937, [2D9](#).

¹³⁵ See [2B11.1](#).

they somehow conspired to lure the District into infringing the Jones patents. As related by Judge Lindley, Dilling had at one time been chief engineer for the district, and while serving in that capacity learned of the District's infringing activities. After he left his employment with the District, he supposedly went to London and negotiated an interest in the Jones patents. In 1936 attorneys for Dilling notified the District that Dilling and Activated Sludge Limited had had a falling out, and that Dilling planned to sue ASL for shutting him out of his alleged interest in the patents. Dilling's lawyers did in fact file a suit in Illinois state court to assert his interest and to claim that he was entitled to a share of any recovery obtained by ASI in the Chicago case. As Judge Lindley relates it, the licensee Guthard apparently promised to share any recovery on the patents with Dilling and two others. The District, however, took no action at the time, or at any time before final judgment, to investigate Dilling's claims. Guthard in 1927 had surrendered to ASI any rights he may have had in the patents, cancelling his former license and thereby clearing the way for ASL to assign them to ASI.¹³⁶ The assignment documents were received in evidence. The District, probably on the assumption that it would win the case on the merits by invalidating all the patents, took no action challenging ownership of them. Judge Lindley was not inclined to reopen the entire case over this. He said even if the facts were as the District was now contending, it would not change anything. Guthard was out, and anyone claiming under him, such as Dilling, was also out.¹³⁷

Never deterred, the Sanitary District appealed the ruling refusing to reopen the case, but the Seventh Circuit made short shrift of it, affirming Judge Lindley in a two-paragraph order by the same Judge Sparks who had sat on all the panels in both the Milwaukee and Chicago litigations.¹³⁸ The District tried once again for Supreme Court review, and it was once again refused.¹³⁹ It was now 1941, and, finally, time to establish the damages in the case.

D. Damages Decision

As of 1941, a successful patent owner in litigation could recover either the defendant's profits, if any, from the infringement or his own damages, or a reasonable royalty.¹⁴⁰

¹³⁶ See assignments, Jones to ASL, and ASL to ASI, [2B11.1](#), [2B11.2](#).

¹³⁷ Lindley decision, [2D17](#), at pdf 6.

¹³⁸ [2D18](#).

¹³⁹ See Chicago's petition, [2D19](#), and the Supreme Court's refusal to hear the case, [2D20](#).

¹⁴⁰ The act of 1946 abolished the recovery of the infringer's profits as a remedy in patent cases, leaving actual damages suffered by the patent owner, but "not less than a reasonable royalty."

Patent damages are always uncertain, the product of sifting through many possible factors, often conflicting ones. The results being unpredictable, many parties settle rather than prolong the intrusions and further costs of more litigation. Chicago apparently had a nearly infinite capacity to prolong the case. It returned to the courtroom to fight the damages proceeding before Judge Lindley.

Judge Lindley began his 1946 damages opinion¹⁴¹ by stating that the plaintiff had not suffered business losses and the defendant Sanitary District had not made any profits from use of the patented methods. ASI was seeking an award based on the savings to the District by using the patented treatment methods. ASI urged the court to find that the North Side plant alone involved a saving of some \$2.8 million in construction costs (versus the next best method of treatment) and \$100,000 per year in operational costs. Alternatively, ASI urged a lower cost-saving figure for the entire set of infringing plants, \$9.4 million, which included the expected revenues from the sale of dried sludge. (Milwaukee had earned \$330,000 from sludge sales from its single plant in the first year of operation alone. Chicago's earnings from dried sludge do not appear in the record.) But Judge Lindley said savings were "not the yardstick" of recovery.¹⁴² The District's public character and its mission of public service were also important considerations in setting the plaintiff's compensation.¹⁴³

The Sanitary District urged that the damages should be set at the amount ASI was willing to accept, and had accepted from other cities, for licenses under these patents, which, as stated earlier, was variable depending on plant size and population served. The Sanitary District said the figure in Chicago's case would have been \$90,000.¹⁴⁴ The judge balked at this, noting the long and expensive litigation in which Chicago had engaged instead of taking such a license at the beginning. And even that offer, in present dollars plus interest, would have amounted to \$251,000. The court rejected this approach as too low.

