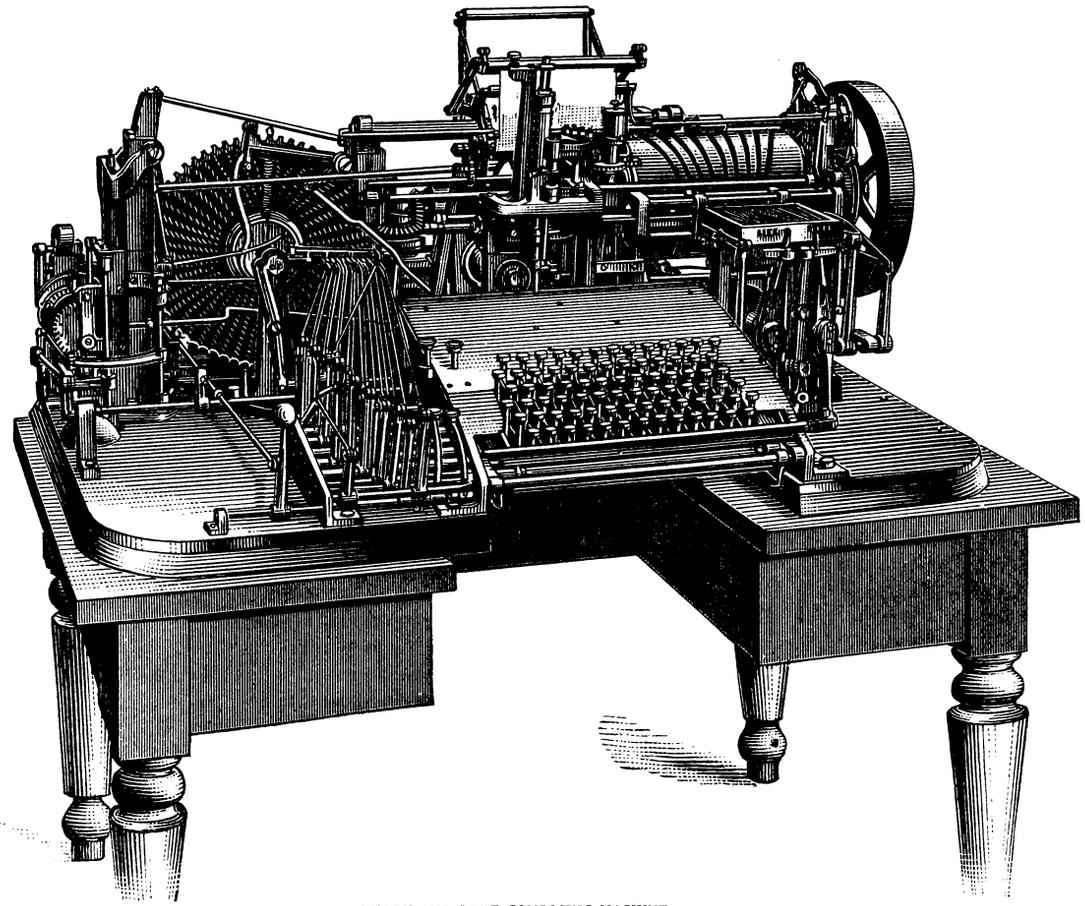
up, as it were, ready for use, fifty or more characters, and these are made to appear upon the paper, in proper place and order, by the automatic action of the machine, even after the operator ceases work at the key-board.

A unique feature of the invention is that by which the lines are "justified;" that is, lengthened or shortened to conform to the width of the column or page. To do this, when movable types are used, as in ordinary type-setting, the compositor, when the line is nearly completed, puts thicker or thinner spaces between the words. Otherwise the lines would be unequal in length, presenting a ragged appearance, similar to that of type-written work. By an ingenious device upon this machine, when a sufficient number of words to approximately fill a line have been registered or "pinned" upon the revolving disk, the justifying or spacing between the words is done automatically; and when the words subsequently appear upon the paper, they fill the line as accurately as do the words in this line, and the spacing between the words is as even as it could be made by the most expert compositor. In fact, the spacing is, and must of necessity be, mathematically correct.



