capital and the construction undertaken by British labor, this point offers no insuperable difficulty and the line now under construction from Mossamedes to Huilla is to be prolonged through Rhodesia and connected with the completed railway from Beira to Salisbury. It is also reported that an agreement has been made between England and Portugal for the construction of a harbor at the mouth of the Kunene, and the building of a railway from thence eastward to Buluwayo. In German southwest Africa a railway is being constructed by the German government to extend from the mouth of the river Swakop to Windhoek, and 60 miles of this road have been in operation since April, 1898.

The most important portion of the railways of Africa, however, are those in the British Cape Colony, the Orange Free State, and the Transvaal Republic. These have a total length of 4,350 miles, the main western line extending from Cape Town to Buluwayo, and beyond to Salisbury, where it connects with the Portuguese line from Beira. Branch lines also connect with Port Elizabeth, Port Alfred, and Port Natal. Johannesburg and Pretoria are connected with the Indian Ocean by two railways, one running to the Portuguese harbor of Lorenzo Marquez, and the other to the port of Durban, in the British colony of Natal.

It is in connection with the Egyptian railway up the Nile Valley from Alexandria to Cairo, and beyond to Khartoum, that the proposed Cape-to-Cairo route has been considered, the whole being intended to form a mixed rail and water route through the whole length of the continent. Herr Claus gives a detailed tabular statement of the length of the various portions of the route his map showing very clearly the completed and proposed portions.

In British East Africa, an important piece of railway is being constructed from Mombassa to Port Victoria, on the Victoria Nyanza, this road being more than 600 miles long, passing over an elevation of more than 8,500 feet, north of Mount Kilimandjaro, and when completed it will enable direct communication to be made from the 25,000 square miles of area of the Victoria Nyanza to the sea.

At the beginning of 1899, 125 miles of this road were in operation.

Herr Claus discusses briefly a number of minor projects for railways from points on the coast into the interior, all of which are of interest in connection with the general opening up of the continent, but for further information respecting these reference must be had to his excellent map and article.

AUTOMATIC LUBRICATOR.

We illustrate an ingenious automatic lubricator intended for the supply of solid lubricants, which has recently been brought out by the Aktiebolaget Lubrikator, of Garfvaregatan 13, Stockholm. Solid lubricants have certain advantages of their own, being

there is, in the first place, a certain liability of sticking fast due to grit or other foreign body finding access to the interior; and, secondly, the rate of supply varies with the temperature. With the lubricator illustrated the feed is positive, and can be altered within wide limits as may be needed by particular cases. The feed is given by a plunger above the grease in the cup, fed

DEVICE FOR MOUNTING DRIVING BELTS.

1. Arrangement upon the pulley. 2. Details of the hook.

down by a screw which is turned round by the ratchet-wheel shown above the cup in figure. The driving pawl is vibrated by a crank on a shaft turned by the friction feed wheel clearly shown in Fig. 2. This wheel is in turn rotated by a swinging arm, carrying a friction pawl as shown, and having at its free end an eccentric roller, which rests on the shaft to be lubricated. The eccentricity of this roller can be varied at will, and consequently a greater or lesser feed given to the friction wheel. The arm, moreover, being extensible, provides an additional means of regulating the feed, since it is obvious that the longer the arm the less the

DEVICE OF MOUNTING DRIVING BELTS.

In order to transmit the motion of the engine to the machines that it is desired to set in motion, it is often necessary in manufactories to make use of driving belts of very large size, which have to be mounted upon pulleys. Now, in most cases, the operation of mounting is performed by means of a cord provided with a slip-noose; but great care must be taken to loosen the cord at once as soon as the engine is started. It may happen, however, that the cord will not slide easily, and in such a case the belt may be damaged. In reality, the operation is attended with many dangers.

M. J. Mollon, superintendent of the weaving works of M. J. B. David, at Boen, having had considerable experience with such inconveniences, has devised an apparatus that permits of easily mounting belts without any danger, and which is represented in the accompanying engraving. It consists of a metallic rod, C, bent upward at one of its extremities in such a way as to form a rounded angle. In the horizontal part of the device is formed a recess for the reception of the edge of the pulley rim, to which the apparatus is fastened by means of an adjusting screw, D. In order that the apparatus may operate properly, the distance of the vertical arm of the rod to the external edge of pulley should not be greater than half the width of the belt.

