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Physicalism and Patent Theory

Christopher A. Cotropia*

United States patent law’s view on the need for a physical embodiment of the invention, and the continued production and use of an embodiment, has varied over the last two centuries. In the early days, the requirement for “physicalism” was high, with the inventor being required to actually reduce the invention to practice prior to patenting, and enforceability was tied to “working” the claimed invention. By the early 1900s, these requirements of physicalism disappeared. This changing view on physicalism speaks volumes as to which major patent theory the law emphasizes, with physicalism supporting the incentive to invent theory and the shift away from this physicalism bringing the disclosure theory to the forefront. This interplay between physicalism and patent theory, particularly regarding post-issuance physicalism, not only explains the past, it also describes the current discourse regarding, and legal reaction to, non-practicing entities (“NPEs”). Decisions such as eBay v. MercExchange, denying exclusivity to NPEs, once again emphasize physicalism and are interrelated to the incentive to invent and, in turn, downplay the disclosure theory and question its current validity as a patent policy goal.

INTRODUCTION	1544
I. PHYSICALISM AND PATENT DOCTRINE.....	1547
A. <i>Physicalism Defined</i>	1547
B. <i>Early Patent Law Doctrines</i>	
<i>Based on Physicalism</i>	1549
1. Actual Reduction to Practice.....	1549
2. Working Requirement	1551
C. <i>Late 1800s and the Fall of Physicalism</i>	1554

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	1.	Constructive Reduction to Practice.....	1554
	2.	Non-use Acceptable	1555
II.		PATENT THEORY'S VIEW TOWARD PHYSICALISM	1556
	A.	<i>Two Prominent Patent Theories</i>	1556
	B.	<i>Physicalism's Alignment with the Incentive to Invent Theory</i>	1561
	C.	<i>Lack of Physicalism and the Promotion of the Disclosure Theory</i>	1563
III.		RECENT RISE OF PHYSICALISM AND ITS IMPLICATIONS FOR PATENT THEORY	1566
	A.	<i>Recent Example of Movement Toward Physicalism—eBay v. MercExchange</i>	1566
	B.	<i>Accompanying Reemphasis on the Incentive to Invent Theory and Lack of Appreciation for the Disclosure Theory</i>	1568
		CONCLUSION.....	1571

INTRODUCTION

Many recent patent law discussions concern patent holders that are not producing the patented invention.¹ Instead, these patentees choose to only assert their patents. These non-practicing entities (“NPEs”), often referred to as “patent trolls,” are blamed for many of the patent system’s current ills.² Part of the problem with such patent holders, critics argue, is that they impede socially beneficial activity by suing and blocking others from making the invention while not providing anything in return.³ Their non-production, while holding and asserting patent, is considered by many a major problem.⁴

This discussion about NPEs can benefit greatly by taking a broader look at the patent and real world activity surrounding it. A unitary focus on the physical requirements of patent law—particularly

1. See, e.g., Christopher A. Cotropia, Jay P. Kesan & David L. Schwartz, *Unpacking Patent Assertion Entities (PAEs)*, 99 MINN. L. REV. 649, 649–52 (2014).

2. See David L. Schwartz & Jay P. Kesan, *Analyzing the Role of Non-Practicing Entities in the Patent System*, 99 CORNELL L. REV. 425, 426 (2014) (describing these concerns about NPEs).

3. See James Bessen & Michael J. Meurer, *The Direct Costs from NPE Disputes*, 99 CORNELL L. REV. 387, 394 (2014) (noting that sixty-two percent of NPE lawsuits involve software patents).

4. See Letter from Fifty-One Legal and Economics Scholars Who Study Innovation, Intellectual Property Law, and Policy, to Congress (Mar. 2, 2015) (http://www.utdallas.edu/~ugg041000/IPScholarsLettertoCongress_March_2_2015.pdf) [<https://perma.cc/PC7B-T89A>] (“Estimates based on surveys, on firm 10-K filings, and on stock prices suggest that PAE litigation has been costing firms tens of billions of dollars per year since 2007.”).

physical implementation of the invention both prior to, and after, patenting—can give a holistic view of the degree of “physicalism”⁵ to which the patent system subscribes at any given time. Defining the patent doctrines that either promote or pull back from such physicalism also allows exploration of physicalism’s ties to patent theory. Physicalism then becomes a tool, grounded in patent policy specifics, that can be used in various ways to evaluate and address concerns like NPEs.

United States patent law’s view on the need for a physical embodiment of the invention, and the continued production and use of an embodiment, has varied over the last two centuries. Early in patent law’s history, the requirement for “physicalism” was high. The inventor was required to actually reduce the invention to practice prior to patenting, and enforceability was tied to “working” the claimed invention.⁶ As time moved on, these requirements of physicalism disappeared. Courts deemed the patent document itself as a constructive reduction to practice, and the patentee could choose to not make or use the invention and still prevent others from doing the same.⁷ The patent document became the ultimate required “product” of the system.

This changing view on physicalism speaks volumes on the primacy and interpretation of the disclosure theory of patent law and how it ranks vis-à-vis the other major patent theory—the incentive to invent. The early need for physical embodiments and continued use of the invention emphasizes the incentive to invent theory and a very three-dimensional disclosure—the actual product or process.⁸ The eventual shift away from this physicalism brings traditional disclosure theory to the forefront. The emphasis is now on the patent text, and its required robustness, to both act as a proxy for manufacture of the invention and provide enough detail to others to eventually engage in

5. As will be explored further *infra*, “physicalism,” in the context of this Article and patents, is the view that the invention exists outside the patent—that there is a physical embodiment of the invention.

6. Oren Bracha, *The Commodification of Patents 1600–1836: How Patents Became Rights and Why We Should Care*, 38 LOY. L.A. L. REV. 177, 187–90, 213–14 (2004); William Macomber, *Reduction to Practice of Patentable Inventions*, 63 U. PENN. L. REV. 353, 354–56 (1915); Warren H. Willner, *Origin and Development of the Doctrine of Constructive Reduction to Practice*, 36 J. PAT. OFF. SOC’Y 618, 618–19 (1954).

7. See Willner, *supra* note 6, at 621–22; *Cont’l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 429 (1908).

8. See, e.g., Christopher A. Cotropia, *What Is the “Invention”?*, 53 WM. & MARY L. REV. 1855, 1897 (2012) (“The incentive-to-invent story assumes patent law will use this contextualized invention and demands that patent law provide protection for an invention that is both created and eventually sold to the public.”).

such manufacture upon the patent's expiration.⁹ The incentive to invent theory is, in turn, not directly implicated by the patenting requirements, and the emphasized disclosure is a public, two-dimensional description.

This interplay between physicalism and patent theory, particularly regarding post-issuance physicalism, not only explains the past, but it also describes the current discourse regarding, and legal reaction to, NPEs. Put simply, the application of decisions such as *eBay v. MercExchange*,¹⁰ de facto denying exclusivity to NPEs,¹¹ once again emphasizes physicalism and is interrelated to the incentive to invent and, in turn, downplays the value of the patent disclosure by itself. And by recognizing this linkage between physicalism and patent theory, the disclosure theory, and its validity as a policy goal, is brought into the NPE debate.¹²

This Article proceeds as follows: First, Part I of the Article defines physicalism in the context of patent law and describes how doctrinal movements in the 1800s and 1900s brought patent law closer to, and then further from, physicalism. This analysis locates patent law's physicalism in various doctrinal discussions such as the actual reduction to practice and working requirements. Part II takes physicalism and links the doctrinal movements around it to patent theory.¹³ As patent law moves toward physicalism, it emphasizes an incentive to invent theory framework; when it moves away from physicalism, the patent system necessarily emphasizes the disclosure theory. The Article then, in Part III, examines the Supreme Court's recent decision in *eBay v. MercExchange* and the de facto use requirement arising from that decision to provide an example of the descriptive and explanatory power of looking at physicalism in patent law.

9. See, e.g., *Universal Oil Prods. Co. v. Globe Oil & Ref. Co.*, 322 U.S. 471, 484 (1944):

As a reward for inventions and to encourage their disclosure, the United States offers a seventeen-year monopoly to an inventor who refrains from keeping his invention a trade secret. But the quid pro quo is disclosure of a process or device in sufficient detail to enable one skilled in the art to practice the invention once the period of the monopoly has expired

10. See *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 393–94 (2006).

11. See Christopher B. Seaman, *Permanent Injunctions in Patent Litigation After eBay: An Empirical Study*, 101 IOWA L. REV. 1949 (2016) (establishing the de facto use requirement for an injunction empirically).

12. John F. Duffy, *Reviving the Paper Patent Doctrine*, 98 CORNELL L. REV. 1359, 1360–61 (2013) (cataloging the anti-patent aspects of the paper patent doctrine).

