

Science and Inventions

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An experience in inventing



Highly X-linked UHMWPE



Inspiration, hope, realization



are hereby made a body corporate, by the name of the Massachusetts Institute of Technology, for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally, by suitable means, the advancement, development and practical application of science in connection with arts, agriculture, manufactures and commerce; with all the powers and

1861: MIT's charter

Boston's 8 research universities provide \$7B annual boost to the regional economy

Study: Universities are stable economic engines, constantly changing, developing new knowledge, new industries

March 11, 2003

MIT Graduates Have Started 4,000 Companies With 1,100,000 Jobs, \$232 Billion in Sales in '94

March 5, 1997

Inventions with “power” our country some day!

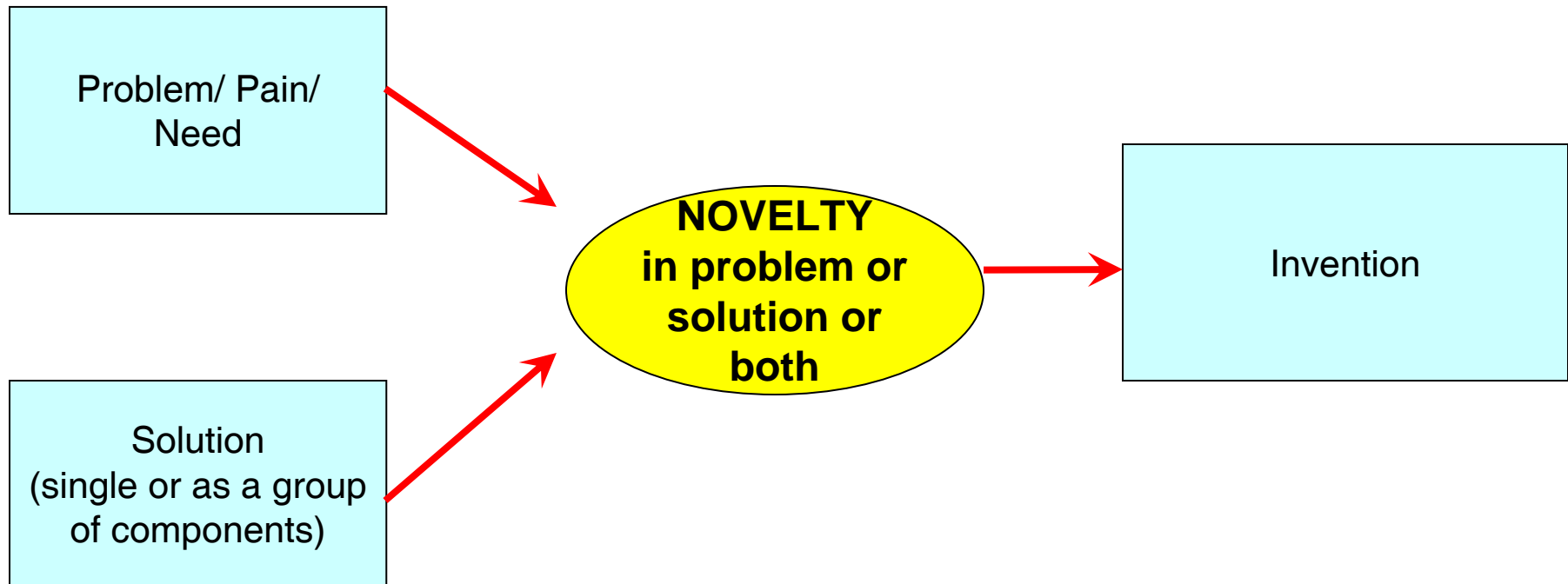
Inventions

◆ **Invention:** An invention is the creation (by a human) of a new configuration, composition of matter, device, or process (that does not already exist in nature or is a law of nature) that serves a useful purpose.

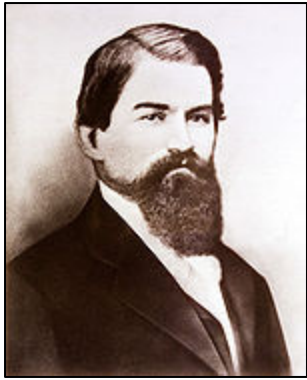
◆ **Innovation:** Inventions become common in usage are innovations, and may be a major breakthroughs or of minor and incremental impact. Innovation is something new or different *introduced*.

◆ **Patentable:** An invention that is (industrially) useful, novel and not obvious to those who are skilled in the same field may be able to obtain the legal protection of a patent.

Invention: A practical and useful definition



Examples of Inventions: Familiar things



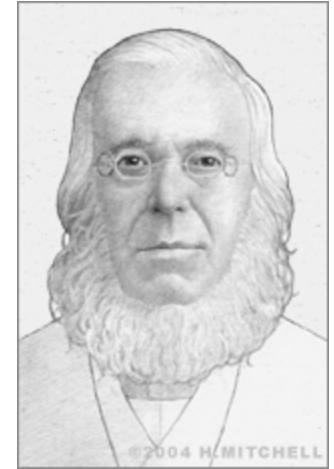
John Pemberton
Coca Cola



Ruth Handler
Barbie



1905: 11-year-old Frank Epperson left out on his porch a mixture of powdered soda and water that contained a stir stick. That night, temperatures in San Francisco reached record low temperature. When he woke the next morning, he discovered that it had frozen to the stir stick, creating a fruit flavored 'icicle' ... a treat that he named his 'epsicle'. He then waited 18 years before releasing it to the public.