RISLEY AND LAKE COMPOSING-MACHINE.

The reproduction of the work done on the machine now on exhibition is accomplished by lithography. The printing by the machine is done with lithographic ink on paper specially prepared. The impression is then transferred to stone in the usual manner, and the desired number of copies struck off. The first printing or composing on the machine is done in less than a fourth of the time required when movable types are used, the ordinary speed being from twenty to twenty-five words a minute. The cost of transferring to stone is said to be less than the "making up" of forms for the press in ordinary printing, and there is no "distribution" of type.

This machine has also been tested with a view to making matrices for the casting of stereotype plates, but the experiments have not been carried sufficiently far, as yet, to determine what may be accomplished by it in that direction. The patents covering the machine are controlled by the Graphic Process Company of this city, who are now erecting extensive workshops for its manufacture. The chief moving spirit in the enterprise of bringing it to the front and putting it upon a commercial basis is Mr. Edward F. Underhill, official stenographer of the New York Surrogate's Court, who has had it in use in his office for several months, with highly satisfactory results.

METHYLATED ALCOHOL.[1]

THE employment of alcohol so adulterated as to render it unfit for use as a beverage, free of tax, in the arts and manufactures, has lately been receiving attention by Congress. To prevent fraud on the revenue, the degree of adulteration that would be permitted should be governed by two considerations, — first, the minimum amount of adulterant that should be added to make the subsequent purification of the alcohol unprofitable; and, second, the maximum amount of adulterant that can be added without rendering the use of such adulterated alcohol unsuitable in the arts and manufactures.

Compounds known as methylated spirits, made by adulterating pure grain spirits, free of tax, with wood naphtha (methyl alcohol), are more expensive than such pure spirits, because the adulterant is, contrary to what is usual in such cases, more costly than the article adulterated.

For most manufacturing purposes, the addition of any amount of adulterant to grain alcohol must be regarded as just so much added useless matter. Besides, there is no purpose for which methylated spirits is used where the employment of grain alcohol would not yield both a cleaner and better product; in addition, there are many cases in which methylated spirits cannot be used at all.

Let us see what has been done in this matter in England and Germany, where laws and regulations on the subject have been enacted.

[1] Paper read before the Chemical Society of Washington, Jan. 10, 1889, by Edgar Richards.

Great Britain.

In England, according to the definition of their regulations and law, "the spirits must be plain spirits or unsweetened foreign spirits, of not less strength than 50 per cent over proof, or rum of not less strength than 20 per cent over proof, and must be mixed with at least one-ninth of their bulk of wood naphtha. This mixture is termed 'methylated spirits.'" Accordingly, 10 per cent is the amount of added impurity.

The Board of Inland Revenue only permits the use of a decidedly impure and crude wood naphtha for this purpose, of a not "less strength than 60 over proof," and which must not be used until a sample has been submitted and approved by the chemical department of Somerset House. Until the necessary approval has been obtained, the naphtha is kept under official lock and key, and only allowed to be used for mixing under certain regulations; and the whole quantity, 100 gallons, "must be drawn off and used before any other naphtha is conveyed into the vat." "Naphtha disapproved by the board must be immediately removed from the naphtha warehouse."

The mixing must be done in the presence of officers of inland revenue, and "500 gallons of methylated spirits is the least quantity which may be prepared at one time in a mixing-room, whether the spirits used be British or foreign spirits." "The mixing must take place in a vat of sufficient capacity to admit of the spirits and naphtha being thoroughly mixed."

Methylated spirits is "supplied to such persons only as undertake to use it in the arts and manufactures, subject to the board's approval," and on entering into bond in the sum of from £200 to £1,000 penalty, depending on the annual consumption which they propose to employ. Scientific societies and hospitals who obtain the methylated spirits for scientific purposes are not required to give a bond.

