Preliminaries

Basic Framework and Initial Questions

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Roadmap:

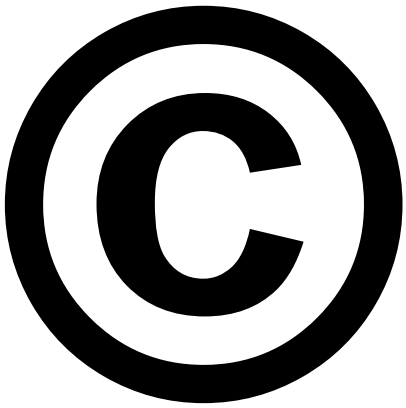
- What is intellectual property?
  - The kinds of IP
  - Comparisons
  - The label "intellectual property"
- Why is IP law said to be necessary?
- How did IP law come to be?

What is intellectual property?

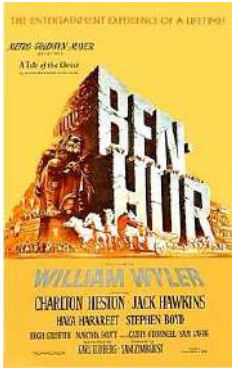
the kinds of IP

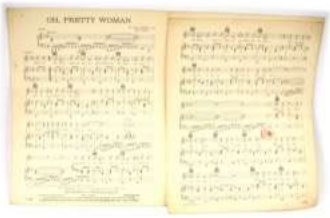
What is
"intellectual property"?

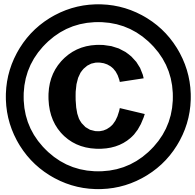
Copyrights
Trademarks
Patents
Trade Secrets
Rights of Publicity



Copyright







Copyright

Copyright

- Books
- Poems
- Movies
- Computer software
- Photographs
- Paintings
- Sculptures

Copyright

- original works of authorship fixed in any tangible medium of expression from which they can be perceived, either directly or with the aid of a machine

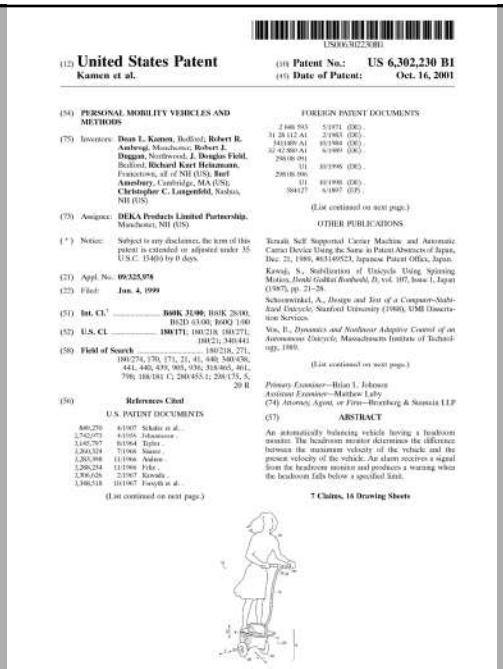
Copyright ©

Protects	expression (text, images, recordings) fixed in a tangible medium
Requires	a mere modicum of creativity
Vests	automatically upon creation
Sustained by	[nothing]
Lasts	lifetime + 70 years; or 95 years
Theory	incentive to create; public goods problem

PAT.

Patent

Patent



US006302230B1

(12) **United States Patent**
Kamen et al.

(10) **Patent No.: US 6,302,230 B1**
(45) **Date of Patent: Oct. 16, 2001**

(54) **PERSONAL MOBILITY VEHICLES AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/325,978**

(22) Filed: **Jun. 4, 1999**

(51) **Int. Cl.**[7] **B60K 31/00**; B60K 28/00, B62D 63/00; B60Q 1/00

(52) **U.S. Cl.** **180/171**; 180/218; 180/271; 180/21; 340/441

(58) **Field of Search** ..... 180/218, 271, 180/274, 170, 171, 21, 41, 440; 340/436, 441, 440, 439, 905, 936; 318/65, 461, 708; 188/181 C; 280/455.1; 296/175, 5, 20 R

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(57) **ABSTRACT**

An automatically balancing vehicle having a headroom monitor. The headroom monitor determines the difference between the maximum velocity of the vehicle and the present velocity of the vehicle. An alarm receives a signal from the headroom monitor and produces a warning when the headroom falls below a specified limit.

7 Claims, 16 Drawing Sheets

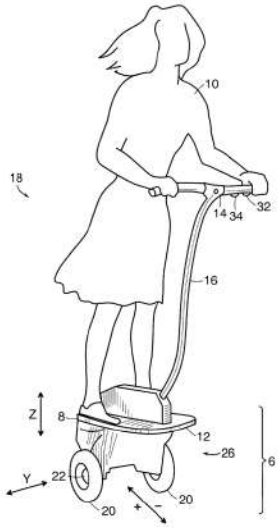
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FIG. 1

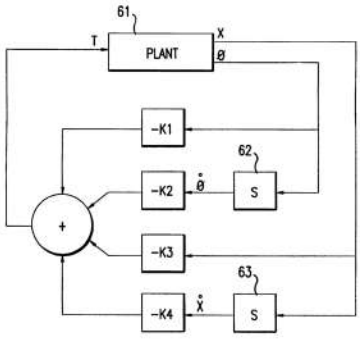
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FIG. 3

PERSONAL MOBILITY VEHICLES AND METHODS

TECHNICAL FIELD

The present invention pertains to vehicles and methods for transporting individuals, and more particularly to balancing vehicles and methods for transporting individuals over ground having a surface that may be irregular.

BACKGROUND ART

A wide range of vehicles and methods are known for transporting human subjects. Typically, such vehicles rely upon static stability, being designed so as to be stable under all foreseen conditions of placement of their ground-contacting members. Thus, for example, the gravity vector acting on the center of gravity of an automobile passes between the points of ground contact of the automobile's wheels, the suspension keeping all wheels on the ground at all times, and the automobile is thus stable. Another example of a statically stable vehicle is the stair-climbing vehicle described in U.S. Pat. No. 4,790,548 (Decelles et al.).

