tory evidence. This is easily obtained by half filling large glass jars with badly infested roots, interspersed with a little soil, about the time or some time before the grapes begin to ripen. If there are pupæ upon such roots the winged females will soon begin to appear on the side of the jar toward the light."

One of Prof. Riley's correspondents, who has large interests in Californian grape culture, and who has recently recently returned from an extended visit to the richer wine producing sections of the State, says that the insect has been established in the Sonoma Valley for the last five years, and is now working there with terrible effect. No one in this valley seems able to give any suggestion as how the pest may be successfully fought. Every variety of vine planted in the valley has been attacked and destroyed, or is being destroyed.

ENGINEERING INVENTIONS.

Messrs. John Maguire and William A. Alexander, of Mobile, Ala., have patented improvements in vessels and apparatus for river and harbor dredging, wherein pumps are made use of for elevating the material from the bottom. The inventors make use of a vessel of suitable dimensions, formed with a central well and water ballast compartments, whereby the vessel may be sunk to the bottom. The vessel is also fitted with pumping apparatus, whereby the water in the space inclosed by the well is first to be pumped out, and the mud, sand, etc., of the bottom then pumped out to the desired depth. Within the well of the vessel is a frame fitted for being raised and lowered, and carrying discharge nozzles of a second pumping apparatus, whereby streams of water are discharged for agitating the mud, etc., and rendering it semi-liquid, so that it may be pumped out. These discharge nozzles are fitted upon carriers that are movable upon slideways, whereby all portions of the inclosed bottom may be subjected to the action of the water.

Mr. John H. Wait, of Opelika, Ala., has patented an automatic railway switch, that may be operated by the wheels of the passing locomotive, or by means of levers attached to the locomotive or one of the car trucks. The invention consists in a combination of pivoted rails, levers, and locking devices, which cannot be fully explained without engravings.

An improved process and apparatus for sinking piles has been patented by Mr. Henry Case, of Brooklyn, N. Y. The object of this invention is to sink piles for submarine or other foundations without the aid of pile driving machinery, and to secure good bearings for the piles at proper depths.

An improved car brake and starter has been patented by Mr. John L. Cole, of Williamstown, Mass. The improvements relate to apparatus for checking the momentum of railroad cars and storing power to be subsequently used in starting or impelling the car. The apparatus consists, generally, of springs, a cord or chain, a conical spirally-grooved winding drum, and gearing and clutches for connecting the drum with the car wheels or axle, whereby the cord is wound on the drum, the springs compressed and held for use in propelling the car by their expansion. The invention has certain novel features of construction and combination of mechanism by which the propulsion of the car in the proper direction by the springs is obtained and the compression of the springs by the momentum of the car is arrested at a definite point, and the mechanism is automatically thrown out of gear when the momentum is arrested, and also when the springs have expended their force in starting the car. It may also be thrown into and out of gear at any time by the driver.

ARTESIAN WELLS FOR COLORADO.

The Committee on Public Lands has reported favorably the bill introduced by Senator Hill, of Colorado, providing for an appropriation of $50,000 to be used in sinking artesian wells in the arid regions of the Rocky Mountains.

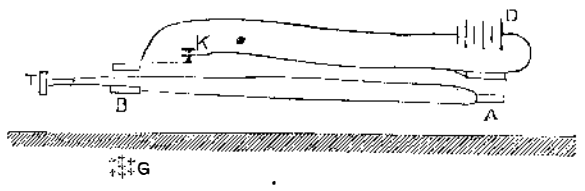
It is estimated that there are in those regions five hundred million acres of government lands, now unsalable because of their aridity, which could be converted into valuable farming lands by irrigation, and that such artificial watering is entirely feasible by means of artesian wells. The government is asked to pay the cost of the experimental proof of this position because it owns the land, and private enterprise cannot be expected to undertake its improvement. It is asserted, however, that having demonstrated the possibility of reclaiming such lands, the government will have no difficulty in selling the land to men who will go on sinking wells at their own cost. Mr. Hill's bill provides for the sinking of five wells, two on the east and three on the west of the Rocky Mountains, the sites to be selected by the Secretary of the Interior.

A New Way of Studying Sounds.