13. This Part of the Article benefits greatly from Professor John Duffy's earlier discussions regarding the "paper patent" doctrine. See generally *id.*

I. PHYSICALISM AND PATENT DOCTRINE

Patent law includes doctrines that define what is required beyond the patent document itself to both initially obtain a patent and then to enforce it. Early patent law required both an actual reduction to practice of the invention to receive a patent and then continued use of the patented invention to enforce the patent.¹⁴ Both of these required activities outside the patent introduced a physicalism in patent doctrine—requiring the invention to exist in physical space beyond the patent itself. In the late 1800s and early 1900s, these physical requirements for patent protection began to disappear, and patent doctrine moved away from such physicalism.¹⁵ This movement to and from these physical requirements in patent doctrine and the definition of physicalism in the context of patent law are detailed below.

A. Physicalism Defined

Physicalism, as used in this Article and in the context of patents, is the view that the invention exists outside the patent—there is a physical embodiment of the invention.¹⁶ Physicalism

14. Bracha, *supra* note 6, at 187–90, 213 (detailing this historic development from England, to the colonies, to the states, and to federal patent law).

15. *Id.* at 226 (noting that federal patent laws did not include “working clauses”).

16. DANIEL STOLJAR, *PHYSICALISM* 16 (2010) (defining physicalism as the belief that “everything here is physical . . . everything here is necessitated by the physical”); *see also* Daniel Stoljar, *Physicalism*, STAN. ENCYCLOPEDIA OF PHIL. (Edward Zalta ed., 2009) <http://plato.stanford.edu/archives/fall2009/entries/physicalism/> [<https://perma.cc/X87J-PGK>] (“Physicalism is the thesis that everything is physical, or as contemporary philosophers sometimes put it, that everything supervenes on, or is necessitated by, the physical.”). Physicalism is akin to “materialism,” but physicalism, in some philosophers’ view, includes more than just matter, but also forces such as gravity. *Id.* Materialism also suggests a hierarchy of values—suggesting material items are of more value than intellectual or spiritual pursuits—while physicalism is a simple statement that all things are physical. *Id.*

In the patent context, Professor John Duffy labels what I call physicalism as the “‘materialist’ approach to invention.” Duffy, *supra* note 12, at 1369. Professor Michael Madison discussed the legal and physical existence of an invention in patent law. *See* Michael J. Madison, *Law as Design: Objects, Concepts, and Digital Things*, 56 CASE W. RES. L. REV. 381, 383–84 (2005) (“In patent law, for example, there is the actual device that the inventor developed, and there is the legally distinct thing that the patentee owns, which the law knows as the patent claim.”). Professor Dan Burk has also discussed “the dualism of tangible and intangible property that undergirds current copyright” through the lens of “new materialism.” Dan L. Burk, *Copyright and the New Materialism*, in *INTELLECTUAL PROPERTY AND ACCESS TO IM/MATERIAL GOODS* 44, 44 (Jessica C. Lai & Antoinette Maget Dominicé eds., 2016).

This concept of physicalism is related to what I labeled the “external invention” in a previous article exploring the relationship between the contents of the patent and external activities and thoughts of the inventor. *See* Cotropia, *supra* note 8.

describes a manifestation of the invention that goes beyond the textual and graphical description that appears in the patent itself.

The core components of a patent are the specification, the drawings (if included), and the claims.¹⁷ All of these exist in paper (or digital) form and are depicted by words or lines on a page.¹⁸ These descriptions of the claimed invention are not the physical embodiment of the invention. Instead, they are incredibly detailed descriptions and may include visual depictions of physical manifestations of the invention.¹⁹

In contrast, the invention can also exist in the physical world. An invented computer circuit can be described textually and drawn in a patent, but can also exist in real space in the form of a computer chip.²⁰ A computer circuit may even exist physically as code executing on a general purpose computer that actually implements the computer circuit.²¹ Even a patent claiming a method of doing something—manufacturing a new drug for example—can have a physical embodiment of that method: actually making the new drug.²²

Notably, physicalism in patent law would view these examples of physical implementations of the invention, in contrast to the patent document, as a necessary part of the patent invention. Put another way, invention, through the eyes of physicalism, necessarily includes physical manifestations of the invention. Physicalism means that an

17. See 35 U.S.C. § 112(a)–(b) (2012) (defining the written description and enablement requirements for the patent specification to both describe the invention and teach a person having ordinary skill in the art to practice the invention); 37 C.F.R. §§ 1.73, 1.77(b), 1.81 (2015) (describing the different components of a patent document, including the drawings); Christopher A. Cotropia, *Patent Claim Interpretation and Information Costs*, 9 LEWIS & CLARK L. REV. 57, 67–74 (2005) (detailing the information about the invention required to be included in the patent document).

18. See, e.g., U.S. Patent No. 8,207,092 (filed Jun. 26, 2012) (methods and compositions for improving health, containing textual descriptions of the invention and drawings of the chemical structure of the invention).

19. Cotropia, *supra* note 8, at 1861 (defining the concept of an “external invention” drawn from the details of the specification):

The specification is the more robust part of the patent and includes descriptions and drawings of the state of the relevant technology, references to what has been done before, any specific implementations of the invention known to the inventor, and a general description of the purpose or goal of the invention.

20. See, e.g., U.S. Patent No. 4,972,338 (filed Apr. 19, 1988) (memory management for microprocessor system, whose commercial form was Intel’s 80386 microprocessor); *Cyrix Corp. v. Intel Corp.*, 846 F. Supp. 522, 530 (E.D. Tex. 1994) (noting that “[i]n order to be covered by claim 1 of the ‘338 Patent, [Intel’s] physical embodiment of the microprocessor device must have every circuit element of the claim . . .”).

21. See, e.g., U.S. Patent No. 8,893,122 (filed Nov. 28, 2008) (virtual computer system and a method of controlling a virtual computer system on movement of a virtual computer).

22. See, e.g., U.S. Patent No. 7,951,403 (filed May 31, 2011) (method of making pharmaceutical multiparticulates).

invention is not an “invention” for patent law purposes unless it exists physically.²³

B. Early Patent Law Doctrines Based on Physicalism

Early patent law adhered to the idea of physicalism—requiring both physical embodiments of the invention prior to patenting and continued real world use of the patent to enforce the patent.²⁴ The physical requirement for patent protection was governed by an actual reduction to practice requirement. And physicality in the form of a use requirement was a necessary prerequisite to enforcement of the patent in court.²⁵ Both of these early physicalism-based requirements are detailed below.

1. Actual Reduction to Practice

The early patent grants in England in the sixteenth and seventeenth centuries were based, in part, on demonstrations that the invention worked and, in some cases, “actually delivered the promised results.”²⁶ Individual state patent law took a similar approach, requiring the inventor to actually implement the invention in order to get a patent.²⁷

Early interpretations of federal patent law continued this requirement via the actual reduction to practice doctrine. Early patent statutes required an inventor to make the invention, that is, to reduce it to practice, before gaining patent protection.²⁸ Courts interpreted this as an “actual” reduction requirement, which became part of the definition of “invention.”²⁹ Justice Story, when sitting as a circuit

23. Geoffrey Paul Hellman & Frank Wilson Thompson, *Physicalism: Ontology, Determination, and Reduction*, 72 J. PHIL. 551, 551–52 (1975) (explaining that physicalism is the reduction of all things to expression in physical terms).

24. Bracha, *supra* note 6, at 187–90.

25. *Id.*

26. *Id.* at 189.

27. *Id.* at 213–14 (noting such a requirement in Massachusetts).

28. Willner, *supra* note 6, at 618–19; *see* Macomber, *supra* note 6, at 354–56.

29. Willner, *supra* note 6, at 618–19:

Prior to the turn of the century, the courts of the United States had rendered decisions in patent cases in which the principle was firmly established that (except where modified by the question of diligence) the inventor within the purview of the patent law was the one who first adapted and perfected his invention to use; that is, reduced it to practice.

Willner lists the early cases articulating an actual reduction to practice requirement. *Id.* at 618 n.1.

judge, explained that the first who brought "the machine to perfection, and made it capable of useful operation" was entitled to a patent.³⁰ One was not an "inventor" until she "put the invention into practice."³¹ This requirement to "practice" the invention, that is, to make it physical, was the majority rule in patent law into the early to mid-1800s.³² There were a few isolated exceptions, with some courts not requiring an actual reduction to practice.³³

The United States Patent and Trademark Office ("USPTO") adopted this requirement as well—awarding patents to the first to create a physical manifestation of the invention. Patents went to those who actually reduced the invention to practice.³⁴ The inventor had to "perfect the machine" and "make[] it capable of useful operation" to get a patent.³⁵ The "idea" of the invention was not enough—it needed to be physicalized before patenting.³⁶

Early patent law also required inventors to submit a physical model of the invention with the patent application. This model, depicting the invention and demonstrating its operation, was another physical requirement of early patent law.³⁷ The first federal patent

30. *Washburn v. Gould*, 29 F. Cas. 312, 317 (C.C.D. Mass. 1844) (No. 17,214).

31. *Bedford v. Hunt*, 3 F. Cas. 37, 38 (C.C.D. Mass. 1817) (No. 1,217):

The intent of the statute was to guard against defeating patents by the setting up of a prior invention, which had never been reduced to practice. If it were the mere speculation of a philosopher or a mechanic, which had never been tried by the test of experience, and never put into actual operation by him, the law would not deprive a subsequent inventor, who had employed his labor and his talents in putting it into practice, of the reward due to his ingenuity and enterprise.