Peter Cooper
Jello-o



King C Gillette; Shaving stick



Marion Donovan, Disposable diapers



Courtesy: <http://web.mit.edu/invent/iow/i-archive-cp.html>
<http://en.wikipedia.org/>

Interaction session 1 (with samples)

Bundling Tie

Bundling Tie

United States Patent [19]

[11] **4,138,770**

Barrette et al.

[45] **Feb. 13, 1979**

[54] **BUNDLING TIE**

[75] Inventors: **Richard P. Barrette, Lancaster; John B. Glode, Jr.; Richard P. Olsen, both of Acton, Mass.**

[73] Assignee: **Electro-Ty, Inc., Concord, Mass.**

[21] Appl. No.: **790,121**

[22] Filed: **Apr. 22, 1977**

[51] Int. Cl.² **B65D 63/00**

[52] U.S. Cl. **24/16 PB**

[58] Field of Search **24/16 PB, 30.5 PB, 73.7, 24/73 PB, 30.5 P, 17 AP, 206 A; 248/68, 74, 74 PB**

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,605,199 9/1971 Eberhardt 24/16 PB
 3,660,869 5/1972 Caveney et al. 24/16 PB
 3,906,593 9/1975 Caveney et al. 24/16 PB

3,908,233 9/1975 Caveney et al. 24/16 PB
 3,924,299 12/1975 McCormick 24/16 PB
 3,965,538 6/1976 Caveney et al. 24/16 PB

FOREIGN PATENT DOCUMENTS

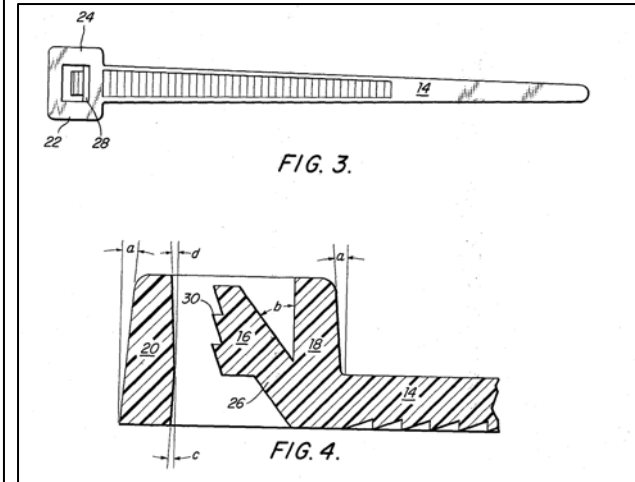
2360992 7/1974 Fed. Rep. of Germany 24/16 PB
 1447628 6/1966 France 24/16 PB

Primary Examiner—Werner H. Schroeder
Assistant Examiner—Moshe I. Cohen
Attorney, Agent, or Firm—David E. Brook

[57] **ABSTRACT**

An improved bundling tie is disclosed of the type having a relatively rigid head and an integrally attached strap having a series of ratchet teeth on its inner surface which engage another series of complementary ratchet teeth on a pawl member positioned within a transverse slot through the head.

8 Claims, 4 Drawing Figures



US 4138770

Filing date: Apr 22, 1977

Issue date: Feb 13, 1979

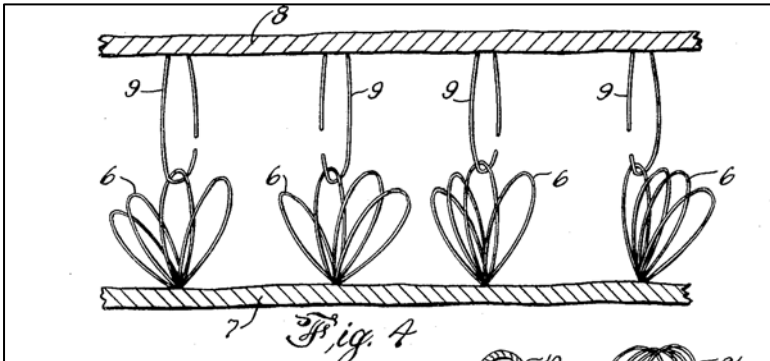
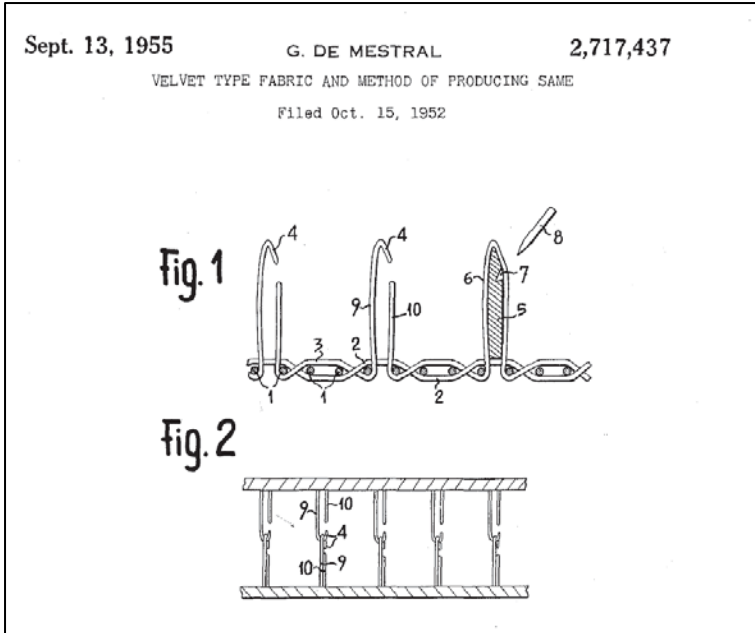
Inventors: Richard P. Barrette, John B. Glode, Jr., Richard P. Olsen

Assignees: Electro-Ty, Inc.