The London *Times* reports that a new and simple way of producing colored rings, which seems capable of some interesting applications, has been recently brought to public notice by M. Guébhard. A saucer filled with not very pure mercury is all the apparatus required. Then clear off with a piece of card or paper the thin pellicle of oxide and dust, breathe on the bright surface, and a magnificent system of colored rings is given by the film of condensed moisture then formed. Instead of the four or five "irises" described by Newton, six or seven can be well made out, and the thickness of the film increasing from the border inwards, the order of hues is reversed. Still better effects can be got by dropping volatile substances (as petroleum oil) on the mercury surface, instead of breathing on it; but the most remarkable results are had with collodion. Diluted with ether, this gives pellicles on the mercury, which may be detached (after their thickness and colors have been regulated at will) and transferred to paper. M. Guébhard has utilized these effects in study of the sounds of the voice. Vowel sounds uttered above the moistened mercury surface produce characteristic ring figures which throw new light on the nature of the vibrations involved. The vibratory state, indeed, for vowel sounds, appears to be often very complex, the figures presenting groups of several ring systems, indicating several centers of percussion.

"Prospecting" Metal Veins by the Induction Balance.

A correspondent of the *Electrician*, referring to the reported invention of a method for detecting and tracing veins and lodes of metals in the earth by means of electricity, says there has been suggested to him the application of the induction balance of Professor Hughes to the purpose. It is well known, he adds, that the balance is extremely sensitive to the neighborhood of metals, and it becomes a question worth settling by experiment whether this sensibility could not be employed as a means of indicating the presence of metalliferous ores underground. The obvious mode of applying the apparatus would be to separate the two induction pans of the balance to such a distance apart that, while one of them was brought under the influence of the concealed metal, the other would be comparatively unaffected. This could be done, perhaps, by elevating the balance vertically on a pole or standard, to be carried about by the prospector, so that one pan was brought near the surface of the ground, while the other was raised above it to a considerable height, say, of ten or twelve feet. On a balance being obtained in a proper locality the search could begin, and the presence of veins under foot might be found to reveal itself by disturbing the balance. A better but more inconvenient plan, from its rendering it necessary to pay out a portable line or wire,



would be to keep one pan of the balance stationary in one place, while the other was being moved about so as to feel for the hidden ores. The latter method is shown in the accompanying sketch, where A is the stationary pan of the balance, and B is the movable pan carried by the prospector; C is a metal lode under the surface, D is the battery, and K is the key in the primary circuit of the balance, and T is the telephone in the secondary circuit.

While moving over the ground the prospector makes and breaks the primary circuit by means of the key, and listens in the telephone for any sound indicating that the equilibrium of the induced currents has been disturbed. Should the balance prove sufficiently sensitive, it can, of course, be used for similar and allied purposes in mining and boring operations, so as to trace the positions and roughly determine the richness of metal veins, ores, and other conducting minerals, such as coal, graphite, etc. The first plan would probably answer best in cases where the metal was at or near the surface, as is the case in "surface diggings."

Job Shops and Slop Shops.

A writer in the Boston *Journal of Commerce* pictures the difference between a well organized job shop and what he terms a slop shop, as follows. The job shop is *sui generis*. While it partakes of the character of those adapted and intended for special productions, it has a character of its own not shared by any other. The various jobs and the frequent make-shifts tend to produce what would seem to the unpractical eye an appearance of disorder, and would convey such an impression, possibly, to the experienced mechanic, who might be unacquainted with the methods and system of that particular shop. But the well arranged job shop has an all-pervading character of order in the seeming disorder, and its workmen waste little time in preparing for emergencies, and are usually ready for any job that comes up.

The slop shop is exactly the reverse in character, and is never just ready for an unexpected job. Its apparent character is its true one. An outsider could just as readily find a missing tool or designate the hiding place of a needed appliance as the proprietor, foreman, or any one of the workmen. The floor is rarely swept; when the debris of work accumulates too much in one spot, it is spread by a few hasty kicks, and all is serene. There are "glory hole corners" under the benches which rarely are overhauled. There are hiding places for spoiled jobs which are inquired for by the vexed foreman, but rarely found. The shafting welcomes the visitor with a beseeching squeak, the repetition of which finds an echo in the chafing of a lathe belt on the cone. Some of the belts show angular gaps across their face, premonitions of sudden partings and telltales of neglect. The workmen are lavish with oil and waste, put new files on cast iron scale, toss a broken tool under the bench, and if they get hold of a decent tool, in decent order, chuck it into their private drawer or locked box. If a drill is wanted for a three-quarters of an inch hole, one sized to thirteen-sixteenths is taken and ground to size. Possibly half an hour after it has been transformed another workman needs it on work for thirteen-sixteenths holes. So the drills can never be kept in sets and sizes, and when account of stock is taken at the end of the year the proprietor wonders what has become of the sets of drills with which he started off so sanguinely and hopefully the preceding January.