32. *See, e.g., Agawam Woolen Co. v. Jordan*, 74 U.S. (7 Wall.) 583, 602 (1868):

The settled rule of law is, that whoever first perfects a machine is entitled to the patent, and is the real inventor, although others may have previously had the idea and made some experiments towards putting it in practice. He is the inventor and is entitled to the patent who first brought the machine to perfection and made it capable of useful operation;

Whitely v. Swayne, 74 U.S. (7 Wall.) 685, 687 (1868) ("[F]or he is the first inventor, and entitled to the patent, who, being an original discoverer, has first perfected and adapted the invention to actual use.").

33. *See Heath v. Hildreth*, 11 F. Cas. 1003, 1006 (C.C.D.C. 1841) (No. 6,309):

I do not consider the expression "reduced to practice" as importing the bringing of the invention into use. When applied to an invention, it generally means the reducing it into such form that it may be used so as not to be a mere theory. If a machine be invented and described in such a manner that it may be made and used, and especially if a model be made, the invention may be said to be reduced to practice.

34. *See Mayhew v. Wardwell*, 1869 C.D. 5; *Crane v. Whitehead & Atherton*, 1875 C.D. 26 ("It must follow, then, as a logical sequence, that a mere application for patent is not a 'reduction to practice' . . .").

35. *Agawam*, 74 U.S. (7 Wall.) at 602.

36. *Willner*, *supra* note 6, at 618–19.

37. *Kendall J. Dood, Patent Models and the Patent Law: 1790–1880 (Part I)*, 65 J. PAT. OFF. SOC'Y 187, 189–93 (1983) (detailing the 1790 model requirement and its application); *see also* Alain Pottage, *Law Machines: Scale Models, Forensic Materiality and the Making of Modern*

law, in 1790, explicitly included a model requirement.³⁸ This mandatory nature of models varied under the 1793 Patent Act, but again became an absolute requirement under The Patent Act of 1836.³⁹ The Act read: “Before any inventor shall receive a patent . . . [he shall] furnish a model of his invention, in all cases which admit of a representation by model, of a convenient size to exhibit advantageously its several parts.”⁴⁰ A true working model was even sometimes relied upon to support a claim of actual reduction to practice prior to filing.⁴¹

2. Working Requirement

The early English patent grants included provisions that the patentee had to continue to practice the patented invention in order to exclude others.⁴² These patents contained express “working clauses” that required the patentee to practice the invention within a pre-defined period.⁴³ If the patentee failed to work her invention—that is, go beyond reducing the invention to practice by producing, selling, distributing, and/or commercializing the invention—then the patent was nullified and not enforceable.⁴⁴ In some cases, the patentee was

Patent Law, 41 SOC. STUD. SCI. 621 (2011) (discussing the model requirement as introducing materialism in patent law).

38. Patent Act of 1790, ch. 7, § 2, 1 Stat. 109–112 (repealed 1793):

That the grantee or grantees of each patent shall, at the time of granting the same, deliver to the Secretary of State a specification in writing, containing a description, accompanied with drafts or models, and explanations and models (if the nature of the invention or discovery will admit of a model) of the thing or things, by him or them invented or discovered, and described as aforesaid, in the said patents; which specification shall be so particular, and said models so exact, as not only to distinguish the invention or discovery from other things before known and used, but also to enable a workman or other person skilled in the art or manufacture, whereof it is a branch, or wherewith it may be nearest connected, to make, construct, or use the same, to the end that the public may have the full benefit thereof, after the expiration of the patent term

39. Dood, *supra* note 37, at 200, 208.

40. Patent Act of 1836, ch. 357, § 6, 5 Stat. 117 (repealed 1870) (“[H]e shall moreover furnish a model of his invention, in all cases which admit of a representation by model, of a convenient size to exhibit advantageously its several parts.”).

41. Dood, *supra* note 37, at 189.

42. Bracha, *supra* note 6, at 187–90.

43. *Id.* at 188; see also E. Wyndham Hulme, *The History of the Patent System Under the Prerogative and at Common Law*, 12 LAW Q. REV. 141, 153 (1896) (explaining the history of working clauses in early patent grants).

44. Bracha, *supra* note 6, at 188; see also D. Seabome Davies, *The Early History of the Patent Specification (Part I)*, 50 LAW Q. REV. 86, 90, 95 (1934) (describing the requirement of patent specifications).

required not only to practice the invention to keep the patent, but also to produce the invention at a certain, high quality.⁴⁵

English patents also included a "revocation clause," which gradually replaced all working clauses.⁴⁶ This clause allowed "the crown or its arm, the Privy Council, [] the power to revoke the patent" under certain circumstances. One such revocable circumstance was "any failure to introduce an invention within a reasonable period."⁴⁷ These clauses "became a fixed feature of all patents of invention" in England during this time.⁴⁸

Almost all colonial and state patents included working clauses as well.⁴⁹ These, like those in England, required successful practice of the invention within a specified period of time to maintain enforceability of the patent.⁵⁰ Quality requirements were also prevalent.⁵¹

Federal patent law did not include such an explicit requirement, but courts inferred one in the 1800s. Many cases predicated the issuance of an injunction for infringement upon the patentee having put "his patent to practical use."⁵² This working requirement could also be met by the patentee having licensees using

45. Bracha, *supra* note 6, at 188–89.

46. *Id.* at 189.

47. *Id.*; see also WILLIAM MARTIN, THE ENGLISH PATENT SYSTEM 16 (1904) (detailing the statutory power of the Privy Council to insert revocation clauses into patents).

48. Bracha, *supra* note 6, at 189–90.

49. *Id.* at 212–14; see also BRUCE W. BUGBEE, THE GENESIS OF AMERICAN PATENT AND COPYRIGHT LAW 81–82 (1967) (providing examples of early state patent grants containing working clauses).

50. Bracha, *supra* note 6, at 213–14.

51. *Id.* (detailing such a requirement).

52. See *Heaton-Peninsular Button-Fastener Co. v. Eureka Specialty Co.*, 77 F. 288, 294 (6th Cir. 1896) ("That the grant is made upon the reasonable expectation that he will either put his invention to practical use, or permit others to avail themselves of it upon reasonable terms, is doubtless true."). Notably, even in the late 1800s, some courts held that non-use was irrelevant for patent enforcement. See, e.g., *Cont'l Paper Bag Co. v. E. Paper Bag Co.*, 150 F. 741, 744 (1st Cir. 1906) (citing cases).

the invention with permission.⁵³ Use was thought to be necessary to preserve the patent.⁵⁴

The “paper patent” doctrine developed by the courts also interjected a physical requirement to enforcing a patent.⁵⁵ As Professor John Duffy articulated the paper patent doctrine, courts “distinguished between patents that remain merely pieces of paper issued by a government agency and those that are made into commercial products.”⁵⁶ In some cases, the paper patent doctrine was similar to a working requirement, denying an injunction to those who did not commercialize the patented invention.⁵⁷ In other circumstances, the doctrine metered out patent rights depending on the degree of commercialization.⁵⁸ Courts would give paper patents narrow claim interpretations or allow the lack of commercialization to tilt cases toward a finding of invalidity.⁵⁹

53. *Hoe v. Knap*, 27 F. 204, 212 (N.D. Ill. 1886):

The question, therefore, arises whether the court will grant an injunction in favor of the owner of a patent who has not, after a reasonable time, put it into use, against another who is using it. I think, under a patent which gives a patentee a monopoly, he is bound either to use the patent himself or allow others to use it on reasonable or equitable terms, and as I refused an injunction on the motion before the hearing, I shall refuse an injunction in the interlocutory decree, and allow the defendants to continue to use the patent on their giving bond as they have heretofore.

54. *N.Y. Paper Bag Mach. & Mfg. Co. v. Hollingsworth & W. Co.*, 56 F. 224, 231 (1st Cir. 1893) (containing a concurrence by Judge Putnam doubting whether a nonuser is “entitled to any relief at all” under patent law).

55. *See id.* at 231 (Putnam, J., concurring) (doubting whether, under circumstances of unexplained nonuser, the case “is not one of a mere legal right,” where the party is left to remedies at law, “if entitled to any relief at all”).

56. Duffy, *supra* note 12, at 1379–81 (cataloging the anti-patent aspects of the paper patent doctrine).

57. *See id.* at 1380–82 (observing that the courts “were much more hostile to what today would be considered one objectionable troll-type behavior: the assertion of an uncommercialized patent against an entrepreneurial firm that made technology actually work in the real world”).

58. *See, e.g., Palmer v. Joseph*, 233 F. 1003, 1004 (2d Cir. 1916) (“Exactly as described, we are satisfied that the patentee’s plan was inoperative, a belief confirmed by the admitted fact that such exact thing has never passed into commercial use. This action is upon a ‘paper patent’ of the plainest kind.”).

