is slight. When the water in the cylinders reaches the prescribed level the exhaust valve communicating with the condenser is opened, and as the vacuum is formed water enters the cylinders through the supply valves, and the operation is repeated.

We have been informed that Commander Grenfell, of the British Navy, a Russian engineer, and the technical director of the Flensburg Ship Yards, recently inspected the hydromotor as applied to the Pellworm, and were all highly pleased with its performances. It is said that the technical director wrote Mr. Howalt, the associate of Dr. Fleischer, that he had been converted from a decided opponent to a friend and champion of the invention, having figured over the formulas used in building the hydromotor and finding them both new and correct. Our informant also tells us that the Imperial German Navy has adopted the hydromotor after a personal inspection by the War Minister.

The Pellworm is 75 feet long, 12 feet beam, draws 3½ feet of water, is flat bottomed, and is capable of steaming 6 knots per hour The apparatus develops 25 horse power. It has been ascertained that 40 per cent of power of the steam is realized in the propulsion of the boat.

THE TEMPERATURE OF WATER SUPPLY.

At the recent meeting of the British Association for the Advancement of Science a paper was read by Mr. Baldwin Latham on the temperature of the water supply of towns. The author pointed out the fact that any increase in the temperature beyond 55° rendered the water unwholesome. The temperature of the water supply of a town, as furnished by public waterworks, was totally independent of the temperature of the water at its source of supply, and invariably the temperature of the water was the temperature of the ground at any season of the year at the depth at which the distributing mains are laid. The average temperatures throughout the year, whatever the source or mode of supply, varied very little, but there was great difference in the range of temperature; and while the temperature in the chalk wells at Croydon gave an average monthly range, based upon daily observations, of 0·64°, the same water, when supplied direct from the mains, gave an average monthly range of 21·14°, or when stored in a cistern, a range of 28·05°; while water supplied from the Thames in Westminster gave an average monthly range of 24·69°, but the average yearly difference of temperature between the chalk water supplied at Croydon and the Thames water supplied in Westminster was only 0·67°.

Mr Latham had taken a very large number of observations, and found that the temperature of water in wells varied very greatly. In some of the deepest wells the temperature was colder than in the shallow wells. The movement of the water through the strata of itself increased the temperature. Diarrhea was most largely produced when the water supply became heated beyond a certain degree. Until the water delivered to a town reached something over 60° of constant temperature, diarrhea did not break out in that town. During the present summer the temperature of the water had been five degrees less, and the result was that diarrhea had prevailed only in a very slight degree. The temperature of the water was, from a sanitary point of view, extremely important, and one which ought to be more fully investigated in regard to its influence upon certain classes of disease.

THE SYDNEY EXHIBITION.

The International Exhibition at Sydney, New South Wales, was opened September 17th, with promises of great success.

Great Britain has 800 industrial exhibits and 513 of fine arts. Germany has 691 entries, and Austria 170. France has 350 industrial exhibits and 168 of fine arts. Belgium has 236 industrial exhibits and 50 of paintings America has 150 industrial exhibits.

The State Department at Washington announces that thirty or more of our leading manufacturing firms are represented.

A Decayed American Industry.

Before the advent of cheap cotton the production and manufacture of flax were important industries in this country.

In 1810, when the population of the country was but little more than 7,000,000, there were produced in the United States over 21,000,000 yards of flaxen cloth made in families. At the present time, when the population of the country is believed to be 50,000,000, the total annual production of flax and linen fabrics is probably not over 5,000,000 yards, and not a yard of fine linen is made in the country.

Isthmus Ship Transit.

At a special meeting of the American Society of Civil Engineers, in this city, September 24, the ship railway, as proposed by Capt. Eads, was among the subjects discussed. Mr. F. M. Kelly, who, more than any other individual, has contributed to the exploration of the Isthmus of Panama, said that there would be no difficulty about building such a railway. It would be merely a matter of dollars and cents, but it might be difficult to select a route with the proper grades.

Mr. T. C. Clark, who presided at the meeting agreed with Mr. Kelly that a ship railway was perfectly feasible, and thought the suggestion of Admiral Ammen, that the whole question be referred to a convention of American engineers, was a good one.

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NEW YORK, SATURDAY, OCTOBER 11, 1879.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 197,

For the Week ending October 11, 1879.

Price 10 cents. For sale by all newsdealers.

WATER FOR INDUSTRIAL USES IN NEW YORK.