Courtesy:

<http://www.google.com/patents?id=fXctAAAAEBAJ>

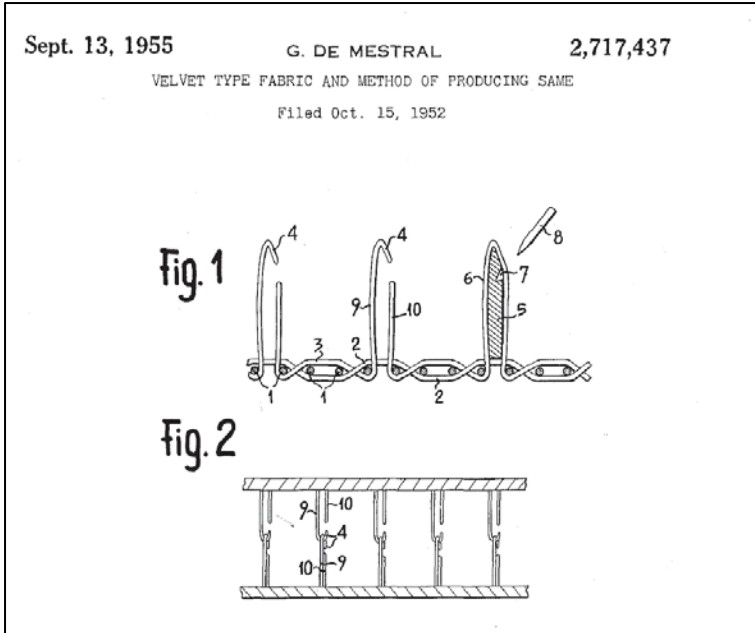
Quiz: What is the invention?



US 2717437 (George de Mestral)

US 3009235 (George de Mestral)

Velcro



1

2,717,437

VELVET TYPE FABRIC AND METHOD OF PRODUCING SAME

George de Mestral, Prangins, Vaud, Switzerland, assignor to Velcro S. A., Fribourg, Switzerland, a corporation of Switzerland

Application October 15, 1952, Serial No. 314,933

Claims priority, application Switzerland October 22, 1951

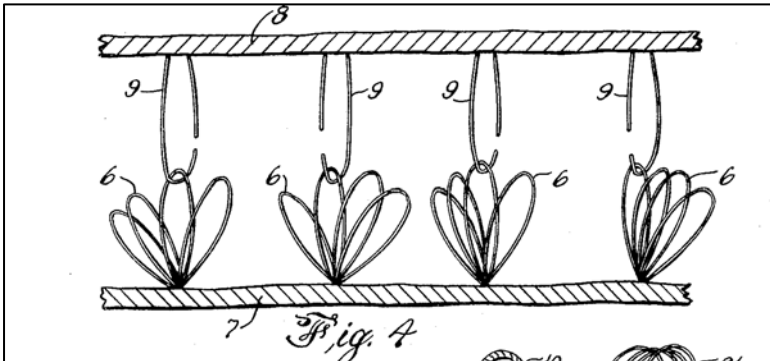
4 Claims. (Cl. 28—72)

2

chain and which is capable of being formed into a filament in which the structural elements are oriented in the direction of the axis. Note "Du Pont Products Index," published by E. I. du Pont de Nemours & Company (Inc.), Wilmington 98, Delaware, page 91, January, 1951.

When producing a fabric of the type illustrated in Fig. 1, I proceed in the same manner as for the production of the special velvet made on bar looms. As a matter of fact, it is possible to use for the formation of the pile, small transverse metal bars (Fig. 1) round which the additional warp threads are caused to pass so as to form loops 6. Each small bar 5 is provided with a longitudinal groove 7 in which is guided a knife 8 adapted to cut the loop 6 open and to form thus the raised pile threads.

However, with a view to obtaining the hooks 4, I heat the bar 5 before the cutting of the loops 6, so that the thread extending over the bar may assume and retain the shape imparted to it by the latter. The heating of the bars may be obtained by making an electric current flow through them. Obviously, the carrier bars 5 for the loop may be heated as well through any means other than an electric current, e. g. the carrier bars may be hollow and heated by steam.



US 2717437 (George de Mestral)
 US 3009235 (George de Mestral)

Let us think problems/ needs/ wish?