59. *See, e.g., Long v. Pope Mfg. Co.*, 75 F. 835, 840 (1st Cir. 1896):

But, in view of the rapidity with which mechanical improvements advance in this age, it would establish a very dangerous precedent to give to a mere paper patent, which has lain dormant for years, a breadth not contemplated on its face, by reason of some new function discovered long after its issued, and after that function had been availed of in practice by others;

Hills v. Hamilton Watch Co., 248 F. 499, 504–05 (E.D. Penn. 1918) (“When such doubt is present, the fact that the patent is a mere paper patent may turn the scale against infringement . . .”).

C. Late 1800s and the Fall of Physicalism

These physical-based requirements eroded in the late 1800s and essentially disappeared by the 1900s, and, in turn, patent law adhered less and less to physicalism. “Constructive” substitutes for actual reduction to practice allowed an enabled patent specification to replace physically building or implementing the invention.⁶⁰ And working the patent was no longer a prerequisite for enforcement.⁶¹ Essentially, the patent document, by itself, became enough to gain entrance into the patent system and to prevent others from practicing the patented invention. Patent law moved away from emphasizing physicalism in doctrine.

1. Constructive Reduction to Practice

In the late 1800s, courts began to accept an alternative way to reduce an invention to practice—“constructive” reduction to practice. An 1872 district court decision was the first to hold that if an invention created “according to the model and specification filed, . . . will operate successfully as a practical and useful thing,” then the “patent is valid” and has been reduced to practice.⁶² The Supreme Court came to a similar conclusion in 1888 in *The Telephone Cases*.⁶³ The Court explicitly rejected a challenge to one of Bell’s patents based on his failure to actually reduce the claimed invention to practice prior to filing.⁶⁴ The Court relied on the patent’s description of the claimed process as proxy for actually implementing the invention.⁶⁵

The USPTO also began recognizing constructive reduction to practice in the late 1800s. The term “constructive reduction to practice” was first explicitly used by the Commissioner of Patents in 1889, noting that an enabling patent application was adequate evidence of invention.⁶⁶ And the United States Court of Appeals for the First Circuit affirmed the doctrine of constructive reduction to practice as valid in 1909.⁶⁷ The patent’s specification had become a

60. Willner, *supra* note 6, at 620–22.

61. *Cont’l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 429 (1908).

62. *Wheeler v. Clipper Mower, Etc. Co.*, 29 F. Cas. 881, 888–89 (C.C.S.D.N.Y. 1872) (No. 17,493).

63. *Dolbear v. Am. Bell Tel. Co.*, 126 U.S. 1, 533 (1888).

64. *Id.* at 534–36.

65. *Id.*

66. Willner, *supra* note 6, at 622 (citing *Elges v. Miller*, 1889 C.D. 108).

67. *Automatic Weighing Mach. Co. v. Pneumatic Scale Corp.*, 166 F. 288, 290–91 (1st Cir. 1909).

recognized substitute for physically making or implementing the invention.⁶⁸

The patent model requirement also went away in the late 1800s. In 1880, a general model requirement for all patent applications was dropped by the USPTO.⁶⁹ By 1900, the invention, for patent law purposes, could be memorialized and completed completely on paper—with an enabled patent document explaining how to physicalize the invention.⁷⁰ Actual physicalization was no longer necessary to “invent” and obtain a patent.

2. Non-use Acceptable

In the early 1900s, the courts removed any working or use requirement to patent enforcement. The key case that made the lack of such a requirement clear was *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, decided by the Supreme Court in 1908.⁷¹ The Court concluded that a patent owner had no obligation to use the claimed invention, nor to let others use the invention.⁷² Analogizing patents to other property rights, the Court recognized that “the very essence of the right conferred by the patent, as it is the privilege of any owner of property to use or not use it, without question of motive.”⁷³ A patentee’s rights are “exclusive, and so clearly within the constitutional provisions in respect to private property that he is neither bound to use his discovery himself or permit others to use it.”⁷⁴ Accordingly, the patentee could enforce her patent, and enjoin others from using the claimed invention, without ever physically using the invention herself, or even allowing others to do the same.⁷⁵ This requirement of physicality had been unambiguously removed.⁷⁶

Similarly, the paper patent doctrine began to fall out of disfavor in the early to mid-1900s.⁷⁷ As Professor Duffy points out, the

68. Willner, *supra* note 6, at 622–24.

69. Kendall J. Dood, *Patent Models and the Patent Law: 1790–1880 (Part II)*, 65 J. PAT. OFF. SOC’Y 234, 271 (1983).

70. *Id.* at 270–72.

71. 210 U.S. 405, 429 (1908).

72. *Id.* at 428–29.

73. *Id.* at 429.

74. *Id.* at 425.

75. *Id.*; *Lorain Steel Co. v. N.Y. Switch & Crossing Co.*, 184 F. 301, 302–03 (3d Cir. 1911) (“Doubtless, in the present case, the complainant was entitled to an injunction restraining further infringement. It was entitled to that relief whether it made use of its patent or not.”).

76. Oskar Liivak & Eduardo M. Penalver, *The Right Not to Use in Property and Patent Law*, 98 CORNELL L. REV. 1437, 1445–47 (2013).

77. Duffy, *supra* note 12, at 1385–86 (detailing the demise of the anti-patent aspects of the doctrine).

erosion of a use requirement in cases such as *Continental Paper Bag*, described above, eroded the “anti-patent side of the doctrine.”⁷⁸ Just as other use requirements went away, so did the judicial bias against paper patents.⁷⁹

II. PATENT THEORY'S VIEW TOWARD PHYSICALISM

Two of the most widely accepted patent theories are the incentive to invent theory and the disclosure theory. The incentive to invent theory focuses on using patents to prompt the creation and eventual production of the claimed invention, while the disclosure theory sees the public disclosure of the knowledge contained in the patent itself as the main goal. These theories, and their goals, are not mutually exclusive, but their emphases are very different. This difference is what links physicalism with the incentive to invent theory and, in turn, explains how a lack of physicalism causes patent law to fall back to the disclosure theory. While the incentive to invent theory centers on the actual creation and commercialization of the invention during the patent term, the disclosure theory focuses on the patent document itself and usage after patent expiration. The same doctrinal differences explored above are echoed when examining these two patent theories as they relate to physicalism.

A. Two Prominent Patent Theories

While there are many theories of patent law,⁸⁰ there are two main, widely accepted ones.⁸¹ The first, the incentive to invent theory,

78. *Id.* (noting “the gradual conflation of the paper patent doctrine with the quite distinct rule that patentees are not required to use their patented technology”).

79. *Id.*; see also *Edward Valves, Inc. v. Cameron Iron Works, Inc.*, 286 F.2d 933, 939 (5th Cir. 1961) (“In a close case the existence of a patent only on paper might tip the scale against a holding of infringement. But lack of commercial success does not preclude enforcement or indicate lack of invention.”).

80. For example, there is the prospect theory of patent law, see Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 276–78 (1977), commercialization theory, F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 707–12 (2001), or signaling theory, Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 643–48 (2002).

81. See, e.g., STAFF OF SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 21 (Comm. Print 1958) (report by Fritz Machlup) (explaining the best known theories of patent protection); Cotropia, *supra* note 8, at 1892 (“The incentive-to-invent theory is the classic justification for the patent system.”); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1024–30 (1989) (noting that the primary justifications for patents are the incentive to invent and disclosure theories); Katherine J. Strandburg, *What Does the Public Get? Experimental Use and the Patent Bargain*, 2004 WIS.

describes patent law as incentivizing the invention's creation for the greater good by getting the invention actually implemented and sold to the public during the patent term.⁸² The second, the disclosure theory, focuses on getting information about the invention out, in the form of the patent, so that upon expiration the public can enjoy the patented invention and the knowledge that goes along with it.⁸³ Notably, they are not mutually exclusive—revealing disclosures are made when an invention is created and sold, and disclosures can provide the seeds for actual creations and mass distributions. However, each theory emphasizes something very different and at a different time—with the incentive to invent theory focused on activities outside the patent document during the patent term, while, in contrast, the disclosure theory's focus is on the patent document itself and usage of that knowledge after the patent term.

The incentive to invent theory is a classic justification for the patent system.⁸⁴ Under this theory, patent law incentivizes the creation of inventions and follow-on commercialization of these inventions, often called innovations, by giving the inventor a mechanism by which she can recoup her development costs: exclusivity.⁸⁵ The incentive to invent theory assumes the exclusive rights to the invention allow the inventor to monopolistically price the invention—above marginal cost.⁸⁶ The potential for this additional

L. REV. 81, 104–05 (“Over and over, scholars and courts have explained that the patent system is justified by the twin theories: ‘incentive to invent’ and ‘incentive to disclose.’”).

82. See U.S. CONST. art. I, § 8, cl. 8 (giving the U.S. Congress the power to grant patents and copyrights in order to “promote the Progress of Science and useful Arts”); *Mazer v. Stein*, 347 U.S. 201, 219 (1954) (“The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare.”); WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 4–5 (2003) (reviewing rationales for intellectual property and finding the economic rationale most compelling); Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1576–77, 1580 (2003); Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 993 (1997) (“Intellectual property is fundamentally about incentives to invent and create.”).

83. *Universal Oil Prods. Co. v. Globe Oil & Ref. Co.*, 322 U.S. 471, 484 (1944).