A significant feature in connection with the water supply of this city is the increasing resort to artesian wells by large brewing establishments and other users of much water. Among the brewers who have made or intend to make themselves independent of the Croton water supply, are Elias & Betz, 54th st. and 1st ave., who have a well 425 feet deep; Clausen & Price, 59th st. and 11th ave., whose well is 625 feet deep; David Jones, 44th st. and 1st ave., well 662 feet deep; Geo. Ringler & Co., 92d st. near 3d ave., well 390 feet, and going deeper; and P. Doelger, 55th st. near 1st ave., whose well in process of construction is intended to be 600 feet deep.

As a rule these wells have a bore of 6½ inches, and cost from $6 to $10 a foot. Their great advantage lies in the cheapness of the water thus secured. The first well named is said to have paid for itself the first year. The Croton water tax paid by the larger breweries rises as high as $6,000 a year, and an equal outlay will usually sink an artesian well, securing a permanent supply independent of Croton water. The purity of the deep well water is also an advantage, and the same may be said of its average low temperature—about 52° Fah. The difference between that and Croton water at summer heat may make a saving of $20 a day in the ice bill of a large brewery. Artesian wells have also been sunk by manufacturers of mineral waters, that of John Matthews going down 300 feet. The deepest well, 1,001 feet, supplies the Higgins Carpet Factory with pure water for dyeing.

Only large establishments, however, such as require a large volume of water daily, can afford the first cost of artesian wells. The vast multitude of smaller manufacturing concerns, which need water chiefly or solely for steam power, are burdened by a Croton water tax which places them at a serious disadvantage in competition with shops elsewhere, which get their water free or at a reasonable cost.

Incredible as it may seem, the cost of water for running a steam engine in this city is at the present time about two-thirds the cost of fuel. For example, to run an economical one thousand horse power engine should cost for fuel, at present prices for coal, about $25 a day; the Croton water bill for the same is $5,062 a year, or nearly $17 a day. For smaller engines, each horse power up to and not exceeding ten, the charge for water is $10 a year; between ten and fifteen horse power, $7.50 each; for each horse power over fifteen, $5 a year. For all manufacturing purposes the charge for quantities of water less than 250 gallons a day is five cents a hundred gallons; for larger quantities the price diminishes to two cents a hundred gallons for quantities ranging between six and ten thousand gallons a day. For still larger quantities special rates are made, never less than one cent for one hundred gallons. Thus an establishment using one thousand gallons of water a day has to pay a water tax of $105 a year; for ten thousand gallons a day, the tax is $600.

The splendid water system of New York is capable of supplying upwards of a hundred million gallons of water a day. The actual consumption averages ninety gallons a day to each inhabitant, an amount fifty per cent. greater than that supplied to each inhabitant of Boston, Philadelphia, or any other of our great cities except Chicago, which furnishes eighty gallons a day to each inhabitant. On the introduction of waste water meters in Liverpool, where water did not begin to be so lavishly squandered as in New York, it was found that out of every hundred gallons supplied, seventy gallons were allowed to run to waste. It is, therefore, speaking within bounds to say that, the year together, an average of fifty million gallons of water are daily wasted in our city; yet the moment a man wishes to use any small portion of such water productively, the tax gatherer comes down on him with charges which, if not needless, are certainly unreasonably excessive. The practical tendency of this policy is to prevent the establishment here of new industries that have to compete with those planted in localities offering a cheaper water supply, and to drive away those that have made a beginning here. In this way New York strikes at the root of her own industrial prosperity. By laying excessive burdens on her manufacturers, she lessens the variety and volume of the employment possible to her working citizens; and by making production relatively more costly here than elsewhere, she indirectly cuts down the wages of her workmen. It is a bad policy; it does not pay, and cannot be made to pay.

CONSPIRACIES TO NULLIFY THE PATENT LAWS.

It is perfectly proper, and possibly a good policy, for parties having much to do with patented inventions to club together to secure the practical and legal testing of the merits of new inventions in their special field, and the validity of the claims on which patents on them rest. All inventions are not new and useful improvements, nor are all patents based upon claims which can be sustained in the courts. And there can be no just ground for complaint when the members, say of the Western Railway Association, the American Millers' Association, or the Car Builders' Association, resolve to act together in determining the advisability of adopting or refusing to adopt inventions which come within their special departments.. It is quite another thing, however, when the members of such associations agree to sustain each other in the infringement of the rights of patentees, in lobbying bills for the invasion or destruction of the inventors' constitutional privileges, or in thwarting the purpose of the patent law by refusing to consider or adopt improvements which are patented, simply because they are patented.