SUMMARY OF THE INVENTION

In one embodiment there is provided a vehicle for carrying a user. In this case, the user is a standing person. The vehicle of this embodiment includes:

a. a ground-contacting module which supports a payload including the standing person, the ground-contacting module contacting an underlying surface substantially at a single region of contact; and

b. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system.

In a related embodiment, the ground-contacting module includes a sinball.

In another embodiment, there is provide a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

a. a ground-contacting module including two substantially coaxial wheels;

b. a platform supporting the user in a standing position substantially astride both wheels; and

c. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system.

In another embodiment, there is provided a vehicle for carrying a payload including a user, and the vehicle of this embodiment includes:

a. a platform which supports the user;

b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;

c. a proximity sensor for determining the presence of the user on the device; and

d. a safety switch, coupled to the proximity detector, for inhibiting operation of the ground-contacting module unless the proximity sensor has determined the presence of the user on the device.

The proximity sensor may be a member, mechanically coupled to the safety switch, having an operating position and a non-operating position, wherein the member is in the non-operating position in the absence of the user from the device and the member is moveable to the operating position when the user is on the device. The member may include a plate, disposed on the device, for receiving a foot of the user, wherein placement of the foot on the plate causes it to move into the operating position.

Alternatively, the proximity detector may be electronic and may include a semiconductor device. In a further related embodiment, the device may include a motorized drive arrangement, coupled to the ground-contacting module; the motorized drive arrangement causing, when powered, automatically balanced and stationary operation of the device unless the proximity sensor has determined the presence of the user on the device.

In another embodiment, there is provided a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

a. a platform which supports the user;

b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;

c. a motorized drive arrangement, coupled to the ground-contacting module; the drive arrangement, ground-contacting module and payload constituting a system; the motorized drive arrangement causing, when powered, automatically balanced operation of the system wherein the motorized drive arrangement has a present power output and a specified maximum power output and, in operation, has balancing margin determined by the difference between the maximum power output and the present power output of the drive arrangement;

d. a balancing margin monitor, coupled to the motorized drive arrangement, for generating a signal characterizing the balancing margin; and

e. an alarm, coupled to the balancing margin monitor, for receiving the signal characterizing the balancing margin and for warning when the balancing margin falls below a specified limit.

The alarm may include ripple modulation of the power output of the motorized drive arrangement, and alternatively, or in addition, may be audible.

In a still further embodiment there is provided a device for carrying a user, and the device includes:

a. a platform which supports a payload including the user,

b. a ground-contacting module, mounted to the platform, including at least one ground-contacting member and defining a fore-aft plane;

c. a motorized drive arrangement, coupled to the ground-contacting module; the drive arrangement, ground-contacting module and payload constituting a system; the motorized drive arrangement causing, when powered, automatically balanced operation of the system in an operating position that is unstable with respect to tipping in at least a fore-aft plane when the motorized drive arrangement is not powered; and

d. a user input control that receives an indication from the user of a specified pitch of the device under conditions of motion at uniform velocity.

The user input control may include a thumb-wheel disposed upon a handle that is part of the device. A related embodi-

such as arcuate members and clusters of wheels are described in the prior applications incorporated herein by reference, and the term "wheel" is used herein to refer to any such ground-contacting element without limitation.

The single wheel **44** of unicycle embodiments of FIGS. **8** and **9** may be supplemented, as shown in FIG. **10**, by a nearby wheel providing a pair of adjacent and coaxial wheels **20**. It can be seen that the vehicle of FIG. **10**, like vehicles of various other embodiments disclosed in this description, when relying on wheels **20** for contacting the ground, is inherently unstable in the fore-aft direction with respect to a vertical z. While the vehicle of FIG. **10** is relatively stable in the lateral direction, vehicles of some other embodiments are unstable in both lateral and fore-aft directions. The motion of vehicle **10** may be controlled by subject **10** shifting his weight, and thus the center of mass (CG) of the loaded vehicle, in accordance with teachings described above.

Also, as described above, in addition to the direct effect, of subject leaning, on the variables governing the torque applied to a motor for directing the vehicle, or as an alternate control strategy, user input may be separately incorporated into the control loop in a manner equivalent to variation of one or more of the input variables. Thus, for example, the user may provide an input, by means of a user interface of any sort, the input being treated by the control system equivalently to a change, for example, in vehicle tilt. Such an interface may include, for example, a thumbwheel or a joystick mounted on the grip **14**.

Referring again to FIG. **10**, steering of vehicle **18** may be provided by user **10** shifting his weight laterally (in the Y-Y direction) with respect to wheels **20**. The change in position of user **10** relative to the platform **12**, and/or the consequential lateral shift of the CG of the combination of user **10** and vehicle **18** may be sensed using any strategy. One example is the use of one or more force/platen disposed on the upper surface of platform **14** to sense differential pressure exerted by a first leg **52** of user **10** with respect to a second leg **54** of the user. Alternatively, a seat (not shown) may be provided on platform **12** for supporting user **10**, and one or more force/poises mounted on the seat may sense a shift in the weight of the user and thus generate a signal for controlling the velocity vector of the vehicle in response to user leaning. As an alternate example, a tilt of platform **12** relative to the axis (Y-Y) of rotation of wheel **20** may be sensed using an inclinometer, or one or more gyroscopes. Corrections may be applied to the measured tilt of differential pressure to account for irregularities in the surface being traversed by vehicle **18**, as determined by the measured tilt, with respect to a plane perpendicular to gravity, of the axis (Y-Y) of rotation of wheel **20**. In accordance with yet further alternate embodiments of the invention, a force sensor may be provided within handle **16** or a rotation sensor may be provided at pivot **46**, either strategem for sensing leaning by the user and applying the sensed leaning as a user input in the control loop for governing vehicle operation.

In accordance with other embodiments of the present invention, leaning by user **12** may be used solely for governing fore-aft motion of vehicle **10**, or, alternatively, leaning may be used solely for governing steering of the vehicle, or, for both functions.