84. See Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129–30 (2004) (describing the incentive-to-invent theory).

85. See *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480 (1974) (“The patent laws promote this progress by offering a right of exclusion for a limited period as an incentive to inventors to risk the often enormous costs in terms of time, research, and development.”). Innovation is technically different than invention in that innovation includes actually bringing the invention to market and distributing it. Ted M. Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 366 (2010). However, the terms are often used interchangeably, and innovation is at least an indirect product of invention. See Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CALIF. L. REV. 803, 809 (1988).

86. See Christopher A. Cotropia & James Gibson, *The Upside of Intellectual Property's Downside*, 57 UCLA L. REV. 921, 927 (2010):

revenue is what entices a would-be inventor to try to invent.⁸⁷ Notably, for this incentive to play out and the inventor to recoup investments via price control, the inventor needs to actually create and sell the invention.⁸⁸ The exclusivity the patent grant awards to the inventor is grounded in the incentive to invent theory.⁸⁹

In contrast, the disclosure theory describes the patent system as a quid pro quo between the patentee and the public.⁹⁰ The inventor fully discloses her invention to the public in the patent, and in return she gains exclusivity over the disclosed invention for a limited period of time.⁹¹ Without the promise of exclusivity, the inventor would never inform the public about the inner workings of her invention for fear of others appropriating it.⁹² The public then gets full possession of the disclosed invention, via the description in the patent, as soon as the patent's term expires.⁹³ At that point, the invention truly becomes part of the public domain.⁹⁴ The disclosure theory articulates the invention's disclosure itself as the justification for the patent system.⁹⁵

This control allows rightsholders to be price searchers, as opposed to price takers who must settle for a price equivalent to marginal cost. The law thus allows rightsholders to engage in monopolistic pricing—or at least pricing that would not be possible without the market power that intellectual property confers. (footnote omitted).

87. See Christopher A. Cotropia, "After-Arising" Technologies and Tailoring Patent Scope, 61 N.Y.U. ANN. SURV. AM. L. 151, 170 (2005) ("The incentive to invent is maintained by the would-be inventor's perception that she will get adequate protection to recoup costs.").

88. See Merges, *supra* note 85, at 808 ("Through the patent system, society obtains the benefit of both an innovation (assuming the invention is perfected and introduced for sale) and, at the very least, an invention—that is, a significant technical advance.").

89. See, e.g., Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 MICH. L. REV. 475, 503–04 (2006) ("Under current law, an inventor's incentive to invent is a function of her expected return under complete patent exclusivity weighted by the probability of obtaining that exclusivity.").

90. *Universal Oil Prods. Co. v. Globe Oil & Ref. Co.*, 322 U.S. 471, 484 (1944):

As a reward for inventions and to encourage their disclosure, the United States offers a seventeen-year monopoly to an inventor who refrains from keeping his invention a trade secret. But the quid pro quo is disclosure of a process or device in sufficient detail to enable one skilled in the art to practice the invention once the period of the monopoly has expired

91. *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 151 (1989) ("In consideration of [the invention's] disclosure and the consequent benefit to the community, the patent is granted.").

92. Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 556–57 (2012) ("Disclosure theory focuses on the quid pro quo of the patent system: the inventor receives the exclusive patent right in exchange for fully disclosing the invention to society, rather than keeping the invention secret (such as with trade secret protection).").

93. Sean B. Seymore, *Making Patents Useful*, 98 MINN. L. REV. 1046, 1073–74 (2014).

94. *Evans v. Eaton*, 20 U.S. (7 Wheat.) 356, 418 (1822) ("The object is to put the public in complete possession of the invention . . . so that interference with it may be avoided while the patent continues, and its benefits may be fully enjoyed by the public, after the patent expires.").

95. Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 548–50 (2009).

In theory, the disclosure adds to the public storehouse of useful knowledge, and without patents prompting such disclosure, such knowledge would remain suppressed or, at the very least, its disclosure would be significantly delayed.⁹⁶ Patentability requirements such as the written description and enablement doctrines,⁹⁷ which require the patent's specification to both describe the claimed invention and teach others how to make and use it,⁹⁸ are heavily linked to the disclosure theory.

These two theories are not orthogonal to each other. Doctrine that emphasizes one theory does not necessarily do so at the expense of the other. Nor do the theories fundamentally reject the other's view of patent law. In fact, by meeting the goals of one theory, patent law could also further the other.

For example, the physical creation of the invention and its distribution—both the goals of the incentive to invent theory—often also disclose the invention to the public.⁹⁹ Most inventions are “self-disclosing” in that their sale de facto informs the public about the invention's composition and operation.¹⁰⁰ The commercialization of the invention necessarily discloses it.¹⁰¹ Admittedly, some inventions are not self-disclosing (e.g., an invented process), and thus the patent document itself may be critical to placing the invention into the public domain upon the patent's expiration.¹⁰²

96. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 481 (1974) (stating that additions from patent disclosures “to the general store of knowledge are of such importance to the public weal that the Federal Government is willing to pay the high price of 17 years of exclusive use for its disclosure . . .”). The disclosure can also provide benefits during the patent term, by facilitating design-arounds. See Sean B. Seymore, *The Teaching Function of Patents*, 85 NOTRE DAME L. REV. 621, 624 (2010) (emphasizing that “the patent document has potential immediate value to the public, which can use the information for any purpose that does not infringe upon the claims”).

97. 35 U.S.C. § 112(a) (2012).

98. Fromer, *supra* note 95, at 545–48 (detailing these patentability requirements and their connection to the disclosure theory).

99. See Strandburg, *supra* note 81, at 104–06; see also Jason Rantanen, *Peripheral Disclosure*, 74 U. PITT. L. REV. 1, 16–36 (2012) (detailing the other ways the patent incentive prompts disclosure beyond the patent itself, such as personal and reputational rewards for the inventor and marketing advantages for the investor, while maintaining the potential to monetize the patent).

100. Strandburg, *supra* note 81, at 105 (“Note, however, that while the incentive to invent is highly pertinent to such self-disclosing inventions, the disclosure quid pro quo has little relevance.”).

101. *Id.* (“Because the free-rider theory assumes that an invention is disclosed and its reproduction enabled by its mere commercialization, the patent disclosure can add little to society's store of technical knowledge and serves almost exclusively to define the ‘metes and bounds’ of the invention.”).

102. *Id.* at 106 (“Examples of such non-self-disclosing inventions include industrial processes or complex software programs.”).

In turn, promoting disclosure can lead to actual creation. In fact, this is an often described consequence of the disclosure theory.¹⁰³ The reason patent law wants the invention disclosed is so that others can use that information to actually implement the invention and create other inventions.¹⁰⁴ Without such disclosures, the invention's dissemination may be limited and never improved upon. Disclosure may also prompt designing around during the patent term.¹⁰⁵

However, even with this overlap between the theories, they each have a very different focus.¹⁰⁶ The incentive to invent theory is centered on the real world creation and distribution of the invention. This is what the theory emphasizes—the utilitarian benefits of the invention production.¹⁰⁷ In contrast, the disclosure theory stresses the public benefits of the patent document itself. The knowledge contained within the patent is the thrust of the disclosure theory.¹⁰⁸ This difference in focus, and its association with the presence or absence of physicalism, is explored in more detail below.

103. Fromer, *supra* note 95, at 549–50 (“Patent disclosures act, as one commentator labels it as an ‘invisible college of technology.’ Use of these disclosures, in turn, speeds the rate of innovation in society, which is central to economic growth.” (quoting Carolyn C. Cooper, *Nineteenth-Century American Patent Management as an Invisible College of Technology*, in *LEARNING AND TECHNOLOGICAL CHANGE* 40, 40 (Ross Thompson ed., 1993))).

104. *Id.* (“Disclosure of an invention sets out what others have already accomplished, thereby both revealing information about those discoveries—enabling the avoidance of ‘wasteful duplication of the original inventor’s research’—and noting, usually implicitly by omission, what has yet to be done.” (quoting Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 *HARV. L. REV.* 2007, 2010 (2005))).

105. *Id.* (“Second, the disclosure can stimulate others to design around the invention or conceive of new inventions—either by improving upon the invention or by being inspired by it—even during the patent term.”).

106. This difference has been recognized, at least indirectly, by commentators, particularly those arguing for patent doctrines to promote the disclosure theory. *See, e.g.*, Fromer, *supra* note 95, at 553:

Until now, much of the academic literature on patent law has addressed the ideal quid—the scope of the patent right in light of economic concerns generally and with regard to particular technologies—but not the ideal quo—the structure and content of invention disclosure and its place in the patent system;

Ouellette, *supra* note 92, at 556:

[I]f patents provided no innovation incentive, I do not believe that the disclosure incentive alone would be sufficient to justify the patent system. But given that we do have an entrenched international patent system—whether it promotes innovation or not—this Article will probe whether strong disclosure should be a central goal of that system.

107. Cotropia, *supra* note 8, at 1898 (“The incentive-to-invent story also assumes that a product or service embodying the invention will eventually go on sale.”).

108. *See, e.g.*, Seymore, *supra* note 96, at 622 (explaining that the “patent document . . . discloses the invention to the public”).