By means of this little device, which is easily constructed, a belt may be very readily put in place. The apparatus is first fastened to the rim of the pulley by means of the screw; the belt is placed upon the hook; then the engine is started, and the belt slides upon the pulley at once. The pulley may make several revolutions with the apparatus attached without the latter interfering with the belt in any way whatever.

For the above particulars and the engraving we are indebted to La Nature.

THE CARE AND HANDLING OF INFLAMMABLE SUBSTANCES.

By JOSEPH F. HOSTELLEY.

PHARMACIES are not infrequently visited by fire, which can oftentimes be attributed to injudicious storage or careless handling of inflammable and explosive substances. On the part of a great number of pharmacists there is a distressing disregard for the dangerous nature of some of the substances carried in stock, elements that have a great affinity for fire. Eternal vigilance is the price of safety. Turn a deaf ear to these words of wisdom when handling inflammables, you give the daily newsgatherers pabulum for their gazettes. It is not only essential that the pharmacist be vigilant of his own actions in this regard, but he must keep a watchful eye upon the movements of his assistants. If the "boy" be of a grammar-school age, it behooves

FIG. 1.

AUTOMATIC LUBRICATOR FOR SHAFTING.

FIG. 2.

cleanly, economical, and excellent reducers of friction. As usually applied, however, there is a difficulty in insuring a continuous and regular flow of the lubricant to the bearing. When the common screw cup is used, the cap has to be screwed down at frequent intervals, while the spring loaded lubricators tend to give a more copious feed of the lubricant when freshly filled than when nearly empty. With the gravity feed lubricators, on the other hand, in which a weight resting on the grease forces it on to the bearing,

feed with a given eccentricity of the roller. The feed screw, we may add, works in a split nut, which can be opened when it is necessary to raise the plunger in order to fill the cup. The refilling is done from the bottom, the top of the cup being freed from the bottom portion by slacking the wing nut shown. In ordinary work, one charge of lubricant will last 300 to 400 hours. The rate of supply is, of course, unaffected by a rise of temperature, which would soften the grease, the feed being a positive one.—Engineering.

every other attaché of the pharmacy to be his and their own guardian angel, so to speak. The pharmacist who will permit a youngster to roam about in a cellar or "back room" in which are stored inflammables and explosives, at his own sweet will, is courting a conflagration, commercial ruin, and possibly bodily harm to one or many persons. The same is true of him who hands a lamp or candle light to an express or delivery man, with a box or barrel, with instructions to "just put it in the cellar; you know

where it goes," or to "look about; you'll find some empties down there." And these cases are facts, not fancies.

System in the handling of inflammable or explosive substances and compounds is powerful in preserving the person and property from injury, and insuring to the pharmacist a sense of safety from the evil effects that often follow reverse methods. There should be a definite locality in the establishment for keeping agents of this type, and here and nowhere else, each and every one should at all times be found. No putting benzine in the rear of cellar, a vial of chloroform near the street exit, and a vessel of phosphorus under the stairs, with, possibly, ethers on a lower shelf in the "back room." Have that proverbial place for everything inflammable, and be able to always find everything in its place. Teach clerks the import of such a regime. Concerted and concentrated effort along this line tends to lessen the possibilities of a casualty and exerts a potent influence toward the elimination of danger arising from scattered containers of inflammables, one of which may happen to rest just in the proper position to be ignited by a lighted match dropped inadvertently, a spark from the heater, the cigar of a careless worker, by mice gnawing matches, or by an overturned lamp.

In a sepulcher one treads with awe because the very appearance of the tomb impels a reverential step. Now, if somewhere about the establishment there was a special fireproof apartment, a room distinct and distinctive wherein to store the commodities of which we write, a foot would not be stepped within its threshold without a realization of the dread nature of its contents. Its peculiar construction and comparative isolation would impress one with the fitness, nay, necessity for cautious movements and prudence. Such a department would necessitate a greater or lesser demand upon the exchequer, to be sure; but would not its services, significantly valuable, merit this expenditure? Surely an ounce of prevention is worth a pound of cure. Would it not be far wiser, then, to spend a few dollars on such a precautionary measure, than to lose hundreds by a fire that might have been averted? If not, then the whole system of property and life insurance is a fallacy, and insurance corporations, frauds.