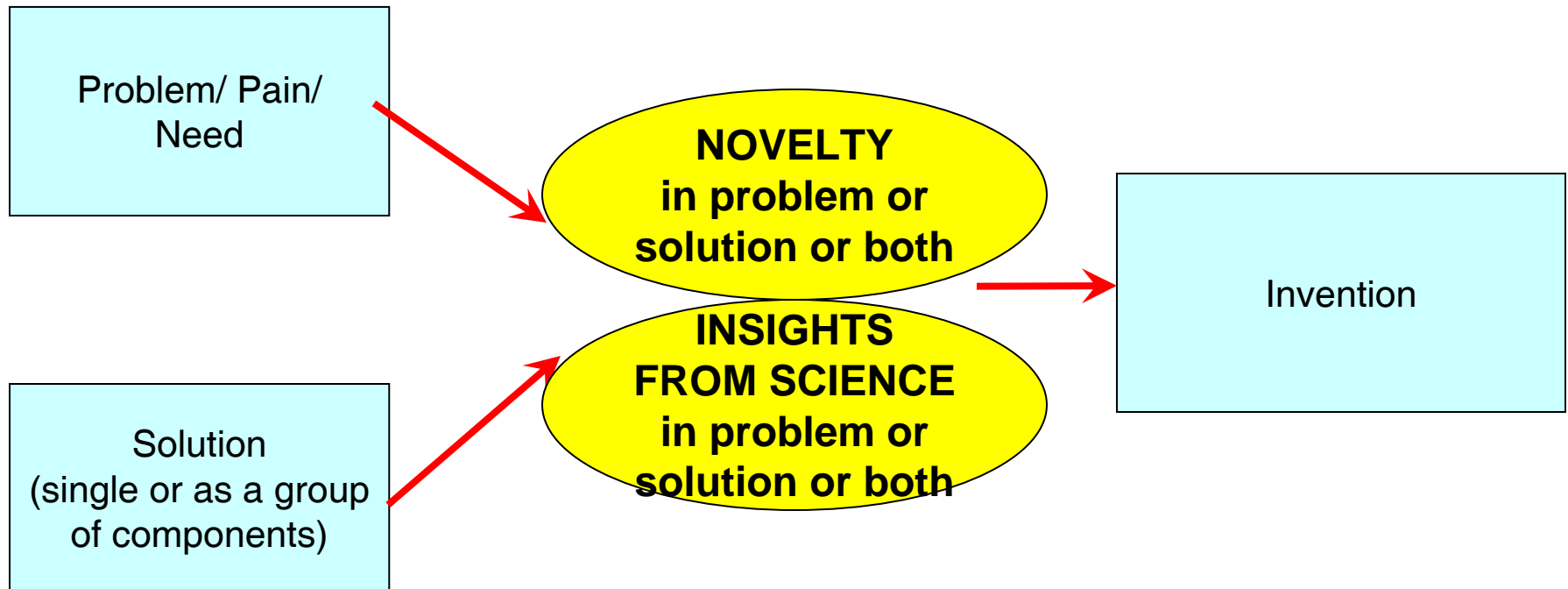
Examples:

- Head injury is the biggest cause of death of motorcyclists in road accidents. But motorcyclists do not like wearing helmets.
- Little kids hurt their fingers in doors.
- Little kids are known to lock their mothers in the bathroom!
- Lot of grass and weeds are burnt to clear areas every year. All that adds to global warming and particulates.
- My cousin in the US has never eaten fresh figs – the kind we get in Pune. How can I take it for him without it getting spoilt?
- I hate peeling pomegranate fruits. But I love eating them. There should be an easy way to peel pomegranates at home.
-

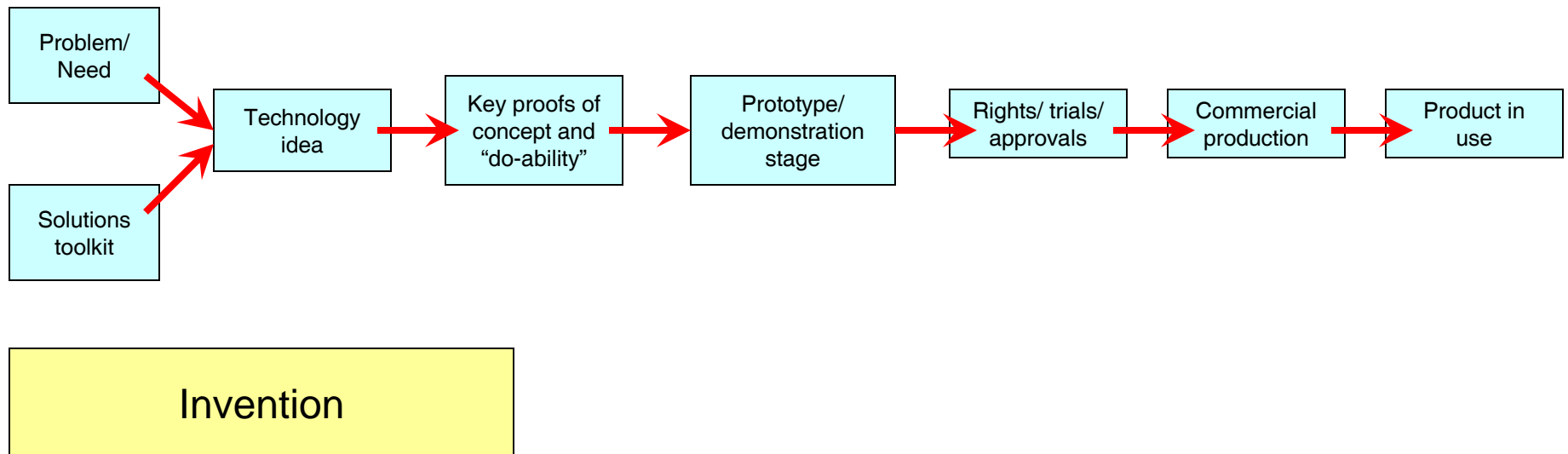
Teams of 5 – bundle of post-it slips each --- 3 minutes each ---- 5 min discussion

Team with highest number of problems wins.

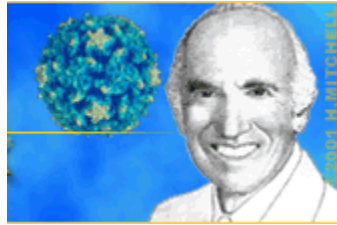
Scientific Inventions



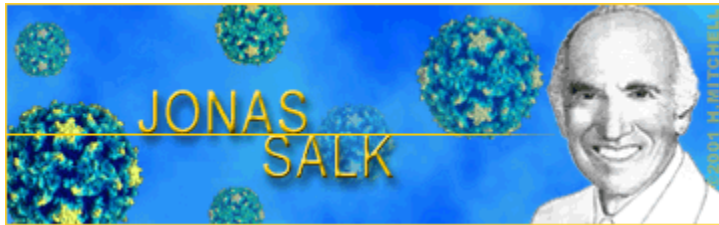
Technology innovation: A simplified view



Quiz: Medical inventions



Medical inventions



First polio vaccine



Alexander Fleming: Penicillin



ALBERT SABIN, M.D.