B. Physicalism's Alignment with the Incentive to Invent Theory

Patent doctrines that require physical embodiments of the invention line up the patent system with the incentive to invent rationale. By requiring the inventor to both actually make/practice the invention and then continue using it, such physicalism-based requirements tune patent doctrine to the goals of the incentive to invent theory—creation and commercialization of the invention. The patent laws, when adhering to physicalism such as in the 1800s, as seen above, bring the patent system closer to the utilitarian goals of the incentive to invent theory.

First, requiring actual reduction to practice ensures that all inventors, in order to obtain a patent, must take a necessary step toward providing society with an operating invention. Conception and articulating the invention in detail on paper are common first steps in giving society the invention to use.¹⁰⁹ But actually physicalizing the invention is a necessary next step.¹¹⁰ A patent system that requires actual reduction to practice to obtain a patent, as required until the late 1800s, places patent protection a step further toward the goal of the incentive to invent theory—getting the invention, in practice, in society's hands as soon as possible.¹¹¹

And this linkage—between the actual reduction to practice requirement and the incentive to invent theory—falls in line with how both view the act of inventing. The actual reduction to practice requirement is predicated on courts emphasizing that the act of physically manifesting the invention is part of the invention process.¹¹² There is no “invention” until the concept is put into actual

109. Christopher A. Cotropia, *Describing Patents as Real Options*, 34 J. CORP. L. 1127, 1135–37 (2009) (detailing this initial development required to file a patent as the invention's “option price”).

110. Such as either making a prototype of the invented electronics, testing the invented software on a computer system, or mixing small batches of an invented chemical. See Christopher A. Cotropia, *The Folly of Early Filing*, 61 HASTINGS L.J. 65, 91–94 (2009) (describing the technological development process in the context of patenting).

111. *Id.* at 124 (explaining how requiring an actual reduction to practice “increases the chances of commercialization” of the invention).

112. See, e.g., *Agawam Co. v. Jordan*, 74 U.S. (7 Wall.) 583, 602 (1868):

The settled rule of law is, that whoever first perfects a machine is entitled to the patent, and is the real inventor, although others may have previously had the idea and made some experiments towards putting it in practice. He is the inventor and is entitled to the patent who first brought the machine to perfection and made it capable of useful operation;

WILLARD PHILLIPS, *THE LAW OF PATENTS FOR INVENTIONS* 110 (1837) (“The claim of the inventor arises only on the practical application of a theory, or abstract truth, or elementary property, in some art, process, or method, which he has invented and put in practice, or some machine or apparatus, or composition of matter, which he has actually made.”); WILLIAM C. ROBINSON, 1

practice.¹¹³ This is similar to how the incentive to invent theory views invention—the concept is not the end goal. The patent system, under this theory, is incentivizing physical creation and ultimate distribution of the invention.¹¹⁴ The incentive to invent story assumes creation, production, and consumption of the invention—all for societal good.¹¹⁵

A similar analysis applies to the requirement to work, or to commercialize, the invention in order to maintain the patent's enforceability. Forcing the patentee to practice the patented invention in order to enforce exclusivity further ensures that patent protection begets societal use of the invention. This is particularly true with commercialization requirements, such as those under the paper patent doctrine and working requirements, where patent law of the late 1800s required the patentee to continue to physically implement the invention to get the privileges of the system.¹¹⁶ By subscribing to such physicalism, use requirements fit well with the incentive to invent theory.

Just as with actual reduction to practice, this linkage is rooted in the working requirement and incentive to invent theory's goal of the patentee providing the invention to society. This is the purpose of the patent grant under the incentive to invent theory—to get the invention produced and distributed. And the use requirement explicitly requires this to happen for the patent to stay enforceable.¹¹⁷ With such a physicalism-based requirement, society gains the benefit of the patented invention's usage—particularly during the patent's period of exclusivity.

And when the physicalism-based requirements go away, like they did in the early 1900s, the patent system does not push as hard

THE LAW OF PATENTS FOR USEFUL INVENTIONS § 77, at 116, § 126, at 181–83 (Boston, Little, Brown & Co. 1890); Duffy, *supra* note 12, at 1368–69.

113. See, e.g., *Whitely v. Swayne*, 74 U.S. (7 Wall.) 685, 687 (1868) (“[H]e is the first inventor, and entitled to the patent, who, being an original discoverer, has first perfected and adapted the invention to actual use.”).

114. Lemley, *supra* note 82, at 995–96 (noting that by giving inventors “control over the use and distribution of their ideas,” intellectual property law “encourage[s] them to invest efficiently in the production of new ideas and works of authorship”).

115. See Cotropia, *supra* note 8, at 1898–99 (detailing this assumption).

116. Duffy, *supra* note 12, at 1361–62 (quoting *Brenner v. Madison*, 383 U.S. 519, 534 (1966)):

If the quid pro quo of a patent is ‘the benefit derived by the public from an invention,’ that public benefit can easily be viewed as including not merely the disclosure required by the statute to be set forth in the patent document but also the benefit flowing from the practical knowledge and experience gained from actually building and commercializing the invention.

117. Bracha, *supra* note 6, at 187–90.

toward the goals of the incentive to invent theory. The requirements for physical creation and commercialization are no longer baked into the doctrine. Such physical implementation and distribution is not necessary for patent exclusivity.¹¹⁸ Certainly, the patent itself, and its exclusivity, can facilitate actual implementation of the invention and its distribution.¹¹⁹ But these activities are no longer required, and thus patent law does not have to reach the ultimate, utilitarian goals of the incentive to invent theory. It may do so via the incentives of exclusivity, but such actions are not wired into the law—physicalism is no longer an express part of the doctrine. Instead, the patent, by itself, can meet the requirements for filing (via constructive reduction to practice), and the patent is all that is needed to enforce exclusivity (since there is no use/commercialization requirement).

C. Lack of Physicalism and the Promotion of the Disclosure Theory

When patent law moves away from doctrines based on physicalism, the law emphasizes the disclosure theory. If a physical embodiment of the invention is not required prior to patenting, and the inventor does not have to continue using the invention to enforce the patent, the only thing the inventor must produce is the patent itself, nothing more. And the theory that focuses on the patent as the produced “product” is the disclosure theory.

Constructive reduction to practice equates a robust patent specification to physically making and implementing the claimed invention.¹²⁰ In order to constructively reduce to practice, the patent specification must contain enough detail to enable a skilled artisan to actually reduce the patent to practice.¹²¹ The doctrine centers on the level of detail and teaching in the patent disclosure, not inventor

118. See *supra* Section I.C.

119. Fromer, *supra* note 95, at 549–50 (observing that patent disclosure can facilitate invention and distribution, by attracting funding, avoiding wasteful duplication, and inspiring other inventors to “invent around”).

120. See Macomber, *supra* note 6, at 357:

We may now safely conclude (1) that before an invention becomes a patentable invention it must possess, in addition to the mental act of invention or discovery, a concrete embodiment of the new and useful idea; (2) that the filing of a patent application disclosing the inventive act and the method of practising the same is constructive embodiment and reduction to practice.

121. See *Frazer v. Schlegel*, 498 F.3d 1283, 1287 (Fed. Cir. 2007) (“[T]he question is whether the document discloses the invention of the count by meeting the written description and enablement requirements of 35 U.S.C. § 112 ¶ 1, for a filed application serves as a constructive reduction to practice of its content.”).

activity outside the patent.¹²² And this is the very thing the disclosure theory identifies as the main goal of patent law—the patent.¹²³

The rationale behind the shift to constructive reduction to practice is consistent with the disclosure theory as well. The conceptualization of constructive reduction to practice was premised, at least in part, on the patent document being evidence of actual invention.¹²⁴ A detailed description of the invention and how to make it established necessary possession under the law.¹²⁵ This level of detail is also what places the invention in the public's possession upon expiration—and thus fits nicely with the disclosure theory. The disclosure theory views the patent system as providing knowledge usable upon the patent's expiration, and a constructive reduction communicates such information.¹²⁶ The lack of physicalism is of no concern to the disclosure theory since information is the first order product of the patent system under the theory.¹²⁷

A similar line of analysis applies to the removal of use requirements and such removal's linkage to the disclosure theory. When physical use of the invention was removed as a requirement to enforcement, the courts concluded that the patentee could do what she wanted with the claimed invention.¹²⁸ If she chose not to actually implement or commercialize her invention, and to prevent others from doing the same, that was her sole prerogative.¹²⁹ However, she still needed to draft and submit the patent document to gain such exclusivity. This view of patent law necessarily emphasizes the disclosure theory because, without a use requirement, the only thing

122. See *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1352 (Fed. Cir. 2010) (en banc) (explaining the distinction between information inside the specification versus that outside, including actual reductions to practice).

123. See *Rantanen*, *supra* note 99, at 6 (“First, conventional disclosure theory focuses entirely on the disclosure of the patent: the information contained in the document itself.”).

124. *Willner*, *supra* note 6, at 622–24.

125. *Ouellette*, *supra* note 92, at 551 (explaining how current case law views constructive reduction to practice as sufficient evidence of possession of the claimed subject matter); see also Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 147 (2006) (“Enablement performs the role of demonstrating what the inventor possessed as her invention when filing her application.”).