Let us tell a succinct story brought to mind by several actual happenings: There is a demand in the store for a certain inflammable substance; it is somewhere in the cellar; the time of day is dusk or dark; the cellar is poorly lighted or the day is gloomy; a lamp or candle is taken in hand; a search is instituted below among a heterogeneous list of items; the search consumes some minutes, probably because of someone else "losing" the desired matter, and the object of the quest does not materialize; haste now oversteps prudence; the movements of the light become erratic; there is a flash, a flame, and an after investigation, which finds that misplaced item of stock the cause, one way or the other, several hundred dollars loss the effect. Which, think you, would have been the cheaper, a special fireproof department for such commodities and system, or what followed the absence of both these expedients?

The whereabouts of the apartment we suggest would, naturally, be governed by circumstances, by the facilities at command. Many impulses suggest the cellar as a good and usually convenient locality wherein inflammables will most likely be beyond the casual fire-brand or that "defective flue" so often sinning and being sinned against. The cellar is a decided vantage ground because of the earth or cement floor and the stone walls. Here a stone or brick and mortar vault could be designed. A corner affords the advantage of two boundaries or walls ready constructed. Little wood should be employed in its erection and accoutrements. A door of sheet iron would be preferable. A pane of glass may be set into one wall, but little or no sash of wood should be seen. Interior shelving could be of boards covered with asbestos cloth or tin, or of heavy plate glass. If practicable, an incandescent globe should constitute the means of affording light therein. If a hand illuminant be necessary, a tallow or wax candle seems commendable because, in itself, there is not, as in the case of the lamp bowl, a substance to greatly endanger surrounding objects, if it be overturned. A candle lantern is a clever device. A gas jet has to its discredit the heat generated by the ignited gas.

A fair substitute for a fireproof vault would be a capacious closet or room of boards, built into one corner of the cellar. This would be less expensive than the former. Boards for its construction could be obtained from packing boxes. Many of those from bottle cases are three feet some inches in length. As they are to be covered and protected by asbestos cloth or tin on both sides, they would require no planing. When completed, both interior and exterior woodwork of closet should be completely and fully hidden beneath a coating of non-combustible material. Shelving should be likewise made insusceptible to flame.

When completed and stocked, in this department will be found such inflammables as the following: Alcohol, benzene, chloroform, carbon disulphide, ether, acetic ether, spirit of nitrous ether, ethylic aldehyde, ethyl bromid, ethyl chlorid, phosphorus, etc. Liquefied gases in cylinders, such as carbonic acid gas, oxygen, etc., should be kept herein; also light petroleum oil for supplying lamps for illuminating or stoves for heating. Some pharmacists make a specialty of preparing powders, etc., for pyrotechnic displays on the Fourth of July, to herald the election of certain men to public office, and for diverse local celebrations. Between festivities these fireworks may be preserved in this compartment for inflammables.

No matter what may be your method of storing inflammables, it should be made an immutable rule, the violation of which is a pharmaceutical misdemeanor demanding a severe censure—never to remove the stopper from a vessel containing such a dangerous substance, in the neighborhood of a lamp, candle, or gas flame. During the hours of sunlight, such a substance is not to be transferred from one container to another in a dark room or cellar, where an unsafe medium sheds light. Let the vessel and its desired contents be taken where the sun may aid the eye and hand to pour, weigh or measure. Insist that, with exceptions really unavoidable, all such duties be done before nightfall. The replenishing of shelf bottles should not be delayed until daylight has waned. Lamps or oil stoves must

be filled during the early hours. Procrastination in these matters is fraught with danger. Excelsior, paper waste, hay, or other matter greedy to grasp a spark or flame, must not be allowed to lie on the cellar floor in loose piles. Hot ashes should never be deposited in a barrel, cask, or box of wood; many fires are caused by ignoring this precaution. Care should be exercised in "banking" the heater fire for the night. When consuming rubbish in the heater, the latter should not be left alone many minutes.