To encourage men to seek for new devices, for instance, for increasing the comfort and safety of travelers by rail, the United States declare that the inventor of such a device shall enjoy—if he wants it—the exclusive right for a term of years to make, use, and sell his invention. In their private capacity the managers of railway corporations have a perfect right to decline to buy or use any and every invention, whether intended for railways or otherwise, without giving a reason to anybody. As railway managers they have no such right, nor is it good policy for them to assume it.

The charter of a railway company is, in a sense, equivalent to a patent. It is granted by the people—just as a patent is—for a specific purpose, namely, the public convenience and profit. It conveys certain privileges, not for the benefit of the railway managers, but because they are essential to the attainment of the end aimed at. The road has, for example, the right of way through an inventor's farm, and in their official capacity its managers can demand what they cannot as private citizens. With official privilege goes official responsibility. As they have a right to take the inventor's land for the public good, if such be the case, so they are morally, if not legally, bound to use his invention, if the public good demands it. They cannot safely play fast and loose with official rights and responsibilities, demanding the one and shirking the other, as suits their personal pleasure and profit. The public gives, and it may take away, to the pecuniary loss of those who misuse the public trusts confided to them.

There is another view of this matter which anti-patent associations may profitably take into account. Since its foundation the government of the United States has manifested a desire to multiply and improve our industrial arts by the encouragement of new inventions. Experience has proved the desire to be a wise one, and has practically justified the means adopted to attain the objects of that desire, especially the means which costs least and yields the most—the granting of patents for new inventions. More than ever before the American people are now satisfied that the encouragement of invention pays.

Are they likely, then, to be pleased with the systematic discouragement of invention—the organized thwarting of the popular will, to say nothing of the attendant hazarding of public comfort and safety—by corporations which owe the possibility of their existence to public grants of privilege?

At the last meeting of the Car Builders' Association certain draw-bar appliances were substantially condemned, so far as it could be done by that body, simply because they were patented. The *National Car Builder* tersely puts their position in this wise:

"A freight brake is wanted—something that will enable a locomotive engineer to handle a long, loaded train as easily as he does his throttle lever. The thing is invented, let us suppose, and the inventor asks the association to give it their formal approval. The members reply, collectively: It is an excellent invention—all we want or could expect, and more too—but we cannot recommend it, because it is patented. Annul or cancel the patent, and make the brake public property, free to all, and we will sound its praises through the length and breadth of the land."

In refusing to "recommend" an invention, the association substantially declares the determination of its members not to use it in building or equipping cars.

We would respectfully suggest that action of this sort is as hazardous as it is unjust and unwise.

If inventions looking to the public benefit are thus to be killed, for the sole reason that they are patented, the public, which offers the patent as encouragement to invention, may take steps to prevent or punish such conspiracies against the public weal and will. And in retaliating it is quite possible for the people to be too severe in their enactments compelling the adoption of improvements. We should prefer to have inventions left to force their way by inherent excellence; but if they should ever be pushed into use by legislative enactments, those who have conspired to nullify the patent law as it stands will have only themselves to blame for the change.

EXTRACTION OF OILS BY MEANS OF SOLVENTS.

The extraction of oils and fats by means of the solvents, benzine, gasoline, and bisulphide of carbon, has grown up to be an important industry in the United States during the past ten years. At the present time, the capital invested in business is probably about $500,000, and the number of independent factories, four to six. The solvents employed are the petroleum benzines of the lowest boiling points, and the gasolines, the latter being used in the cases where it is necessary to remove all traces of the solvent from the finished products. Bisulphide of carbon was once used on a considerable scale for the extraction of oil from corn (maize) under the theory that the oil from corn would be much more valuable for the production of alcohol and starch. The industry, however, was discontinued mainly by reason of the high cost of the bisulphide and the risk in its use from inflammability and unhealthfulness. It is not likely that bisulphide of carbon will come into extensive use in this country, so long as the supply of petroleum is continued. It is well known that it is a much more rapid solvent than the petroleum products, but it is believed that this advantage is more than overbalanced by the objections to it. The petroleums, when heated to the normal boiling point or over, are nearly as rapid as the bisulphide.