126. *Duffy*, *supra* note 12, at 1371:

The rise of constructive reduction to practice and the concomitant entry of paper patents into the legal system corresponds to a fundamental shift toward what we will call an “informational theory” of the patent system—i.e., a theory in which the patent system is justified on the ability of patents to encourage the production and disclosure of information.

127. *Id.*

128. See *Cont'l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 429 (1908) (holding that it is the privilege of a patent owner to use—or not to use—a patent “without question of motive”).

129. *Id.*

society is ensured of getting from the inventor is the patent document itself—again the goal of the disclosure theory.

As discussed above, it is not that removing physicalism-based requirements pushes patent law exclusively into the disclosure theory's domain. The patent itself will likely lead to some physical creation of the invention and eventual commercialization.¹³⁰ The disclosure theory even recognizes this as a secondary product of the patent—patent law wants to incentivize disclosure so that others can eventually practice the invention, particularly after patent expiration.¹³¹ There is some physicalism embedded in the disclosure theory story. But such physical creation is a secondary goal—a by-product of the disclosure itself. And once the express physical requirements are removed, inventions can be patented and enforced to prevent any physical manifestation of the claimed invention.¹³² Without these physicalism-based requirements, the patent is the only assured disclosure. This lack of explicit physicalism causes patent law to emphasize the disclosure theory first and foremost.

Notably, when physicalism is present in patent doctrine, the invention is disclosed. Arguably, patent law with physicalism-based doctrine may provide even more disclosure than a patent system without.¹³³ In the mid-1800s, when physicalism was at its height, society was ensured both the patent disclosure *and* the physical embodiments of the device. Requirements rooted in physicalism prompt disclosures of a different kind—how the invention is made and operates in real space—which may provide even richer information than just the patent.¹³⁴

When physicalism is absent, however, the patent theory emphasized changes. As mentioned above, the two theories—incentive to invent and disclosure—are not mutually exclusive, and both feed

130. Fromer, *supra* note 95, at 549–50. Notably, a vast majority of patents are never commercialized, and many are eventually abandoned due to failure to pay the required maintenance fees. *See, e.g.*, Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1521–24 (2005) (detailing and studying the over half of issued patents whose maintenance fees go unpaid).

131. Fromer, *supra* note 95, at 551 (“[E]ffective disclosure in a patent system should tend to equalize the positions of the initial innovator and potential competitors by granting the latter the information needed to innovate subsequently in the field.”).

132. Oskar Liivak & Eduardo M. Peñalver, *The Right Not to Use in Property and Patent Law*, 98 CORNELL L. REV. 1437, 1445–47 (2013).

133. *Cf.* Strandburg, *supra* note 81, at 103, 104–06 (“[F]or scientists and engineers, understanding is often, if not virtually always, a hands-on experience.”); *see also* Rantanen, *supra* note 99, at 16–36.

134. Fromer, *supra* note 95, at 551.

the other's goals. But as patent law is tuned—or levers are pulled¹³⁵—with regards to physicalism, the law is choosing which theory it wishes to promote. Patent doctrines that require physicalism, as detailed above, place the incentive to invent theory front and center, even if they also further the disclosure theory. In contrast, when physicalism-based doctrine is removed, patent law shifts its emphasis to the disclosure theory, with only secondary hopes of meeting the goals of the incentive to invent theory.

III. RECENT RISE OF PHYSICALISM AND ITS IMPLICATIONS FOR PATENT THEORY

The two insights detailed above—(1) identifying physicalism and its absence in patent law and (2) detailing physicalism's linkage to patent theory—help to both explain doctrinal shifts in patent law and contextualize them in patent theory. As an example of the explanatory power of physicalism, a recent patent law change, partially driven by concerns over NPEs, is discussed below. This change can be characterized as moving patent law back to physicalism. And once so identified, the change also evidences an underlying, although not explicitly articulated, belief that the disclosure theory, by itself, cannot justify the patent system.

A. Recent Example of Movement Toward Physicalism—eBay v. MercExchange

As explained above, the Supreme Court, in its 1908 decision *Continental Paper Bag*, removed any vestige of a use prerequisite to enforcing patent exclusivity. The patent was viewed as a property right, and the exercise of such rights is not predicated on the need to use the underlying property—in this case the patented invention.¹³⁶ The United States Court of Appeals for the Federal Circuit, since its inception in 1982, has vigorously defended the patentee's right not to use and still obtain an injunction.¹³⁷ The court, which hears all patent appeals,¹³⁸ applied a “general rule that courts will issue permanent injunctions against patent infringement.”¹³⁹ This rule was rarely, if

135. See, e.g., Burk & Lemley, *supra* note 82, at 1641–42 (identifying “policy levers” that can be pulled to tailor the patent system to the complexities of the real world).

136. Liivak & Peñalver, *supra* note 132, at 1446.

137. *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1281 (Fed. Cir. 1988).

138. 28 U.S.C. § 1295(a)(1) (2012).

139. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1246–47 (Fed. Cir. 1989).

ever, deviated from, and such deviations were based on concerns over public welfare or health, not the patentee's non-use.¹⁴⁰

The Supreme Court recently revisited *Continental Paper Bag* and the Federal Circuit's permanent injunction practice in *eBay v. MercExchange* in 2005.¹⁴¹ The Court held that the grant of a permanent injunction in patent cases was not automatic upon a finding of patent infringement. Instead, injunction decisions must be made "[a]ccording to well-established principles of equity, [and] a plaintiff seeking a permanent injunction must satisfy a four-factor test."¹⁴² This test required the patentee to show (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.¹⁴³ The majority decision did not speak to whether non-use by the patentee did or did not support an injunction under these four factors.¹⁴⁴

However, in a concurrence, four justices suggested that injunctions may not be appropriate where the patentee is a NPE.¹⁴⁵ The concurrence noted that an "industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees."¹⁴⁶ And injunctions granted to these NPEs "can be employed as a bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent."¹⁴⁷

Courts, in applying *eBay*, appear to have taken the concurrence's concerns regarding NPEs to heart. As Professor Christopher Seaman empirically observed, NPEs "rarely obtained a permanent injunction after prevailing on liability (16%, 4 of 25 cases), while other patentees are successful in obtaining injunctions in the vast majority of the time (80%, 154 of 193 cases)" after *eBay*.¹⁴⁸ Courts

140. See *Rite-Hite Corp. v. Kelley, Co.*, 56 F.3d 1538, 1547 (Fed. Cir. 1995) ("[C]ourts have in rare instances exercised their discretion to deny injunctive relief in order to protect the public interest.").

141. See *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 393–94 (2006).

142. *Id.* at 390.

143. *Id.*

144. See John M. Golden, Commentary, "Patent Trolls" and Patent Remedies, 85 TEX. L. REV. 2111, 2111–13 (2007).

145. *eBay*, 547 U.S. at 395–96 (Kennedy, J., concurring, joined by Stevens, Souter, Breyer, JJ.).

146. *Id.*

147. *Id.*

148. Seaman, *supra* note 11, at 1988.

typically find that all four prongs of the equitable test, after *eBay*, point toward a denial of an injunction when the patentee is not producing the claimed invention.¹⁴⁹ In such circumstances, courts conclude that money damages are adequate, an injunction would be more of a hardship on the infringer, and the public interest is better served without an injunction.¹⁵⁰

Thus, as applied by the courts, *eBay* has reintroduced a use requirement to enforce a patent right, and, in turn, reintroduced physicalism into patent doctrine. This use requirement is not as strong as it was in the 1800s—the patent is not taken away and the patentee can still get money damages.¹⁵¹ But, just as before *Continental Paper Bag*, the patent system, in most cases, now de facto requires working the patent invention in order to obtain an injunction and enforce patent exclusivity. The patentee is required to physically implement the invention in order to get injunctive relief. The Court's decision in *eBay*, particularly its application, is grounded in a physicalism-based view of patent law.

B. Accompanying Reemphasis on the Incentive to Invent Theory and Lack of Appreciation for the Disclosure Theory

Interestingly, this shift back to a use requirement, and the accompanying return to physicalism, coincides with renewed emphasis on the goals of the incentive to invent theory. Discussions as to why injunctions should only be awarded to practicing entities include declarations that the patent system is meant to incentivize actual production and distribution of the invention. Simply sitting on the patent, and not producing, is not the goal of patent law.¹⁵² Patent law

149. *Id.*; see also *Robert Bosch LLC v. Pylon Mfg. Corp.*, 659 F.3d 1142, 1149 (Fed. Cir. 2011) (“We take this opportunity to . . . confirm that *eBay* jettisoned the presumption of irreparable harm as it applies to determining the appropriateness of injunctive relief.”).

150. Seaman, *supra* note 11, at 1988.

151. See *Paice LLC v. Toyota Motor Corp.*, 504 F.3d 1293, 1314 (Fed. Cir. 2007) (“Under some circumstances, awarding an ongoing royalty for patent infringement in lieu of an injunction may be appropriate.”). See generally Christopher B. Seaman, *Ongoing Royalties in Patent Cases After eBay: An Empirical Assessment and Proposed Framework*, 23 *TEX. INTELL. PROP. L.J.* 203 (2015) (reporting the results of an empirical study of ongoing royalty awards after *eBay*).