This brings us to a consideration of fire-extinguishers applicable to the pharmacy. There are patent ones galore. The possibilities of carbonic acid are proverbial. Its potent properties as a fire fighter may be utilized in this way: Beneath a small trap door in the floor of the prescription department or "back room," a cylinder of carbonic acid is set securely upon a shelf at such a height that the flow of its contents can be controlled easily by one above the trap in the floor or by a person in the cellar. Thus one tank suffices for the protection of two departments of the store. To the cylinder is connected a section of rubber tubing or hose, hung at a point where it may be accessible both from above and below. Here is another idea: A fresh water pipe running beneath the flooring might be tapped, a spigot affixed to it, a hose attached, to be hung as described for tank of acid, and the trap cut in floor. Such a scheme as this, or that preceding, secures an expedient to always and quickly answer the exigencies of the hour of need. This end might be furthered by distributing about the premises, in readily accessible positions, syphons of soda, or hand grenades. The latter are easily prepared by the pharmacist from familiar formulas and several flasks.

The peculiar affinity calcium carbide has for moisture, and the specific effects of such an equation, should not be overlooked. Keep calcium carbide in a dry atmosphere. When phosphorus is used but seldom, it is destined to pass out of mind. But don't let it rest unnoticed in an out-of-the-way nook of the cellar until the water in which it is immersed evaporates and the phosphorus ignites. Accidents have resulted by forgetting this principle. Haste precipitates many unforeseen and unfortunate events. Whatever may be the demand upon your time, never fail to recock a vessel containing an inflammable, immediately after handling. If any be spilled on the floor or over other objects, eliminate all possible danger from fire at once and inform other attaches of the pharmacy of the accident, that they may be cautious for some little time after when approaching this locality with a light in hand.

It is well to speak a word of warning to purchasers of benzene. A caution label may be overlooked; verbal advice is potent and it seems to always have an echo that carries weight. In a conspicuous position in the cellar, at the foot of the steps to street, where wagon and dray drivers may see, hang this placard: "NO SMOKING." And after it has been hung, remember its purport yourself.

Let the pharmacist, in the matter of protecting his property from fire, learn to be cautious, painstaking, systematic. Teach the principle of prudence to your clerks, and practice what you preach. Rather be accused of timidity than temerity.—The Pharmaceutical Era.

TRADE SUGGESTIONS FROM UNITED STATES CONSULS.

Agricultural Implements in Eastern Brazil.—Consul Furniss, of Bahia, on January 17, 1900, writes to an Illinois company as follows:

Very few agricultural implements are used in this district.

Some time ago, I made a trip to the most fertile section of this consular district, where coffee, sugar cane, tobacco, etc., are raised in great quantities, and I was surprised to note the entire absence of modern agricultural implements. The ground is prepared for planting by turning it up with a spade, but more often with a crude hoe resembling our grub hoe, or with a pick where the soil is particularly hard. A crop once planted is not bothered much by cultivation, the coffee being full of weeds and other vegetation and a heavy growth often obscuring the cane. The little cultivation that is done (more particularly with tobacco) is effected with a broad hoe, of the type long ago used in the cotton fields of the south of the United States.

In many parts a plow is unknown; in fact, I can find but one district that ever attempted its use, and that was the sugar-cane section, under the management of an English company, and the plows brought out have been allowed to rot and rust, because the natives could not be induced to use them.

Such farm implements as seeders, harrows, planters, drills, cultivators, hay loaders, corn huskers, and the like are entirely unknown here. Indeed, there could be no use for many of these things, because little in the way of grass or vegetables is raised, the supply being imported; the corn and hay from Argentina, the potatoes from Portugal and possessions and Germany, the beans from Southern Brazil, Argentina, and a small quantity from the United States, though there is plenty of land in this district upon which all these products could be raised.

As Brazil is nearly as large as the United States, I cannot speak as to the chances for the implement trade in the whole country, but have to confine my remarks to this consular district, which includes the States of Bahia and Sergipe. I understand that in Rio Grande do Sul and Santos they devote more attention to modern farming.

The whole of the Argentine Republic offers a good market for all kinds of agricultural implements.

American Buggies in New South Wales.—Consul Goding, of Newcastle, under date of January 16, 1900, writes that through the personal efforts of that office buggies manufactured in the United States have been introduced. By the outgoing mail there were ordered six different styles of buggies. The orders are each accompanied by a draft for the amounts. Mr. Goding trusts that this will lead to a considerable business in buggies, etc., between the colony and the United States.