All persons authorized to use methylated spirits are warned that they are not at liberty to purify the spirits in any manner whatever. "No person can legally use methylated spirits, or any derivative thereof, in the manufacture, composition, or preparation of any article whatever capable of being used either wholly or partially as a beverage, or internally as a medicine." It may be used, however, "in the preparation of sulphuric ether, chloroform, hydrate of chloral, soap, compound camphor, aconite, and belladonna liniments," without coming under the foregoing prohibition.

The premises of all users of methylated spirits are liable to inspection of the inland revenue officers at all times.

The following table gives the total quantity of methylated spirits produced in Great Britain since 1881, taken from the annual reports of the commissioners of her Majesty's inland revenue: —

	Methylated Spirits.
1881	1,762,659 gallons.
1882	1,991,765 "
1883	2,100,765 "
1884	2,236,962 "
1885	2,334,835 "
1886	2,477,798 "
1887	2,673,375 "
1888	2,767,492 "

This table shows a steadily increasing consumption.

Canada.

In Canada, where a similar law to England was for many years in force, the government permitted methylated alcohol to be manufactured in bond for use in the arts, and to be withdrawn upon the payment of an excise-tax of fifteen cents per gallon. Twelve gallons of wood naphtha of not less than 60 per cent over proof were added to 100 gallons of grain alcohol. Subsequently the Inland Revenue Department ascertained that such spirits were being demethylated and rendered potable, thus causing a serious loss of revenue. The law was therefore repealed, and the Department of Inland Revenue undertook to supply the trade with a substitute, composed of 25 per cent of wood naphtha and 75 per cent grain alcohol, which is supplied only to varnish-makers and other persons engaged in the mechanical arts. The persons using this grade of methylated spirits give bonds, in the sum of $2,000, that such spirits shall be used solely for the purposes mentioned, and in the premises described in their application. An inferior grade, consisting of equal parts of wood naphtha and grain alcohol, is supplied the trade without any restrictions as to its use (see letter from Assistant Commissioner W. J. Gerald, of Oct. 25, 1888, published in the "Annual Report of the Commissioners of Internal Revenue, 1888," p. cxx.).

Germany.

The German spirit law, and the regulations issued to carry it into effect, permit of a sliding scale of adulteration, depending on the designated use of the "denaturised spirits."

For most purposes, a mixture of two parts of wood naphtha and one part pyridine bases to one hundred parts of alcohol is permitted. The wood naphtha is submitted to certain prescribed tests in regard to color, specific gravity, boiling-point, miscibility with water, contents of acetone, and capacity for absorbing bromine. The pyridine bases are likewise examined for color, behavior towards cadmium chloride, boiling-point, miscibility with water, contents of water, and volatility.

The regulations that have been issued from time to time have variously amended those preceding them. Those of June 21, 1888, are the latest, and several of the provisions contained therein did not come into force till the first of this year.

Makers of the general denaturising agent are permitted to add "40 grams of oil of lavender or 60 grams of oil of rosemary to every litre." Such addition has likewise to reach a prescribed standard.

"It is illegal to remove, or partially remove, the denaturation agent, or to add substances whereby the taste or smell of the denaturised spirits is altered." The selling or placing on sale of such purified spirits is likewise declared illegal.

Manufacturers may also use "five parts of wood naphtha instead of the general denaturation agent or pyridine bases" under certain regulations, and may sell the same "to persons engaged in industrial pursuits."

Varnish and polish makers may use "0.5 per cent of oil of turpentine" for this purpose, and may likewise sell varnishes and polishes so prepared to the trade. In "the manufacture of glazes for brewers' use the denaturation may be made with 20 per cent of a solution of one part of shellac in two parts of 95-per-cent alcohol. The alcohol used for such solution is to be free of tax."

In "the preparation of the alkaloids, medicinal extracts, chloroform, iodoform, chloral hydrate, sulphuric ether, acetic ether for technical purposes, collodion, tannin, salicylic acid and its salts, white lead and acetates, the alcohol may be denaturised by 0.5 per cent of oil of turpentine, or by 0.025 per cent of animal oil, or 10 per cent sulphuric ether."

"For making colored varnishes, 0.5 per cent of oil of turpentine, or 0.025 per cent of animal oil," is permitted; and for alcohol used in the "analysis of sugar-beets in sugar-factories, 0.025 per cent of animal oil" is the quantity prescribed for denaturation.