152. Stijepko Tokic, *The Role of Consumers in Deterring Settlement Agreements Based on Invalid Patents: The Case of Non-Practicing Entities*, 2012 *STAN. TECH. L. REV.* 2, 23 (quoting Daniel J. McFeely, Comment, *An Argument for Restricting the Patent Rights of Those Who Misuse the U.S. Patent System to Earn Money Through Litigation*, 40 *ARIZ. ST. L.J.* 289, 205 (2008)):

As discussed earlier, NPEs do not produce any real product or service and their prosperity depends on obtaining lucrative settlements and licensing fees. Due to NPEs' business model in general, it has been suggested that “the incentive to invent does not exist for [NPEs,]” and it was pointed out that the exclusive rights granted by

is meant, according to current discourse, to produce physical implementation and use of the claimed invention for society's benefit.¹⁵³ The reintroduction of a use requirement is tied to a reemphasis on the incentive to invent theory's ultimate goal—the production of the invention for societal good.

The concurrence's discussion in *eBay* contains a similar theme. This concurrence in *eBay* disfavors the use of patent law to support an "industry . . . in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees."¹⁵⁴ Injunctions, in those situations, should not be granted because society is not getting the fruits of the incentive to invent theory of patent law.¹⁵⁵ The de facto use requirement introduced by *eBay* is explicitly supported by the view that the patent system is meant to incentivize the inventor to produce the claimed invention, not simply prevent others from producing it.¹⁵⁶

The use rule introduced by *eBay* is meant to counteract such behavior—assertion by NPEs—and realign patent law with the incentive to invent theory. The prevalent view is that NPEs do not provide the social good patents are meant to produce—the production

the federal patent system have not incentivized some of the largest NPEs to innovate beyond the patents held in their portfolios.

153. See Daniel J. McFeely, Comment, *An Argument for Restricting the Patent Rights of Those Who Misuse the U.S. Patent System to Earn Money Through Litigation*, 40 ARIZ. ST. L.J. 289, 304–05 (2008):

When the patent troll exercises its exclusive patent rights through litigation, it does so without conferring any corresponding benefit upon society. . . . Further, the incentive to invent does not exist for the patent troll whose business model is based upon revenue generation through licensing and litigation. The exclusive rights granted by the federal patent system have not incentivized TechSearch, NTP, or Acacia Technologies Group to innovate beyond the patents held in their portfolios. None have even gone so far as to practice their patented inventions, so as to have a credible claim of market share erosion from those they allege to have infringed.

154. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 395–96 (Kennedy, J., concurring).

155. See Jeremy Mulder, *The Aftermath of eBay: Predicting When District Courts Will Grant Permanent Injunctions in Patent Cases*, 22 BERKELEY TECH. L.J. 67, 81–82 (2007):

The normative implications of how courts view the four factors are clear: post-*eBay* courts view the patentee as entitled to an injunction to protect its patented invention from direct competition. Allowing a direct competitor to violate a patentee's right to exclude harms the bedrock view that patents provide incentives to invent and thereby promote the progress of science.

156. Notably, this might not be directly behind Justice Kennedy's reasoning in *eBay*, but the decision in *eBay* supports such commercialization goals. See, e.g., Ted M. Sichelman, *Purging Patent Law of "Private Law" Remedies*, 92 TEX. L. REV. 517, 520–21, 536 (2014) ("[D]enying injunctions—even to practicing patentees—and limiting damages to levels below that needed for full compensation may better promote the utilitarian aims of patent law.").

of innovative products and services.¹⁵⁷ Instead, NPE patent assertions are net losses for society.¹⁵⁸ NPEs are not operating the way the incentive to invent theory intends.¹⁵⁹ There is neither physical creation of the invention nor ultimate commercial sale—both of which are the very risks patent law subsidizes by the price controls and exclusivity under the incentive to invent theory.¹⁶⁰ Instead, NPEs, the narrative goes, produce nothing and use their ability to prohibit others from producing to simply extract rents.¹⁶¹ Physicalism-based requirements, such as those introduced in *eBay*, are meant to counteract such behavior, and, in turn, push patent law back in line with the incentive to invent theory.¹⁶²

The disclosure theory, in contrast, is still furthered by patent assertions by NPEs. Even if a patentee is not using the invention, and thus would be unlikely to get an injunction under *eBay*, the possible licensing stream from the patent incentivizes the disclosure of the invention.¹⁶³ And this disclosure is the goal of the disclosure theory. The NPE monetization model, while potentially not as well aligned with the incentive to invent theory, still fits nicely under the disclosure theory.¹⁶⁴ The patent carrot prompts the invention to be

157. Robin Feldman & Thomas Ewing, *The Giants Among Us*, 2012 STAN. TECH. L. REV. 1, 1 (“Troll activity is generally reviled by operating companies as falling somewhere between extortion and a drag on innovation.”).

158. See Sannu K. Shrestha, *Trolls or Market-Makers? An Empirical Analysis of Nonpracticing Entities*, 110 COLUM. L. REV. 114, 129 (2010); see also Bessen & Meurer, *supra* note 3 (discussing the costs of patent litigation).

159. See *Patent Assertion and U.S. Innovation*, EXECUTIVE OFF. OF THE PRESIDENT 5–6 (2013), https://www.whitehouse.gov/sites/default/files/docs/patent_report.pdf [<https://perma.cc/A6YY-JAE9>].

160. Tina M. Nguyen, *Lowering the Fare: Reducing the Patent Troll’s Ability to Tax the Patent System*, 22 FED. CIR. B.J. 101, 112 (2012) (“Patent trolls also do not promote commercialization because they do not market their products, but rather wait in secret for a market to develop and then demand licensing fees.”).

161. Sichelman, *supra* note 85, at 368 (“[Patent trolls] tend to exploit litigation and licensing market defects to extract unwarranted rents from commercializers . . .”).

162. See Garrett Barten, *Permanent Injunctions: A Discretionary Remedy for Patent Infringement in the Aftermath of the eBay Decision*, 16 U. MIAMI BUS. L. REV. 1, 1 (2007) (“[T]he *eBay* decision . . . effectively stops the proliferation of ‘patent trolls’ . . .”).

163. See, e.g., Kristen Osenga, *Formerly Manufacturing Entities: Piercing the “Patent Troll” Rhetoric*, 47 CONN. L. REV. 435, 449–52 (detailing the benefits of patent licensing, including the transfer of information between firms).

164. Duffy, *supra* note 12, at 1360–61 (“If the documentary disclosure theory is the foundation of the patent system, then any hostility toward NPEs or trolls is inexplicable.”); see also Maayan Perel, *From Non-Practicing Entities (NPEs) to Non-Practiced Patents (NPPS): A Proposal for a Patent Working Requirement*, 83 U. CIN. L. REV. 747, 790 (2015) (“Indeed, NPEs presumably play by the rules: they respect the documentary disclosure theory by providing a full and adequate disclosure of their claimed inventions along with their patent applications. However, they do not make any beneficial use of their inventions to promote progress and benefit society.”).

disclosed, via the patent, and the public will be able to use this knowledge to practice the invention upon patent expiration.

Notably, there is little explicit recognition of the resurgence of physicalism in patent law, via cases such as *eBay*, and the accompanying reprioritization of patent theory. Both the introduction of a use requirement and the rhetoric surrounding it emphasize the incentive to invent theory. And such a result is not surprising given the strong tie between physicalism and this theory. What has not been discussed is the resulting downplay of the disclosure theory. As noted above, when patent law moves away from physicalism-based doctrines, the law finds more support from the disclosure theory. There is, however, no discussion about disclosure theory in *eBay* or its implementation by lower courts.¹⁶⁵

This doctrinal move means that those critics of NPEs believe that the disclosure theory, by itself, cannot justify the patent system. Yet, courts and commentators have not explicitly recognized this fact. When viewed through the lens of physicalism, decisions such as *eBay* place the disclosure theory in the backseat. Patent doctrine becomes dominated by the incentive to invent theory.

CONCLUSION

Physicalism, in patent law, is the existence of the invention outside of the patent itself. Patent law has varied its attitude toward physicalism over the last two centuries, first embracing it in the 1800s and then moving away from it in the 1900s. Recent patent law changes, particularly those in response to NPEs, have started to move the law back toward physicalism. And with this movement comes a reemphasis on the incentive to invent theory and, in turn, a downgrading of the disclosure theory. Recognizing both of these movements—toward physicalism and away from the disclosure theory—helps better inform debates regarding NPEs and pending patent reforms to address these patentees. Such framing of patent doctrines within the context of physicalism, and accompanying theoretical implications of that framing, can be very useful going forward.

165. However, Professor Duffy recognized the tension between the broader NPE debate and the disclosure theory. Duffy, *supra* note 12, at 1360–61. As he notes, it is difficult to reconcile the “hostility toward NPEs or trolls” and the disclosure theory. *Id.* at 1364.