Colonial Training in Belgium.—Consul Roosevelt writes from Brussels, February 23, 1900:

In view of the increasing prosperity in the Belgian

Kongo, this government is considering means of interesting the people in the subject of colonization. One of the most practical is the recent establishment at the Horticultural School, at Vilvorde, of a special department for the training of students who intend to seek a fortune in the colonies. There will be practical demonstrations of the sort of buildings a settler must construct and instruction in rules of sanitation. The cultivation of indigenous plants, as well as of European vegetables and plants, the best methods of gathering crops and transporting them to market where there is a demand for them, and the way to treat the native population, from which the labor supply must be drawn, will all be dealt with.

Colonial School in France.—Consular Agent Harris, of Eibenstack, under date of February 12, 1900, writes:

A colonial institute is to be opened in Marseilles to prepare young men to fill positions in the French colonies. Expeditions of students will be sent out at the expense of the State, and commercial houses will receive the information thus obtained in the form of detailed reports. Instruction will be given in botany, zoology, natural history, colonial geography and history, etc. There will be a museum of plants, minerals, etc., so that the student may become acquainted with the actual products of the colonies; also a school of medicine to familiarize him with diseases peculiar to tropical countries. It is probable that arrangements will be made for teaching Oriental languages. For grounds and buildings, the city of Marseilles has donated \$193,000.

Openings for Americans in Nicaragua.—In answer to inquiries by a New York correspondent (to whom the letter has been sent), Consul Donaldson, of Managua, on February 10, 1900, sends the following information:

As teachers and professors in government and other schools in Nicaragua, there is really no opening for our young graduates. Salaries here are insignificant and customs so different that Americans have never proved successful. The salary of a principal here is 50 pesos, or about \$17, per month.

American physicians and surgeons are successful here, but no part of the world is more crowded with them than the large towns of Nicaragua. Hundreds of the native young men study medicine in the United States and return here to practice. They understand better their own diseases, customs, and people than a foreigner could, and the majority of the people prefer them. Dentists, however, are scarce, and whenever an American dentist comes, he does a good business and can charge remunerative prices.

Engineers of all kinds are the most successful of any professional men in these tropical countries. Very few natives follow that vocation, and most of the engineers employed by the government are foreigners. An engineer's salary at the start is from 250 to 300 pesos (\$80 to \$100 in United States gold) per month.

Business here is the favorite occupation for all natives. The wives of officials, of planters, of lawyers, of doctors, and even of politicians, have their little shops and thus crowd every town with stores. Salaries for clerks are not worth the consideration of any foreigner.

The German Jute Industry.—Vice-Consul-General Hanauer sends the following from Frankfort, February 6, 1900:

The number of spindles working up jute yarns has increased from 73,226 in 1890 to 135,000 in 1899. The increase in the import of raw jute has not kept pace in this ratio, but jute yarns from abroad have obtained a larger market in Germany. The annual production of jute fabrics in Germany now amounts to 50,000,000 marks (\$1,900,000) in value. The import of jute bags having in late years largely increased, the German manufacturers are asking for a change in the tariff rates on the bags, so that in future jute bags imported for baling sugar intended for export shall be made to pay duty. These manufacturers are now negotiating for the creation of a trust of jute manufacturers.

American Wheat for Macaroni.—The Bureau of Foreign Commerce has received another letter from Mr. James B. Simpson, of Dallas, Texas, in regard to the wheat which was sent to France to be tested as to its fitness for use in the manufacture of macaroni and similar edible pastes. Mr. Simpson says, in part:

It has been demonstrated beyond question that all Northern Texas is perfectly adapted to the growth of the hard, glutinous wheats now in such great demand in France and Italy. The grain I transmitted through your kindness to Consul Covert, of Lyons, upon analysis shows the value of this hard wheat to Texas. With the port of Galveston now open, giving us easy access to Marseilles, this wheat is calculated to revolutionize production here.

But the difficulty lies in this: Our farmers here, through negligence, have mixed the hard and the starchy wheats, and we find it almost impossible to obtain the pure hard grain. I did the best I could in sending Consul Covert the 2 bushels for analysis, and in sending 5 bushels at your request to the Paris Exposition, but all had some grains of soft wheat in it. If the farmers here could obtain the Taganrog hard wheat for seed, it would be but a few years before Texas would control the French and Italian markets in this hard wheat.

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The Reports marked with an asterisk (*) will be published in the SCIENTIFIC AMERICAN SUPPLEMENT. Interested parties can obtain the other Reports by application to Bureau of Foreign Commerce, Department of State, Washington, D. C., and we suggest immediate application before the supply is exhausted.