Oral polio vaccine



Louis Pasteur: Pasteurization, Rabies vaccine

Courtesy: <http://web.mit.edu/invent/iow/i-archive-mh.html>

<http://en.wikipedia.org/>

“Deadly” inventions



“Deadly” inventions

Dynamite



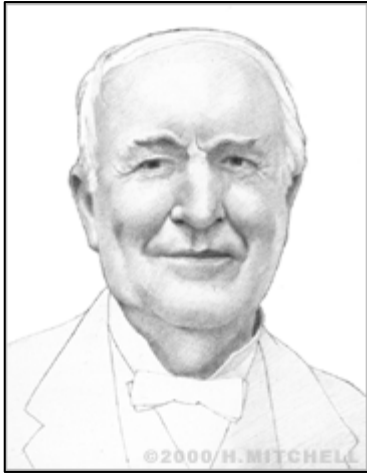
1866 → Alfred Bernhard Nobel (1833-1896)

Atom Bomb

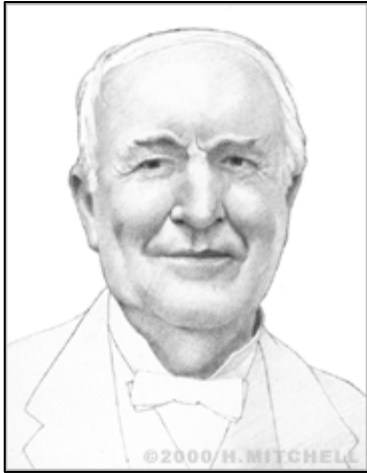


J. Robert Oppenheimer (1904-1967)

Who is this?



Edison: “Greatest inventor of modern times”



Thomas Alva Edison
(1847-1931)



Thomas Edison's
first successful
light bulb model,
1879

Contributions:

- Edison is considered one of the most prolific inventors in history, holding 1,093 U.S. patents in his name.
- Inventor: Electric light bulb
- Inventor: Phonograph
- Inventor: Carbon telephone transmitter
- Inventor: Electric power distribution
- “Invention factory”
- Inventor of celluloid-strip motion picture camera and projector worked under his direction
- Founder, General Electric

Interesting:

- On June 1st, 1869, Edison was granted his first patent (#90,646), for an electric voting machine. But no one wanted to use the machine, and Edison resolved ***never again to invent what would not sell.***

Prophetic words: I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that." -- Edison, to his friends Henry Ford and Harvey Firestone, 1931.

Courtesy: <http://web.mit.edu/invent/iow/edison.html>

<http://en.wikipedia.org/>

First US Patent by an Indian

No. 755,840. PATENTED MAR. 29, 1904.
J. G. BOSE.
DETECTOR FOR ELECTRICAL DISTURBANCES.
 APPLICATION FILED SEPT. 30, 1901.
 NO MODEL.

WITNESSES:
Frederick White
Thomas Mallard

INVENTOR:
Jagadis Chunder Bose,
 By his Attorneys:
William S. Orason & Co.

No. 755,840. Patented March 29, 1904.

UNITED STATES PATENT OFFICE.

JAGADIS CHUNDER BOSE, OF CALCUTTA, INDIA, ASSIGNOR OF ONE-HALF TO SARA CHAPMAN BULL, OF CAMBRIDGE, MASSACHUSETTS.

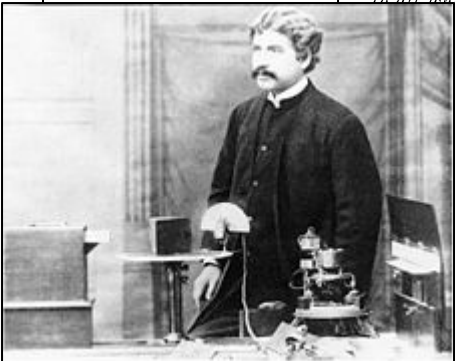
DETECTOR FOR ELECTRICAL DISTURBANCES.

SPECIFICATION forming part of Letters Patent No. 755,840, dated March 29, 1904.
 Application filed September 30, 1901. Serial No. 77,028. (No model.)

To all whom it may concern:

I, JAGADIS CHUNDER BOSE, of the Kingdom of Great Britain and India, and a resident of Calcutta, India, do hereby certify that I have invented certain new and useful Improvements in or Relating to Detectors for Electrical Disturbances or other Radiations, of which the following is a specification.

Reference is made to detectors or "coherers" for the reception of electrical disturbances, Hertzian waves, light, or other radiations; and its object is to improve the sensitiveness and quickness of devices of the kind in question by facilitating the action of the twist upon the sensitive substance and of insuring quick recovery, or with the same object of increasing the sensitiveness and quickness of self-recovery of the sensitive substance I may subject the mass forming the receiver to certain forces, physical surroundings, and conditions suitably adjusted and applied, whereby said mass becomes more responsive to electric disturbances, including Hertzian waves or other forms of radiance. For example, I may produce this effect: (a) by annealing or by mechanical treatment; (b) by heat; (c) by subjecting the substance to increase or reduction of pressure; (d) by subjecting the substance to vapors or gases ordinarily applied—for exam-