A front perspective view of an alternate embodiment of the invention is shown in FIG. **11** where vehicle **10** has a single wheel **24** and user **12** stands, during normal operation of the vehicle, on platform **14** astride wheel **24**. As embodiment is shown wherein handle **16** is rigidly attached to platform **14**, in this case, via cowling **40**.

FIG. **11** shows an embodiment of the invention wherein a vehicle **50** is controlled by leaning, as described above with respect to other embodiments, and no handle is provided, such that the entire support of user **10** is by standing on platform **12**. Within the scope of the present invention, as described herein and as claimed in any appended claims, user **10** may be supported on platform **12** by standing with feet positioned along axis **55** of rotation of wheel **44**, as shown in FIG. **11**, or, alternatively, with feet positioned astride axis **52** of rotation of wheel **44**, as shown in FIG. **12** and FIG. **13**. A handle **16** may also be provided in the case of a configuration of the invention in which wheel **44** is mounted transversely to the direction faced by user **10**, with handle **16** coupled to platform **12** via cowling **40**, as shown in FIG. **14**.

FIG. **15** shows an embodiment of a vehicle wherein the ground-contacting element is a sinball **151**. Such a ball may be separately driven in the x and y directions and the vehicle stabilized in one or both of these directions in the manner described above.

In addition to the personal mobility vehicles described and claimed above, in accordance with alternate embodiments of the invention, scaled down versions of any of the embodiments heretofore described may be employed for recreational or educational purposes, whether or not human subjects are conveyed thereupon. Such toy versions may travel over various terrains while maintaining balance in the fore-aft plane.

The described embodiments of the invention are intended to be merely exemplary and numerous variations and modifications will be apparent to those skilled in the art. All such variations and modifications are intended to be within the scope of the present invention as defined in the appended claims.

What is claimed is:

1. A vehicle for carrying a payload including a user, the vehicle comprising:

a. a platform which supports the user;

b. a ground-contacting module, to which the platform is mounted, which propels the user in desired motion over an underlying surface;

c. a motorized drive arrangement, coupled to the ground-contacting module; the drive arrangement, ground-contacting module and payload comprising a system being unstable with respect to tipping when the motorized drive is not powered; the motorized drive arrangement causing, when powered, automatically balanced operation of the system wherein the vehicle has a present velocity and a maximum operating velocity, determined by a requirement of acceleration to maintain balance and, in operation, has a balancing margin determined by the difference between the maximum operating velocity and the present velocity of the vehicle;

d. a balancing margin monitor, coupled to the ground-contacting module, for generating a signal characterizing the balancing margin; and

e. an alarm, coupled to the balancing margin monitor, for receiving the signal characterizing the balancing margin and for warning when the balancing margin falls below a specified limit.

2. A device according to claim **1**, wherein the alarm includes ripple modulation of the power output of the motorized drive arrangement.

3. A device according to claim **1**, wherein the alarm is audible.

Patent PAT.

Protects	machines, inventions
Requires	novelty, some level of cleverness (nonobviousness, inventive step), and some other things
Vests	after application, upon issuance by government
Sustained by	escalating maintenance fees
Lasts	up to 20 years
Theory	incentive to invent and disclose; public goods problem

Trade Secrets

Trade Secret

Trade Secret

Protects	formulas, recipes, manufacturing techniques, and other intangibles with independent economic value
Requires	secrecy and reasonable efforts to keep secret
Vests	automatically
Sustained by	continuing secrecy and efforts to keep secret
Lasts	potentially forever
Theory	? ? ? ?

Trademark

TM

Trademark

®

Trademark

CHEVROLET

source

Trademark ® ™

Protects	names, logos, slogans, other indications of commercial source
Requires	distinctiveness (can identify a commercial source)
Vests	common law: upon use federal: after use, upon registration
Sustained by	continued use
Lasts	as long as used, potentially forever
Theory	provides information to consumers, which helps the market function better, increasing economic efficiency

Right of Publicity

Right of Publicity

Right of Publicity

Protects	name, voice, image, other indicia of identity of a real person
Requires	nothing; fame in a few jurisdictions maybe
Vests	automatically
Sustained by	[nothing]
Lasts	lifetime; post-mortem in some states
Theory	? ? ? ?

You

own intellectual property

Comparisons

What is protected?

©	Expression (text, images, recordings)
Pat.	Inventions
TM	Indications of commercial source
Trade Secret	Transferrable commercial secrets
Right of Publicity	Indications of personal identity

What does it take to get it?

©	Fixation (immediate)
Pat.	Application, gov't review
TM	Use in commerce, creating meaning
Trade Secret	Nothing
Right of Publicity	Nothing (fame, some places maybe)

What does it take to keep it?

©	Nothing
Pat.	Payment of maintenance fees
TM	Continued use in business
Trade Secret	Keeping it secret
Right of Publicity	Nothing

How long does it last?

©	on the order of 100 years
Pat.	on the order of 20 years
TM	forever (if used)
Trade Secret	forever (if kept secret)
Right of Publicity	life + extra sometimes

How is it lost?

©	Very difficult
Pat.	Unpaid fees; successful challenge
TM	Failure to keep exclusive control
Trade Secret	The secret gets out
Right of Publicity	Very difficult (?)

Defenses include ...

©	Fair use, first-sale
Pat.	Invalidity, first-sale
TM	Non-trademark uses, fair uses, first-sale
Trade Secret	Reverse engineering
Right of Publicity	News, free speech, non-commercial