This is the general practice in the slop shop. There is no real head to the concern, there are no Mede and Persian rules of order, no sharp, overseeing eye, and no developed and vitalized system. A job that should be drilled under the upright drill is taken to the lathe because the former is in use, and a workman is put to a three hours' job of chipping and filing because another is using the planer. In this shop there is manifested little readiness among the workmen to assist each other, except to help in turning the shop into a "hurrah's nest." If one man knows more than another he will hold on to his knowledge very much as a miser clings to his pennies. The foreman, possibly, gives instruction but grudgingly or with an air of reproof. The slop shop is a good place to leave a job, but it is a poor place from which to get the completed work. The foreman will promise readily enough to-day, but his performance and day of redemption are indefinite.

There are plenty of these slop shops all over the country. It is singular to note that, although the proprietors invariably fail in business, there are about so many all the time; soon as one drops out another is anxious to show how little he knows about the management of a business, and the slop shop is probably a permanent institution.

Hydrocellulose in Photography.

M. Aime Girard has communicated to the Photographic Society of France the following note on the employment of hydrocellulose in preparing photographic pyroxyline: "Whenever cellulose ($C_{12}H_{10}O_{10}$), in any form, is submitted to the action of concentrated acids, it is dissolved, and by taking up two equivalents of water is transformed into glucose ($C_{12}H_{12}O_{12}$). But previous to this saccharification, an intermediate stage may be observed, where only one equivalent of water is taken up, and a new compound is formed to which the formula $C_{12}H_{11}O_{11}$ is attributed. This compound, to which I have given the name of *hydrocellulose*, is not soluble in the acids, and provided that care be taken in the manipulation, it still possesses its original external form; but so soon as it is touched it will be found to have lost all its power of cohesion, and to fall away to an almost impalpable powder. Hydrocellulose possesses a number of chemical properties of its own, but it keeps also some of the properties belonging to ordinary cellulose. Among the latter is its capability of being nitrified by a mixture of nitric and sulphuric acids, and of being by this means transformed into either explosive or soluble pyroxyline. In this way we can prepare either explosive or soluble pyroxyline in the state of a fine powder. The manner of preparing it is precisely similar to that of preparing pyroxyline from cellulose, but in this case the product, when rubbed in a mortar, is at once reduced to an exceedingly fine powder. This powder, dissolved in a mixture of alcohol and ether, gives a collodion whose value to photographers it will be most interesting to ascertain.

"The only difficulty, therefore, is the production of the hydrocellulose. This substance can be obtained from any form of cellulose, but the best for the purpose will be found to be raw cotton in tufts. For effecting the conversion there are three ways: (1) Immersion for several hours in concentrated acids; (2) exposure to the vapors of the hydracids, as hydrochloric or hydrofluoric acid; (3) absorption by a weak acid, and then desiccation. Of these three methods the last-named is undoubtedly the most convenient. Take, then, some fine tufted cotton, and immerse it in a 3 per cent solution of nitric acid; remove it immediately, drain it, and put it in a cloth and wring it well; then pull it out and leave it to dry. If you are pressed for time, you may dry it on a stove at a temperature of 40° to 50°; a few hours will in that case suffice to render the cotton quite friable, and its transformation into hydrocellulose will be complete. But care must be taken not to raise the temperature above the point indicated, or the substance will turn yellow and decompose. When, however, time is no object, let the cotton be well pulled asunder, and then be allowed to dry slowly on a plate in the laboratory or studio at a temperature of from 15° to 20°. By this, the more preferable method, the cotton will, in a few weeks, be converted into hydrocellulose, which, though perfectly friable, will preserve sufficiently its fibrous condition to be easily acted on by the acids that are to nitrify it.

Back Numbers and Volumes.

Subscribers to the SCIENTIFIC AMERICAN will be entered on our books to commence at the date the order is received; but those desiring the back numbers to the commencement of the year will be supplied on their signifying a wish to have them. Last year's volumes may be had in sheets by mail at regular subscription price, namely, $3.20.

THE series of illustrated articles on "American Industries," which was commenced in this journal about one year ago, has proved so acceptable to our readers that it is our purpose to continue the publication of manufacturing establishments until every important industry of the country has been illustrated and described in these columns.