US 755840

Filing date: Sep 30, 1901

Issue date: Mar 1904

Inventor: JAGADIS CHUNDER BOSE

Courtesy: Hasit Seth and
<http://www.google.com/patents?id=2B5dAAAAEBAJ>

Nylon



Wallace Hume Carothers (1896-1937), du Pont



1949: Life Magazine



1939 World's Fair, New York



Queues and fights for Nylon: 1941-1945

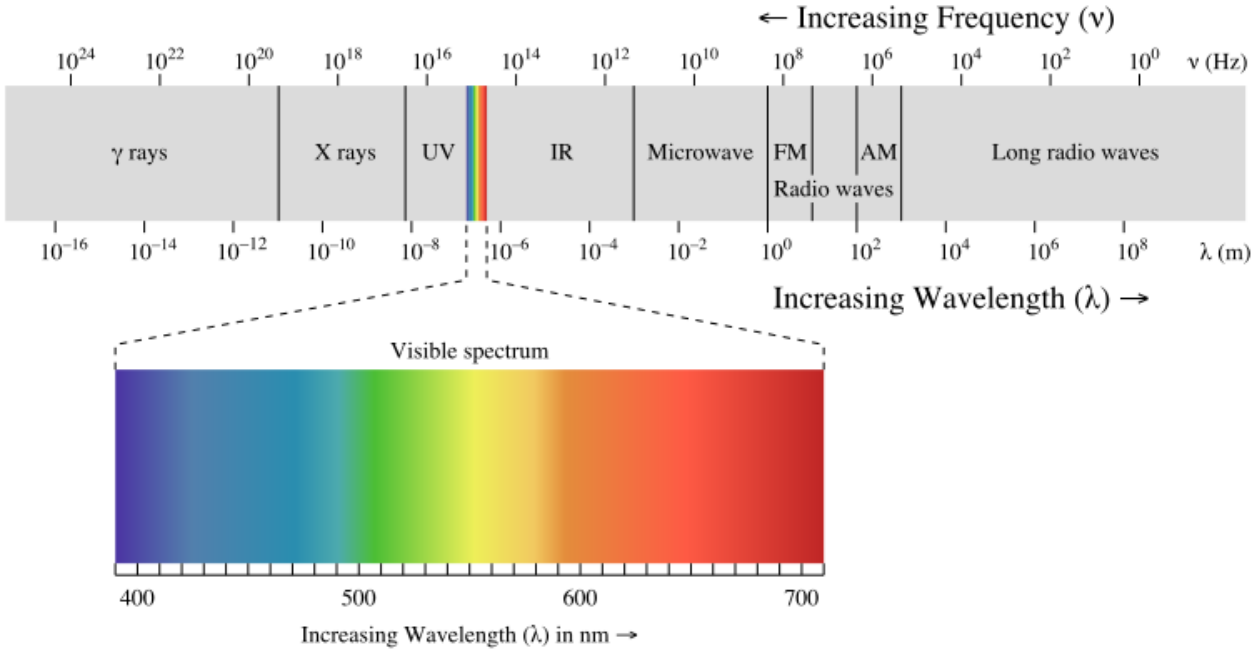
Courtesy: <http://web.mit.edu/invent/iow/carothers.html>

http://invention.smithsonian.org/centerpieces/whole_cloth/u7sf/u7materials/nylondrama.html

Windows that warn birds

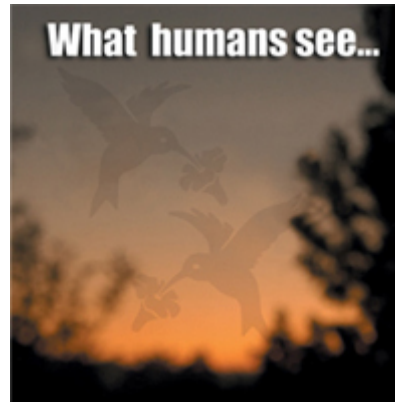


Charlie Sobcov's (8th grader) window decals are clear and transparent to humans, but not to birds 21 Jan 2009, Ottawa, Canada, CBC News



Courtesy: <http://www.cbc.ca/consumer/story/2009/01/21/ot-090121-bird-decals.html?>

Windows that warn birds



PROBLEM: Birding enthusiasts share a similar problem: wild birds fly from backyard trees and feeders into home windows where they are injured or die. Wild birds also collide with office windows. In North America alone, tens of millions of wild birds die in this manner each year.

SOLUTION: WindowAlert is a decal that may be applied to home and office windows. The decal contains a component which brilliantly reflects ultraviolet sunlight. This ultraviolet light is invisible to humans, but glows like a stoplight for birds.

<http://windowalert.com/>

Let us invent

“Simple” problems:

- Pencils – keep breaking, need sharpening continuously, break while sharpening, lead breaks at various places
- Blackboard chalk – noisy, dusty, needs wiping, breaks, runs out

Teams of 5 --- 3 minutes each ----- 5 min discussion

Think solutions

Interesting: http://www.noogenesis.com/inventing/pencil/pencil_page.html

Inventions and Patents

- ◆ Every inventor must be aware of patents.
- ◆ Patents are tools that:
 - ◆ Makes it attractive for entrepreneurs to risk efforts and money in trying to productize and commercialize an invention.
 - ◆ Creates a mechanism for inventors to protect their inventions and be rewarded for their creativity and efforts.
 - ◆ Provides a mechanism for inventors to claim priority on an idea and hence get due credit for their invention.
 - ◆ Allows a mechanism for society to spur innovation (and hence solutions for problems) by enabling full public disclosures by inventors.

PATENT...

A **property right** granted by the Government to an inventor “**to exclude others** from *making, using, offering for sale, or selling the invention or importing the invention*” for a **limited time** in exchange for **public disclosure** of the invention when the patent is granted.

PATENT...

What is PATENT?

- A **legal document** issued by the patent office
- Granted for a **limited period**
- Confined within the **geographical limit** of the country
- Confers a **right to exclude** others

Patentable Inventions

◆ **Invention:** An invention is the creation (by a human) of a new configuration, composition of matter, device, or process (that does not already exist in nature or is a law of nature) that serves a useful purpose.