The materials operated upon with benzine are especially the residues from fat rendering, and castor oil seed cake or pomace. The largest establishment of this kind is at Philadelphia, and is carried on by a joint stock company, under the patents of Adamson. The dissolving cylinders are horizontal—one say 8 feet in diameter and 20 feet long. The cylinders are provided with a railway, and the material is brought into the cylinders closely packed on trucks or cars. At the bottom of the cylinders are steam pipes traversing the whole length. When the cylinders are charged and their doors bolted on, benzine is let in so as to cover the steam pipes, the steam is let on, the benzine evaporizes, and condenses through the material, dissolves the fat, and the solution falls down to the bottom. The solvent again vaporizes and rises again to extract more oil. The dissolving cylinders or extractors are provided with suitable instruments to determine the temperature, height of the solution, etc. The fat or oil, after distilling off its solvent, undergoes a special refining treatment. The favorite raw material for this process is "beef scrap" and "pork scrap," containing 12 to 15 per cent of fat, which is practically extracted in the process. The residues are ground and used as fertilizers, under the name of azotine, and contain about 15 per cent of ammonia. The extraction process lasts from 24 to 36 hours. The extraction of oil from castor pomace is conducted in all respects as above. The fats and oils resulting from the process are mostly used as lubricants for machinery, and are not of the quality needed for good soap.

The works at Philadelphia have suffered severely from fire, having been at least twice wholly consumed. It is evident from the fact that they are just reconstructed that the industry is found to be profitable.

About ten years since an incorporated company began the manufacture of extract of hops under the plans of Professor Charles A. Seeley, making use of gasoline of specific gravity 80° to 90° B., as the solvent. The industry has steadily and healthily grown, and promises to become of the first importance. The useful matter of the hops by this process is completely extracted, is of small bulk compared with the hops, and is not at all deteriorated by keeping. The extractors of Seeley's system are vertical, are charged at the top, and discharged at the bottom. They are heated by steam, being jacketed on the lower half for that purpose, and the pressure of the vapor of the solvent serves as the motive force for discharging the solution into a separator or still. The apparatus is so constructed that the solvent travels in a circuit and does not go out of the connected parts of the apparatus. The separator or still consists of a vertical iron coil surrounded by steam, into which the solution is fed at the top. During the descent of the solution, the solvent is volatilized and escapes through a stand pipe to the condenser, while the oil or extract of hops, etc., flows away at the bottom.

Gasoline, according to the above plan, has been used upon meat scraps, cotton waste, seed cake, etc., quite successfully, as to the quality of the produce from it, as it is wholly free from petroleum contamination. In respect of the quality of the produce, gasoline is probably to be preferred to bisulphide of carbon, and in first cost and ease of working it is also plainly superior.

The oil extracting industry by means of solvents may be considered as firmly established in America, and as promising a very great extension in the near future. There are at present 20 to 50 patents relating to the industry, and there is no doubt that it will continue to employ the talent of inventors. S.

THE POLICY OF PATENT LAWS.

At the recent meeting of the Social Science Association at Saratoga, Mr. Frederic H. Betts, of this city, read a paper tracing at considerable length the historical development of patent laws, and traversing with singular skill and cogency the arguments of those who oppose the theory and practice of granting patents for new and useful inventions. The positions taken by Mr Betts are those which have been advocated in detail, over and over again, in this paper—those which every friend of industrial progress and the rights of inventors will justify and applaud. And he developed his thesis so coherently, so forcefully, and with such aptness of illustration, that his paper makes the most readable and convincing argument for mantaining the integrity of our patent law that we have seen for a long time. In view of the probable renewal of the assault upon our patent system in Congress next winter, the paper is as timely as it is admirable.

In every congressional district the friends of the patent system—that is, as to its underlying principle and policy—should see to it that their representatives do not go to Washington without an opportunity, at least, for becoming acquainted with the actual standing of patent rights in law and equity and sound industrial policy, as therein set forth.

Mr. Betts begins by sketching the early history of patent rights for inventions, tracing meanwhile the development of the idea that patents are to be regarded as a fair bargain, the inventor contracting to contribute a new item to the stock of common knowledge of practical utility for purposes of trade, the public offering in return the means of retaining the exclusive use of the invention for a term of years. He then takes up and answers the objections raised against patent laws, both theoretical and practical, and proves the claims of inventors to be consistent with natural justice. He shows that the right of property in ideas, so far from being exceptional in the case of patents for invention, is widely recognized among men, and that its increasing recognition is one means of estimating progress in civilization. To the objection that inventions are intangible, incapable of precise definition, and unsuited to be the basis of property rights, he replies by showing that all civilized men recognize and respect incorporeal rights. The difficulty of defining the exact limits of such rights may be great, but that has never been successfully urged as a reason for their abolition. Of all incorporeal rights, that of character and reputation is the least capable of measurement, yet for that very reason it has been most jealously guarded.