Having looked at various other factors relevant to reasonable compensation for infringement, Judge Lindley set the figure at \$950,000.¹⁴⁵ This figure is a little larger than the \$818,000 that finally settled the Milwaukee case in 1938 while an appeal was pending from Judge Geiger's much larger damages judgment. The last of the Walter Jones patents

¹⁴¹ [2D21](#).

¹⁴² *Id.* at pdf 10.

¹⁴³ *Id.*

¹⁴⁴ *Id.* at pdf 13.

¹⁴⁵ *Id.* at pdf 17.

had expired in 1935, so no damages could be recovered for uses after that time. Milwaukee had only the one plant at Jones Island during the terms of the patents, while Chicago had three involved in the suit -- the small Des Plaines unit; the North Side plant; and the Calumet facilities. However, on the other side of the coin, the period of infringement by Chicago was considerably shorter. Its first large-scale plant, the North Side, opened only in 1928, and the Calumet plant in 1931 (and possibly did not use activated sludge until 1935, the final year of patent coverage). The huge Stickney works, a combination of the West Side and Southwest side treatment plants, was opened in two stages: the west side part in 1930 and the southwest side part in 1939. The West Side plant, although opened in 1930, did not use the activated sludge process until after expiration of the patents,¹⁴⁶ and hence was left out of the damages calculation. Thus, due to a host of political and economic delays, Chicago's largest-scale uses of processes covered by the patents in suit did not occur until after the seventeen-year terms of the patents had expired.

True to form, the Sanitary District would not accept the court's monetary ruling, and, throwing good money after bad, appealed it to the Seventh Circuit, which rejected the appeal out of hand,¹⁴⁷ and then petitioned for review in the Supreme Court, which was also rejected.¹⁴⁸ Thus, on May 19, 1947, this long-protracted litigation, begun more than twenty-two years earlier on September 19, 1924, finally ended.

V. Aftermath

We now return to England, where all of this history began in 1913, to see how it had played out. Activated Sludge Limited (ASL), formed in 1919, was 56% (16,750 shares) owned by Walter Jones's company Jones & Attwood. The patents involved were assigned to ASL. The remaining corporate shares were issued 1,000 to Professor Fowler, 750 to an employee named Harry Killon, 756 to employee James Coombs, and 750 to the married couple Ernest and Gladys Mumford.¹⁴⁹

¹⁴⁶ See Milwaukee's petition for certiorari, [2C26](#) at pdf 6 (indicating that as of 1934 Chicago's West Side facility was not yet using an activated sludge process).

¹⁴⁷ [2D22](#). Judge Sparks was once again on the panel, but the ruling was "per curiam," i.e., by the court, with no opinion other than accepting the district court's opinion in full.

¹⁴⁸ [2D23](#), [2D24](#).

¹⁴⁹ Jones & Attwood History, [2B2](#), at pdf 58.

Walter Jones retired from Jones & Attwood in 1922 and was succeeded by his son Ernest Jones. Walter passed away two years after that, just before the United States litigations began. Ernest Jones had served in British army in the Great War, and his father Walter, in keeping with his strong sense of civic duty, had urged in a published article in 1914 that men of means should provide the funding for the war, rather than "to fatten on investments at home while patriots bleed and perish for their country abroad."¹⁵⁰

ASL was able to assist Jones & Attwood in getting orders for apparatus to be used in activated sludge plants in the U.K., but apparently not in the United States. As for the long litigations against Milwaukee and Chicago, the financial result for ASL was almost as bad as that portrayed in Dickens' *Bleak House*. The net recovery, after litigation expenses, was only £18,850,¹⁵¹ or in U.S. terms under \$100,000.¹⁵² This equates to less than \$5,000 per year of litigating.

Meanwhile, as pointed out in Chicago's unsuccessful effort to obtain Supreme Court review, the activated sludge process -- whoever might be labeled as its inventors -- had become the gold standard for large-scale wastewater treatment throughout the United Kingdom, the United States, and much of the rest of the world. And now that we are living through a period of drought in many parts of the United States, more and more of what we call our fresh water, has in fact been used before and has come to our reservoirs from somewhere else.

¹⁵⁰ Id. at pdf 20.

¹⁵¹ Id. at pdf 12.

¹⁵² The 1940 Bretton Woods agreement set the exchange rate at \$4.03 to the pound. A year earlier it had been \$4.86.