"For the preparation of acetic ether intended for technical purposes, freedom from tax can only be granted for the alcohol to be used under condition that besides the prescribed denaturation of the alcohol," as already mentioned, the ultimate destination of the acetic ether must be indicated, and will be controlled by suitable regulations.

The "animal oil, oil of turpentine, sulphuric ether, and shellac solutions intended to be used as denaturation agents, must satisfy the prescribed tests," and be submitted to an officially appointed chemist, and be approved by him before they are permitted to be used for the purpose. The expense of such test is borne by the manufacturer.

"For the preparation of vinegar, alcohol may be denaturised by 200 per cent of acetic acid of 3 per cent, or by 30 per cent of acetic acid (vinegar) of 6 per cent, or by 70 per cent water and 100 per cent beer." It is also allowable to use, "besides the prescribed quantity of acetic acid (vinegar), 100 per cent of pure genuine wine instead of the beer and water."

Alcohol of "less than 80 per cent" is not permitted to be treated, and "not less than 50 litres" must be treated at a time. The mixing must take place under the supervision of two revenue officers.

United States.

The bill now before Congress contemplates: 1. The use of large, bonded warehouses for the storing exclusively of spirits "of not less than 180 per cent proof." 2. The removal of such spirits free of tax from the bonded alcohol warehouses to bonded storerooms, to be "used in manufacturing establishments, in the industrial arts, and in the manufacture of articles, preparations, compounds, acetic and other acids, and medicinal drugs or chemicals." "The manufacture of tinctures, proprietary articles, wines, liquors, cordials, bitters, or other alcoholic compounds which are used or sold as beverages," is excluded from the provisions of the act. "The commissioner of internal revenue, with the approval of the secretary of the treasury," is to make and enforce all needful regulations. The bonds for the alcohol warehouses are not to be in a less sum "than $100,000;" and those for storerooms to be not "less than $5,000;" all operations conducted in such bonded establishments to be under the supervision of revenue officers, as is now customary in all distillery warehouses. 3. The proprietor of any bonded alcohol warehouse may methylate such spirits free of tax, so as to cause them "to be unfit for use as a beverage," under prescribed proportions and regulations; and such methylated spirits may be withdrawn from the warehouse upon a permit issued in due form by any person who has complied with the provisions of the law, and filed the necessary application and bond with the collector of internal revenue in whose district the methylated spirits are to be used; the sale, removal, transportation, and use of such methylated spirits to be under prescribed regulations and bonds. Heavy penalties are prescribed for the purification, by any means, or the use, of such purified methylated spirits.

It will be seen from this review of the legislation on the subject, that the purification of methylated spirits is made unlawful, from which one might conclude that this process does not render the spirits altogether unfit for drinking-purposes when properly purified.

Having been requested by the commissioner of internal revenue to make experiments for the purpose of ascertaining whether such spirits could be demethylated, the experiments were made, and my report on the subject was published in the "Annual Report of the Commissioner of Internal Revenue," lately issued.

I now beg leave to submit to the members of the society some of the samples of distillates and artificial liquors produced, and let them judge for themselves how far I have succeeded in making a drinkable compound.

Ten per cent of the methyl alcohol was used for adulteration as being the largest amount known to me, when the experiments were carried out, as being legally permitted. The provisions of the Canadian law I did not learn of till after my report was written. As soon as I have some leisure, I intend trying to purify 25 and 50 per cent of adulteration.

The loss was, for the reasons stated in my report, much greater than would happen on a commercial scale; and, as long as there is a high tax on distilled spirits, a large loss might take place in purifying methylated alcohol, and yet render the illegal process profitable enough for unscrupulous persons to take the risk of detection.