The objection that any individual inventor is but one of many working in the same field, all drawing from the common stock of knowledge and experience, and that to grant a patent to the first claimant is to set up a barrier to further progress, is considered at length and effectually disposed of. The alleged fact of the frequent simultaneous invention of the same device by several independent workers is shown to be untrue; and the asserted hinderance to progress by patenting the successive steps of it, is equally shown to be inconsistent with common experience.

On the contrary, the evidence is abundant that the grant of patents directly and powerfully promotes the progress of science and the arts.

Particularly interesting and valuable is the review of the growth and progress of ideas in respect to patents as shown in judicial decisions and legislative enactments—a development of a true appreciation of the rights of inventors, due not to mere change of sentiment, but to an increasingly full and exact understanding of the nature of trade and the proper province of laws in relation to it. This section will be found of special value in combating those reactionists who so boldly assert that the progress of thought is in a direction opposed to the principles underlying patent laws.

In closing, Mr. Betts proves statistically the exact coincidence of industrial progress with the increase in patent rights. Patents and trade go hand in hand. Take away the motive of invention and an important ally of improvement is destroyed. This has been the experience of industrial nations the world over. And American experience has shown that the more widely that motive is brought to bear on all classes, the more accessible patents are made to the multitude, the more rapid will be industrial progress, the more steadfast and general the country's industrial prosperity.

Mr. Betts' paper will be found in full in this week's issue (No. 197) of the SCIENTIFIC AMERICAN SUPPLEMENT.

The Movement of Breadstuffs and Provisions.

The movement of breadstuffs continues extremely active. The receipts of flour at this port the week ending Sept. 23, were 104,361 barrels, chiefly by rail. The receipts of grain were:

	By Canal.	Railroad.	Coastwise.	Total.
Wheat, bush	1,239,400	817,770	200	2,057,370
Corn, bush	1,075,450	45,850	....	1,121,300
Oats, bush	28,100	150,015	....	178,915
Rye, bush	204,800	7,602	400	212,802
Barley, bush	12,000	29,068	588	41,656
Total bush	2,560,550	1,050,305	1,188	3,612,043

The clearances of sailing vessels and steamers carrying breadstuffs from this port, the week ending Sept. 19, numbered one hundred and five. The total grain export was 50,643 barrels of flour; 2,329,279 bushels of wheat; 973,506 bushels of corn; 44,317 bushels of oats; and 107,613 bushels of rye.

During the same week there were exported 4,529 barrels of pork; 6,259,932 pounds of bacon; 3,293,122 pounds of lard; 2,466 pounds of beef; 611,005 pounds of butter; 2,684,468 pounds of cheese; and 917,021 pounds of tallow.

The Highest Telegraph Station.

A telegraph station has been lately established at the Ryffel Hotel, under the Ryffelhom, in the Valais. It is about 8,500 feet above the level of the sea, and is the highest telegraph station in Europe. A Swiss paper has claimed that it is the highest telegraph station in the world, but this is a mistake. The station on Pike's Peak, in the Rocky Mountains, is 14,000 feet above sea level, and is, therefore, something higher than that at the Ryffel Hotel.

The Ship of the Future.

After pointing out the great faults and failures of the present style of ocean vessels, a writer in the *American Ship* avers that the ship of the future will carry no ballast. If a sailing vessel, her sail area and displacement will be so well balanced that, if the rudder were lost or disabled, the vessel could be guided on her course by her sails. The center of effort of sails and of gravity of vessel will be adjustable, so as to harmonize with the griping influences of the lee line of flotation.

The ships of the future will be profitable, for they will be built for and under a specific service, on scientific principles; they will be designed, built, loaded, and navigated, as they have never been, with direct reference to their equilibrium of stability, the safety of vessel and cargo, with the lives of those on board. The rating characterization of vessels will then be determined by an international, or an independent, board; the British Lloyds will have passed away, only to be remembered as a corrupt organization. The material of vessels will be steel for metallic, and bent timber frames for wooden vessels. Under this new dispensation of genius, ocean, mail, and passenger steamers will be non-sinkable, and make their Atlantic trips in six instead of seven-and-a-half days, with a roll angle not exceeding eight degrees.