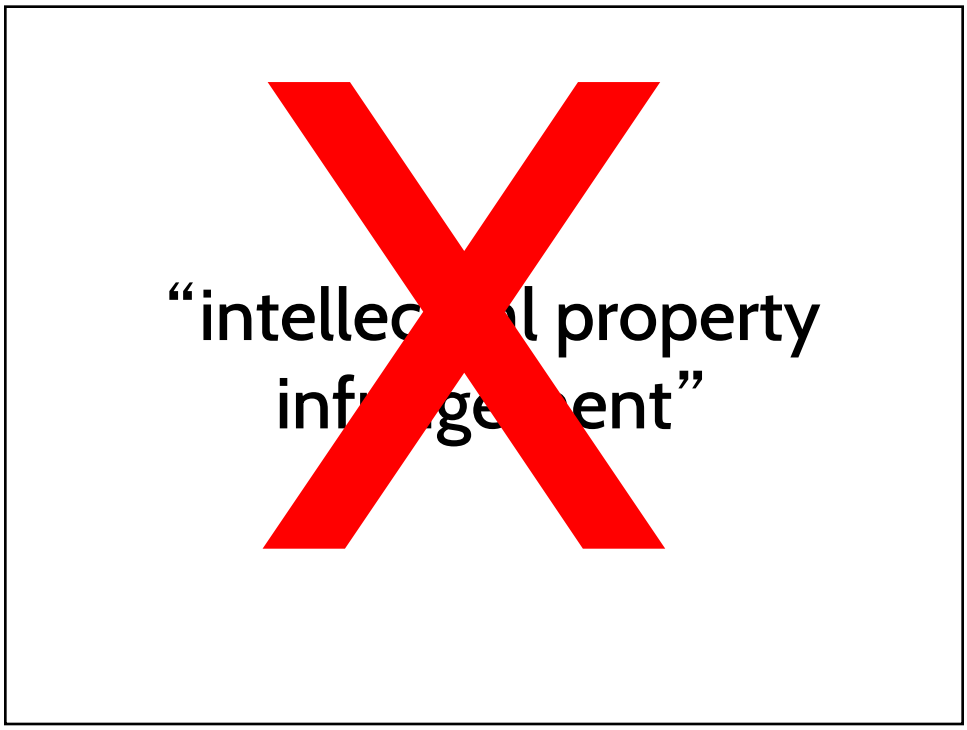
Remedies include ...

©	Injunctions; restitution (of D's wrongful gains); statutory damages up to $150K per infringement
Pat.	Injunctions; royalties; treble damages
TM	Injunctions; punitive damages; treble damages
Trade Secret	Injunctions; restitution (of D's wrongful gains); punitive damages; royalties
Right of Publicity	Injunctions; punitive damages

the LABEL

What is
“intellectual property”?

“intellectual property
infringement”



What is
“intellectual property”?

Is it
"property"?

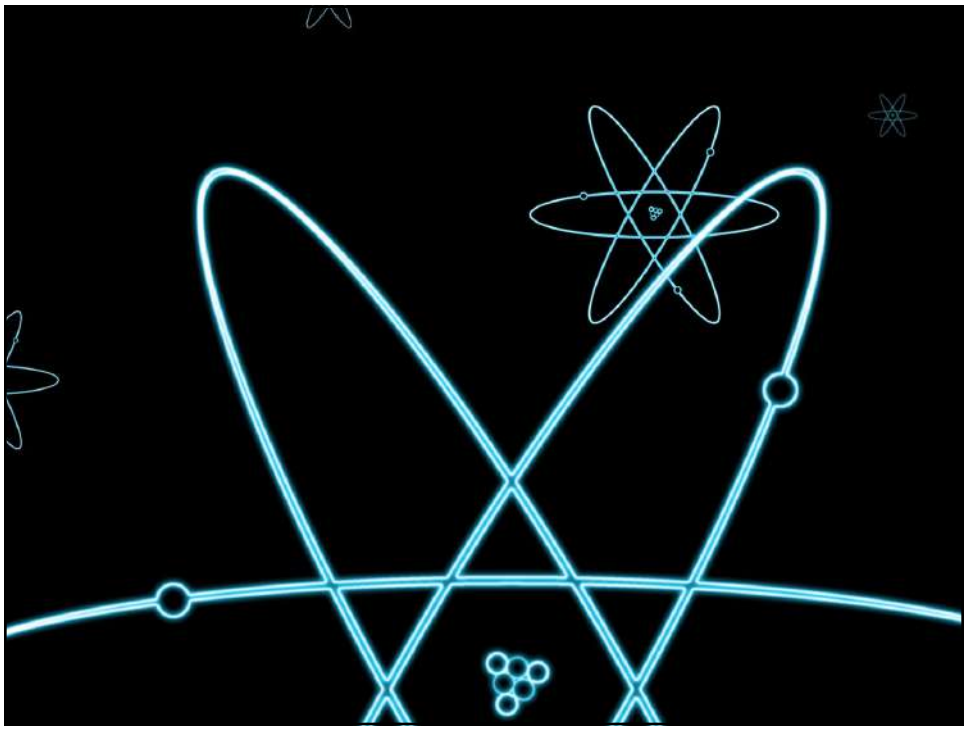
Is it
"property"?
It depends on who you ask.

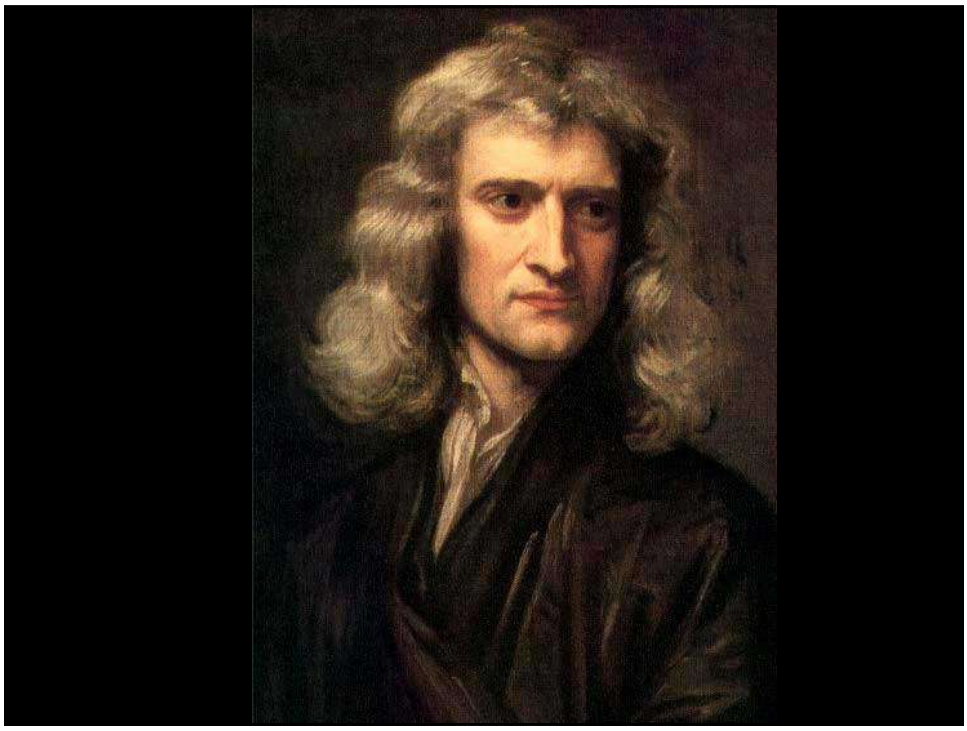
Is the right to receive government welfare property?