Since the bill has been introduced a strong opposition to its provisions has been developed in the large wholesale and retail drug trade, and the *Oil, Paint, and Drug Reporter* has lately been devoting a great deal of space to the views of the most prominent dealers. They are of the general opinion that alcohol should be free to all, or not at all; that the small druggist who now prepares a great many, if not most, of his medicines, etc., would be driven out of the business, as he could not afford the bonded storeroom, etc., and be compelled to purchase from a few large firms who could readily afford to comply with all the necessary regulations; and, lastly, that the supervision at all times of revenue officers over their business is distasteful to them. A great many of them state, that, even if the alcohol was methylated, it would most certainly have to be purified before they could make use of it.

The great supporters of the measure are of course the alcohol-producers, who see in its provisions an increased market for their product.

ELECTRICAL NEWS.

Dissipation of Fog by Electricity.

SOME remarks in the editorial columns of the *London Electrician* have called forth a letter from Professor Lodge on the subject of the dissipation of the London fogs by means of electric discharges. At the Montreal meeting of the British Association, in 1884, Professor Lodge described some experiments in which he condensed smoke by means of a brush discharge from points connected with a static electric machine. The subject was an interesting one, and attracted considerable attention at the time; but it seems that no experiments on a large scale have since been attempted. A number of possible applications have been suggested, — for example, it has been proposed to use an electric discharge to dissipate the dust-particles in flour and other mills, which have been the cause of several disastrous explosions, — but the efficacy of the plan has not been tried. In the letter referred to, Professor Lodge states that he has been deterred from experimenting chiefly on account of the great initial expense necessary for a trial on a large scale, — an expense which he estimates to be in the neighborhood of five thousand dollars. As to the form of experiment, he is not sure that a battery of an enormous number of cells would not be the most likely plan. So far, the largest experiment that Professor Lodge has made has been the clearing of a smoke-filled room; but the results were so encouraging, that he does not despair of condensing the fog in a stagnant atmosphere. He has applied to the trustees of the Elizabeth Thompson fund in this country for a grant of five hundred dollars with which to continue his work, but has not yet heard the result of his application. The matter is a most interesting one. We have an entirely new field for electrical application, with a very substantial promise of reward for success. There are a number of possible applications of the process, — the clearing of smoke from tunnels, the dissipation of dust-particles in mills, and the general abatement of the smoke nuisance that is so unpleasant in manufacturing towns.

TRIALS OF THE SUBMARINE BOATS "GYMNOTE" AND "PERAL." — At a recent meeting of the French Academy of Sciences, Admiral Paris read a short paper on "The Submarine Boat 'Gymnote,'" which we lately described. He was most enthusiastic as to its success, and in the course of his remarks said, "In short, we are able to say that the 'Gymnote' moves and steers equally well above or below the surface, that it can be kept accurately at the desired depth, that its speed is all one could expect, that respiration is unimpeded, and that down to a certain depth it is easy to see. M. Tédé says that Captain Krebs's electric motors are marvels of lightness and precision, and that this important part of the boat has been carried out in a most masterly manner. The energy available amounts to 240 horse-power hours. So complete a success would have been impossible without the scientific ingenuity and minute care which M. Romazoff, naval engineer of Toulon, brought to bear upon every detail. Here, then, we have a solution of the submarine-boat problem. The first step has been taken. Better work will be done in the future. But, even as it is, the 'Gymnote' is capable of rendering good service." From *Engineering* we take the following: "The new Spanish submarine torpedo-boat 'Peral,' which has lately been tested with much success, is 72 feet long by 9.5 feet in diameter. It is fitted with a secondary battery of 600 cells, which supply the current to five electro-motors, two of which are of 30 horse-power each, and drive the propellers: the other three are only of 5 horse-power each. The boat has a speed of 11 knots on the surface, and 10.5 knots below. It can remain submerged for two days before the air requires to be renewed. It will be armed with Whitehead torpedoes." With the recent partially successful experiments with directable balloons, and these latest experiments with submarine boats, we may expect novel developments in warfare.

NEW RECKENZAUN TRAM-CAR. — The principal novelties in this car consist in the method of gearing the motors to the car-axles, and in the employment of a form of secondary battery on which Mr. Reckenzaun has been working for some years past. The ordinary practice of connecting the motor-shafts and car-axles is through two pairs of spur-gears, the ratios of the diameters giv-