◆ **Patentable:** An invention that is (industrially) useful, novel and not obvious to those who are skilled in the same field may be able to obtain the legal protection of a patent.

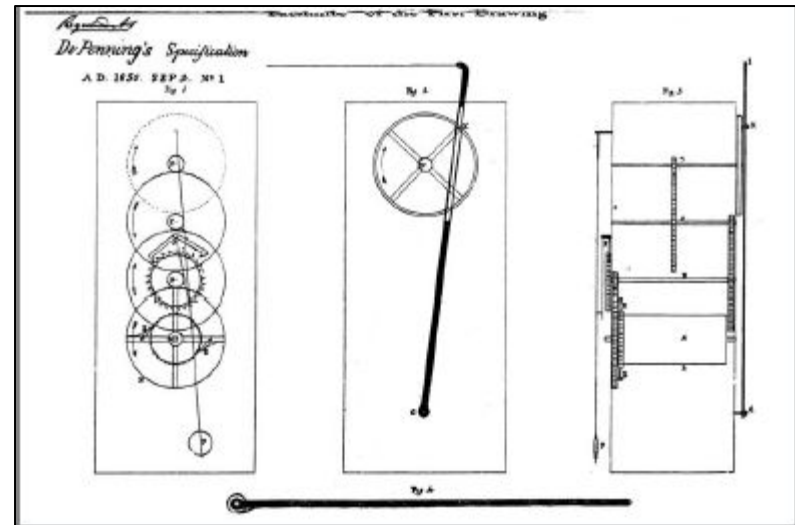
First Indian Patent for an Invention



George Alfred DePenning

3 March 1856

"An Efficient Punkah Pulling Machine"



Courtesy: Hasit Seth and

<http://www.hindu.com/mag/2006/04/09/stories/2006040900150200.htm>

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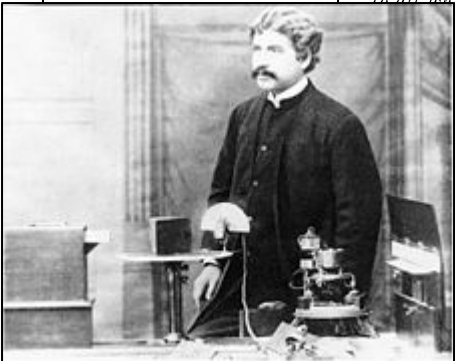
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SPECIFICATION forming part of Letters Patent No. 755,840, dated March 29, 1904.
 Application filed September 30, 1901. Serial No. 77,028. (No model.)

To all whom it may concern:

Know that I, JAGADIS CHUNDER BOSE, of the Kingdom of Great Britain and India, and a resident of Calcutta, India, have invented certain new and useful Improvements in or Relating to Detectors for Electrical Disturbances or other Radiations, of which the following is a specification.

Reference is made to detectors and "coherers" for the reception of electrical disturbances, Hertzian waves, light, and other radiations; and its object is to improve the sensitiveness and quickness of devices of the kind in question by facilitating the action of the twist upon the sensitive substance and of insuring quick recovery, or with the same object of increasing the sensitiveness and quickness of self-recovery of the sensitive substance I may subject the mass forming the receiver to certain forces, physical surroundings, and conditions suitably adjusted and applied, whereby said mass becomes more responsive to electric disturbances, including Hertzian waves or other forms of radiance. For example, I may produce this effect: (a) by annealing or by mechanical treatment; (b) by heat; (c) by subjecting the substance to increase or reduction of pressure; (d) by subjecting the substance to vapors or gases ordinarily applied—for exam-