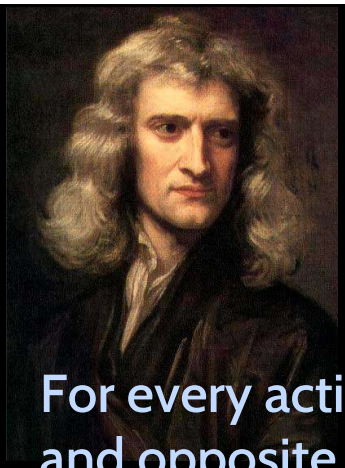
Is a professional license property?

Is a government pension property?

What's "intellectual" about it?

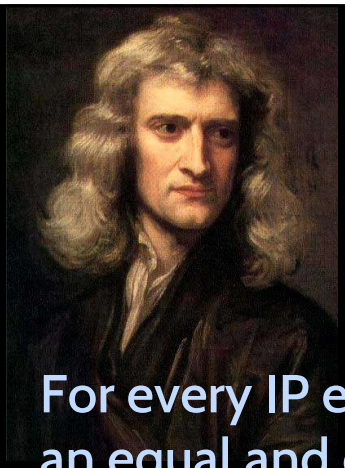






Newton's Third Law of Motion

For every action, there is an equal and opposite reaction



Newton's Third Law of IP

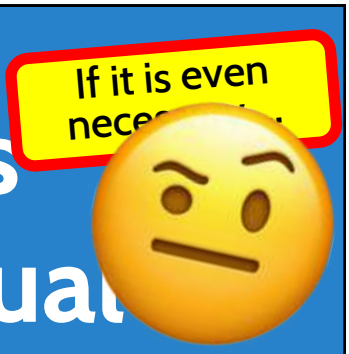
For every IP entitlement, there is an equal and opposite reduction in freedom.

Why is intellectual property law necessary?

Why is intellectual property law necessary?

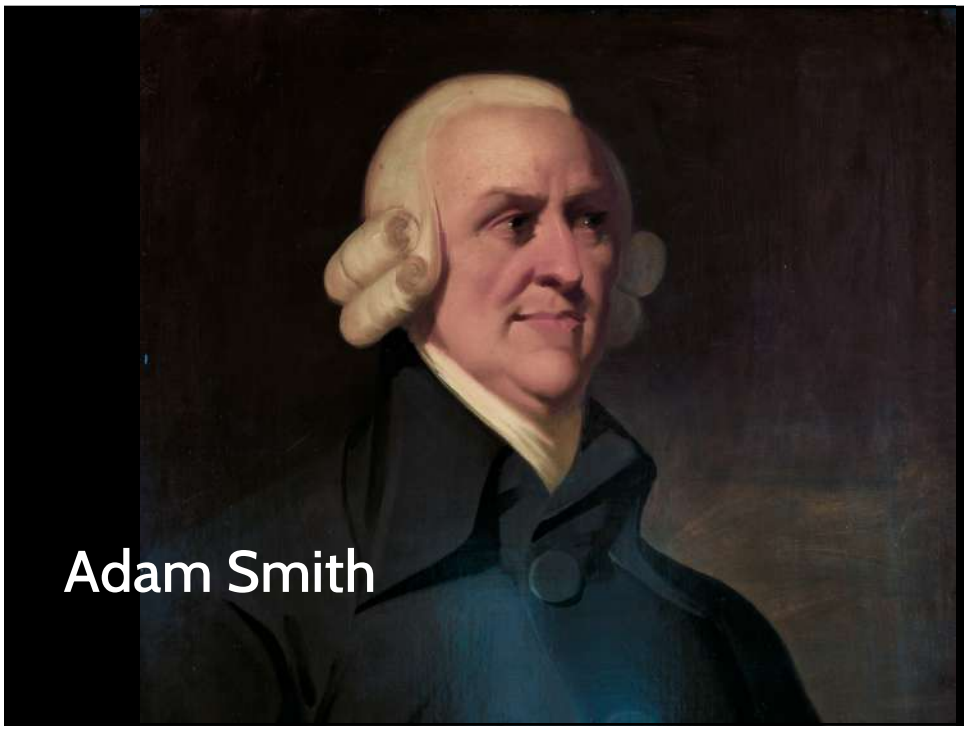
If it is even necessary ...

Why is intellectual property law necessary?



raison d'être

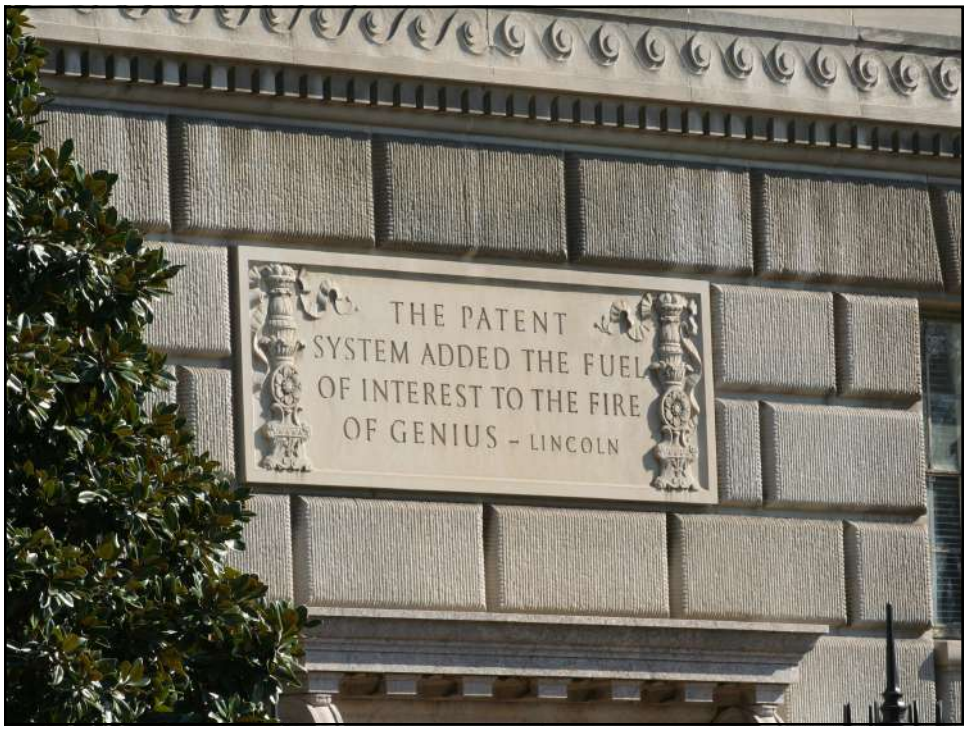
In the U.S., the main justification is an economic story.

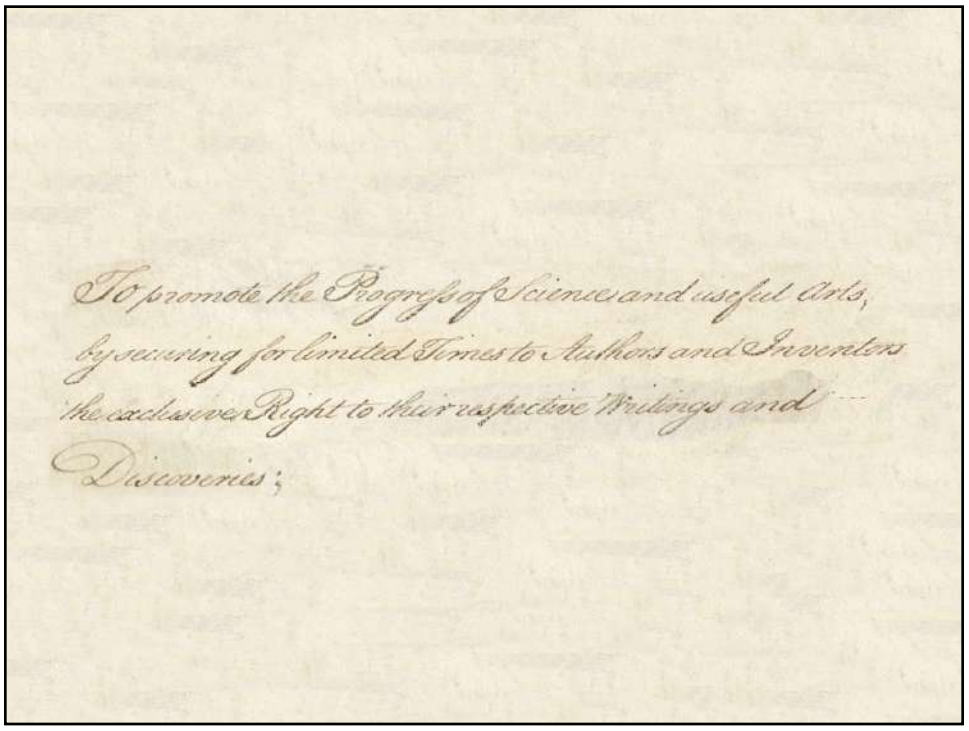



excludability
rivalrousness


nonexcludable
nonrival


The compensation / incentive problem

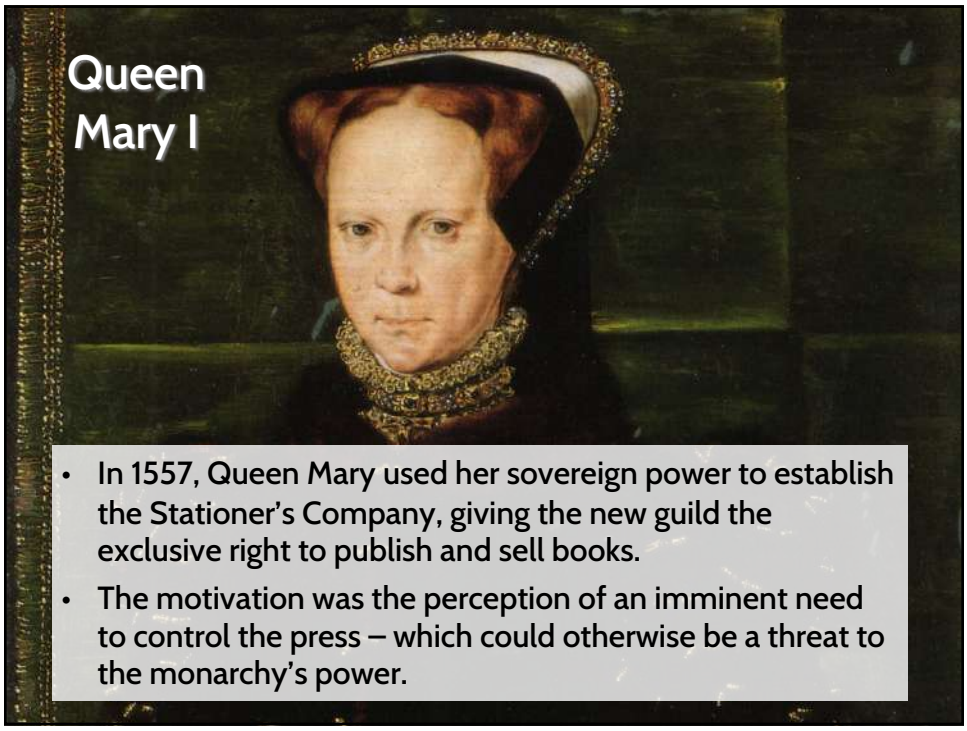

THE PATENT
SYSTEM ADDED THE FUEL
OF INTEREST TO THE FIRE
OF GENIUS - LINCOLN



How did intellectual property law come to be?