US 755840

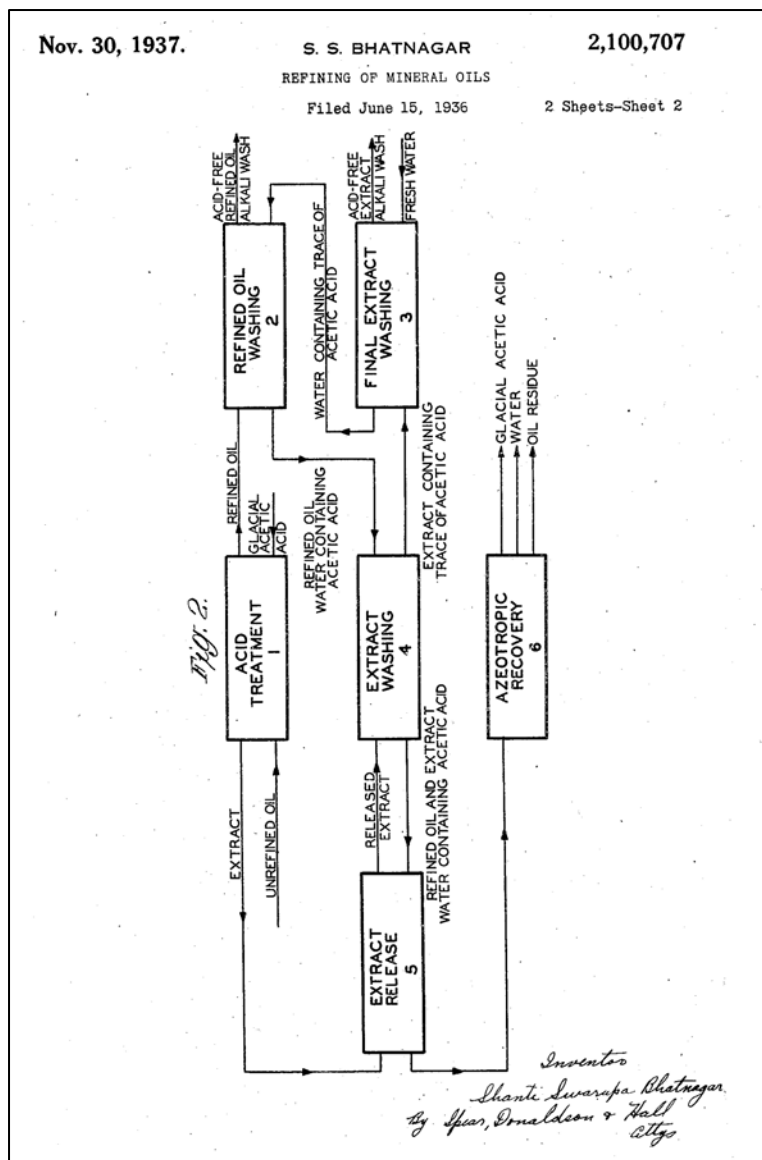
Filing date: Sep 30, 1901

Issue date: Mar 1904

Inventor: JAGADIS CHUNDER BOSE

Courtesy: Hasit Seth and
<http://www.google.com/patents?id=2B5dAAAAEBAJ>

US Patent of SS Bhatnagar, Founder of CSIR



Patented Nov. 30, 1937 2,100,707

UNITED STATES PATENT OFFICE

2,100,707
 REFINING OF MINERAL OILS
 Shanti Swarupa Bhatnagar, Lahore, India, as-
 signor to Steel Brothers & Company Limited,
 London, England
 Application June 15, 1936, Serial No. 85,409
 In Great Britain August 19, 1935
 9 Claims. (Cl. 196-13)

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A process for refining liquid petroleum oil fractions which comprises subjecting the fraction to extraction with a quantity of acetic acid of at least 97 per cent. strength amounting to at least about half the volume of the fraction and separating from one another the layers of refined oil and extract thus formed.

US 2100707

Filing date: Jun 15, 1936

Issue date: Nov 30, 1937

Inventor: Shanti Swarupa Bhatnagar

Courtesy:

CSIR Invention Award for School Children

Announced at: <http://www.patestate.com/>

Eligibility: Any Indian student enrolled in an Indian school below the age of 18 years as on 31 July of that year can apply.

Deadlines for submissions: 30 September

Results: 1 January of following year

First Prize (1 No.) Rs. 50,000/- ; **Second Prize (2 Nos.)** Rs. 25,000/- each; **Third Prize (3 Nos.)** Rs. 15,000/- each; **Fourth Prize (4 Nos.)** Rs. 10,000/- each; **Fifth Prize (50 nos.)** Rs. 5,000/- each

Examples of winners (2008):

- A NOVEL WRITING AID [LIPI- Letting Infirm to Pen their Ideas]
- A NOVEL FINGERPRINT DETECTING COMPOSITION BASED ON THE FOOD DYE TARTRAZINE
- A NOVEL LOW COST AUTOMATIC WARNING SYSTEM FOR HIGH SPEED WINDS
- MANUAL BATTERY CHARGING DEVICE
- ANTI ALGAL/FUNGAL AND ANTI BACTERIAL MATERIAL

Interesting links

◆ Informative

- ◆ Invention for kids: <http://www.inventored.org/k-12/> ; <http://www.uspto.gov/go/kids/>
- ◆ Invention and inventors: <http://en.wikipedia.org/wiki/Invention> ; <http://inventors.about.com/> ; http://en.wikipedia.org/wiki/List_of_inventors ; <http://www.ideafinder.com/>
- ◆ Famous/ notable inventions/ inventors: http://en.wikipedia.org/wiki/Timeline_of_invention ; http://en.wikipedia.org/wiki/Timeline_of_invention ; <http://www.wipo.int/pct/en/inventions/inventions.html> ; http://inventors.about.com/od/timelines/Timelines_of_Invention_and_Technology.htm ; http://inventors.about.com/od/famousinventions/Famous_Invention_From_A_to_Z_Find_Any_Famous_Invention.htm ; http://inventors.about.com/od/famousinventors/Famous_Inventors_Nationality_or_A_Z.htm
- ◆ List of Indian inventions: http://en.wikipedia.org/wiki/List_of_Indian_inventions
- ◆ Story of Edison: http://invention.smithsonian.org/centerpieces/edison/000_story_02.asp
- ◆ Other invention stories: http://invention.smithsonian.org/resources/default_index.aspx
- ◆ Inventor's handbook: <http://web.mit.edu/invent/h-main.html> ;
- ◆ Associations: <http://www.uiausa.com/> ; <http://www.inventne.org/> ; <http://www.younginventorsinternational.com/>
- ◆ Contests and Awards: <http://web.mit.edu/invent/> ; <http://www.invent.org/> ; <http://www.inventnow.org/> ; http://en.wikipedia.org/wiki/National_Inventors_Hall_of_Fame
- ◆ Museums and resource centers: <http://invention.smithsonian.org/home/> ; <http://nmoe.org/gallery/index.htm>

◆ Curious/ Amusing

- ◆ Loony/ obscure inventions/ patents: <http://www.totallyabsurd.com/> ; <http://www.patentlysilly.com/> ; <http://www.funnypatentsandinventions.com/> ; <http://www.freepatentsonline.com/crazy.html> ; <http://funny-town.blogspot.com/2006/10/absolute-crazy-innovations.html> ; <http://www.delphion.com/gallery> ; http://inventors.about.com/od/wackypatents/Wacky_Patents_and_Gadgets.htm
- ◆ Killed by own invention: http://en.wikipedia.org/wiki/List_of_inventors_killed_by_their_own_inventions
- ◆ Games: <http://web.mit.edu/invent/g-main.html> ; <http://www.uspto.gov/go/kids/games/kidgames.html>