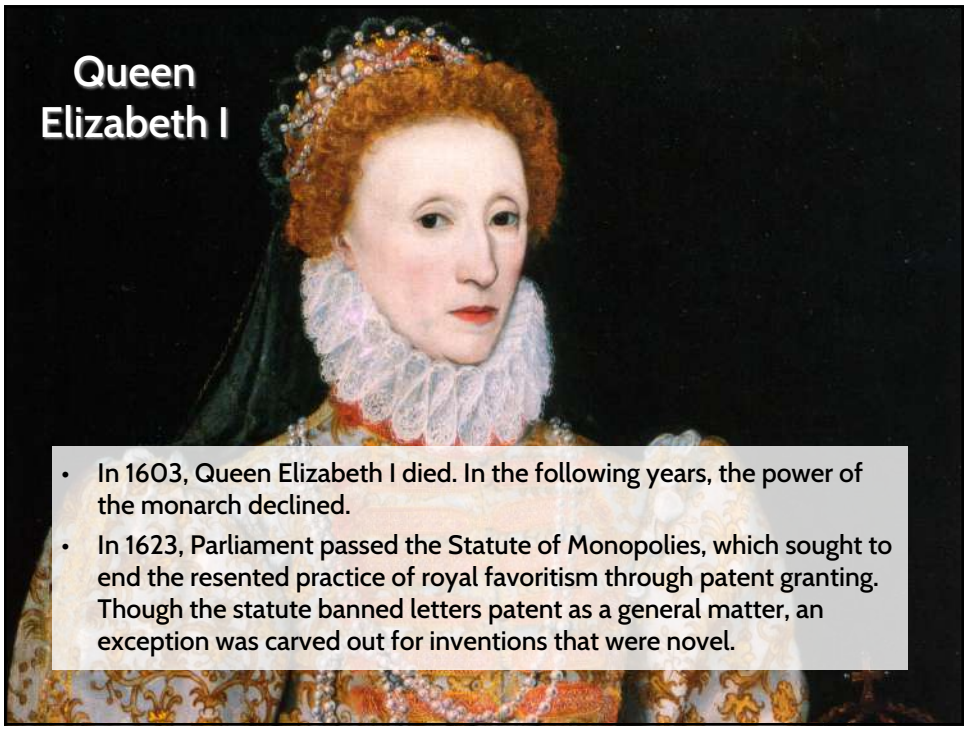

Queen Mary I


Queen
Mary I
• Winning a succession fight after the death of her father King Henry VIII, Queen Mary sought to reverse her father's religious reforms breaking with the Catholic church.
• In 1555, she began having the first of more than 280 religious dissenters executed — most by being burned alive. This was unpopular.



- In 1557, Queen Mary used her sovereign power to establish the Stationer's Company, giving the new guild the exclusive right to publish and sell books.
- The motivation was the perception of an imminent need to control the press – which could otherwise be a threat to the monarchy's power.

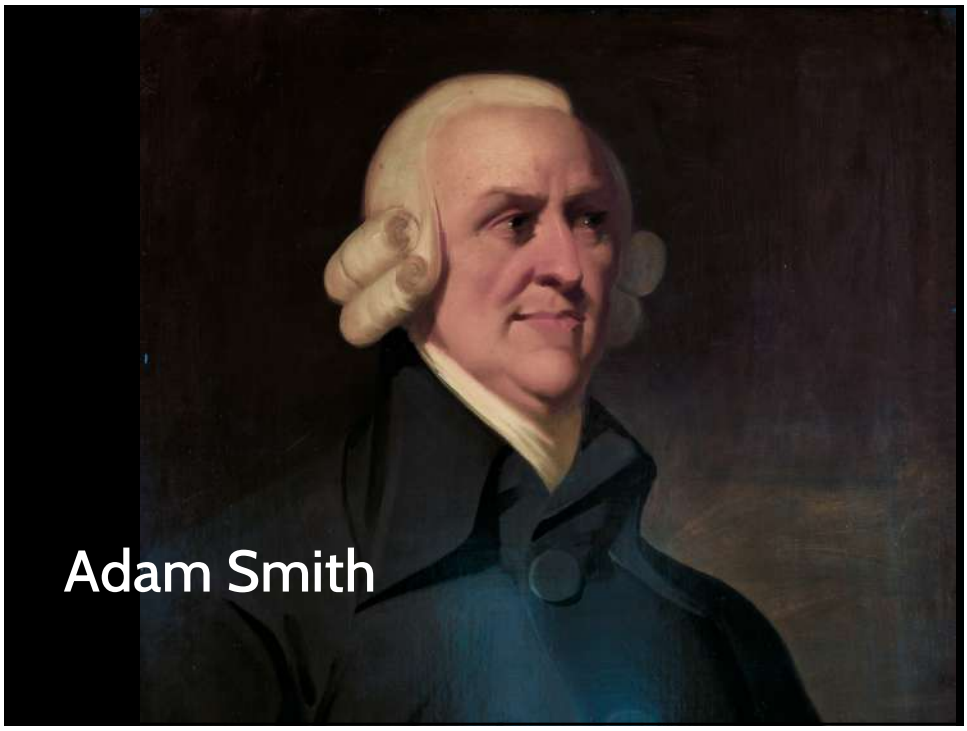
- In 1558, Queen Elizabeth I ascended to the throne.
- She faced a number of challenges to her popularity and support.
- Her reign was marked by an explosion of "letters patent" – "open letters" – that gave an exclusive franchise of some aspect of commerce. Early on, some monopolies were connected to bringing foreign industrial talent into England. But increasingly these monopoly privileges were used to reward powerful supporters of the queen.

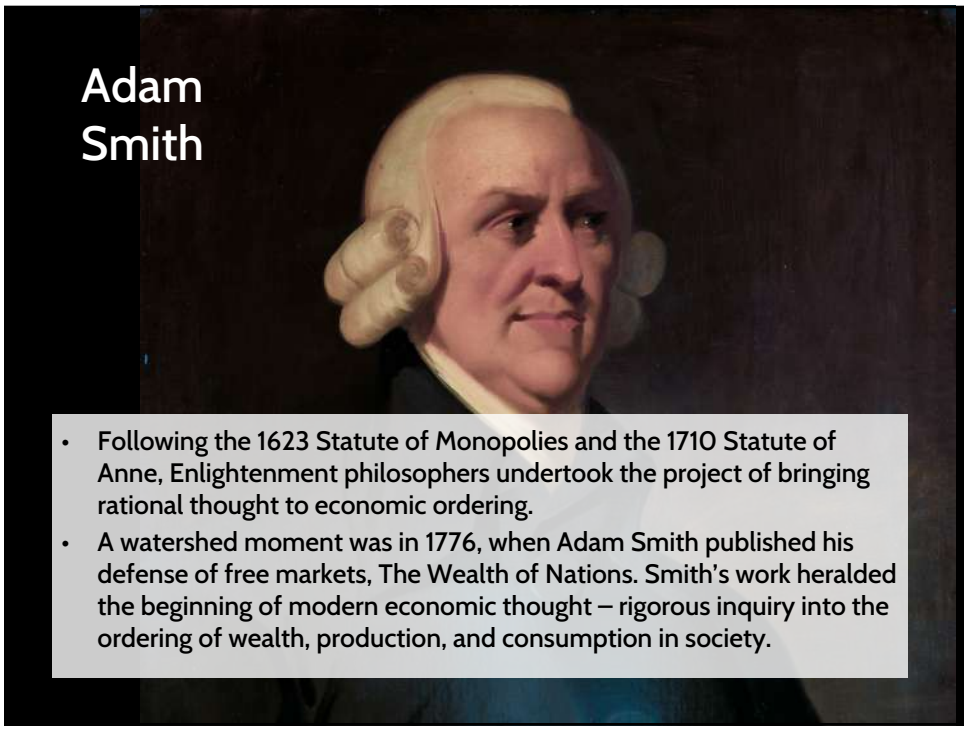


- In 1603, Queen Elizabeth I died. In the following years, the power of the monarch declined.
- In 1623, Parliament passed the Statute of Monopolies, which sought to end the resented practice of royal favoritism through patent granting. Though the statute banned letters patent as a general matter, an exception was carved out for inventions that were novel.

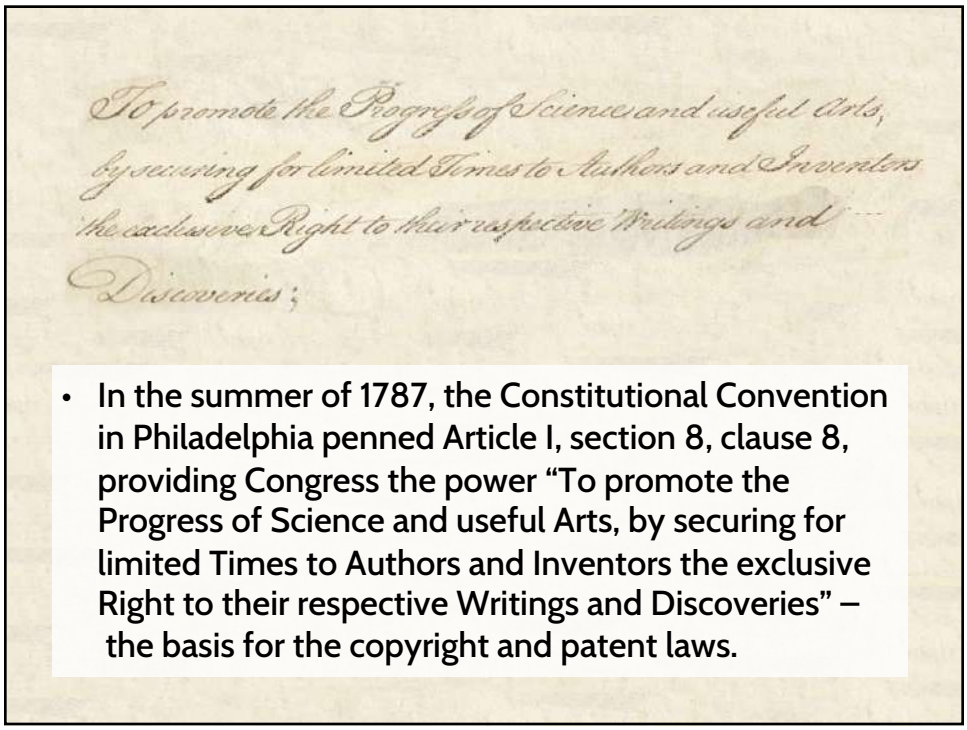

Queen Anne


Queen Anne
• In the late 1600s, the Stationer Company's royally chartered monopoly expired. The Stationers sought from Parliament a statute to replace the royal charter in preserving the Stationers' monopoly.
• In 1710, seeing no point in rewarding the book industry for the efforts of authors, Parliament replaced the Stationers' monopoly with a specially crafted limited-term monopoly to authors over their published works—a "copyright."
• This wasn't precisely what the book business desired, but it provided the legal foundation for a transfer of rights from authors to publishers. That, in turn, allowed proprietors in the book trade to avoid competition with regard to individual titles.





- Following the 1623 Statute of Monopolies and the 1710 Statute of Anne, Enlightenment philosophers undertook the project of bringing rational thought to economic ordering.
- A watershed moment was in 1776, when Adam Smith published his defense of free markets, The Wealth of Nations. Smith's work heralded the beginning of modern economic thought – rigorous inquiry into the ordering of wealth, production, and consumption in society.



- In the summer of 1787, the Constitutional Convention in Philadelphia penned Article I, section 8, clause 8, providing Congress the power "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries" – the basis for the copyright and patent laws.

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