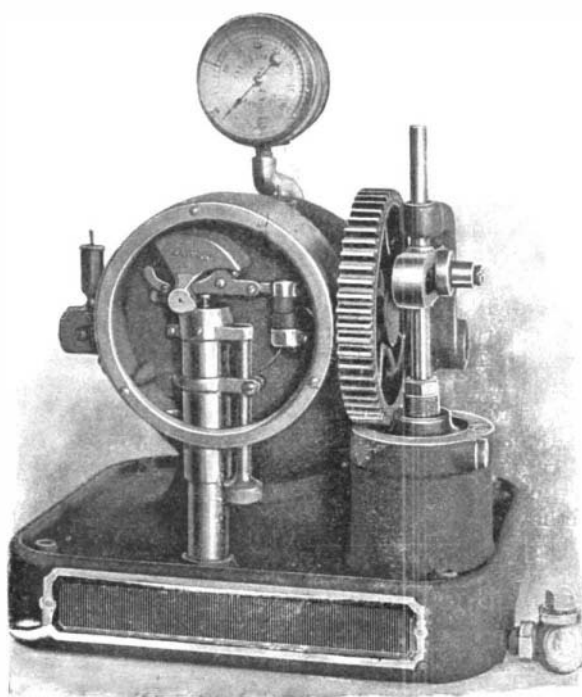


**A SMALL AUTOMATIC ELECTRIC AIR-PUMP.**

A very simple and effective electric air-pump for purposes requiring only small pressures, has recently been introduced by the Auto-Electric Air-Pump Company, of 38 Cortlandt Street, Manhattan, New York city, which pump is noteworthy for the ingenious mechanism employed in automatically breaking the circuit when the pressure becomes excessive.

Air is forced into a supply-tank by means of an air



**ELECTRIC DRIVEN AIR-PUMP FOR LIGHT SERVICE.**

compressing cylinder 3 inches in diameter with a stroke of 3 inches, the piston-rod being provided with a slot which receives a pin projecting from a gear wheel, driven by a pinion on the shaft of the motor. The piston is reciprocated as the gear-wheel is turned. The current used is derived from an ordinary 110-volt electric light circuit. The motor is of one-sixth horse-power and requires slightly less than one ampère.

The automatic regulation device consists of a small branch-pipe connected with the air-supply tank and provided with a spring-pressed piston or plunger, the rod of which is designed to operate a heavy tumbler. In its normal position the tumbler serves to depress a pivoted lever carrying at one end a carbon contact, which, when in engagement with a similar, lower, fixed, carbon contact, completes the circuit and causes the pump to force air into the tank. Should the pressure become excessive, the plunger is forced upward against the tension of its spring; the plunger-rod gradually lifts the tumbler so that it falls back on the other, upturned end of the lever, thereby raising the contact, breaking the circuit, and stopping the pump. When the pressure is reduced, the spring returns the plunger; the tumbler falls back to its original position, thereby depressing the contact-end of the lever, completing the circuit, and starting the pump. A set screw is provided, whereby the tension of the spring can be so regulated that the circuit can be broken when any desired pressure is attained. Once started, the pump operates automatically, without requiring any attention whatever.

The small size of the apparatus—it occupies barely a cubic foot of space—naturally adapts it to a great number of uses. Physicians have very successfully employed it in connection with atomizers. For airbrush artists and photo-engravers it is particularly serviceable; for it gives a continuous pressure without exertion, leaving the hands and feet free. The operation of dentists' instruments, the pumping of ale or beer, the driving of clocks, the inflation of bicycle and automobile tires, and the provision of power for every kind of small motor, are purposes which it admirably serves. The cost of operation is small; for the current used is about equal to that required by a sixteen candle-power incandescent lamp.

THE reclaiming of unhealthy districts in Palestine is being attempted by the planting of immense eucalyptus groves; in one place there are three-quarters of a million trees.

**SHOULDERING CAR FOR LEVELING AND TRIMMING ROADBED.**

A large part of the labor of the section gangs which keep in order the 200,000 miles of track in this country is devoted to the work of leveling and trimming the roadbed and preserving the proper width, level and slope called for by the standard cross section of the road. Ordinarily this work is done by hand labor, and it requires a considerable amount of work and an accurate eye to preserve that evenness of cross section and level which are necessary if the track is to have a thoroughly finished and first-class appearance.

By the courtesy of Mr. Frank Barr, the assistant general manager of the Boston and Maine Railroad, we are enabled to illustrate a machine which is designed for performing mechanically and cheaply the work which hitherto has been done by hand.

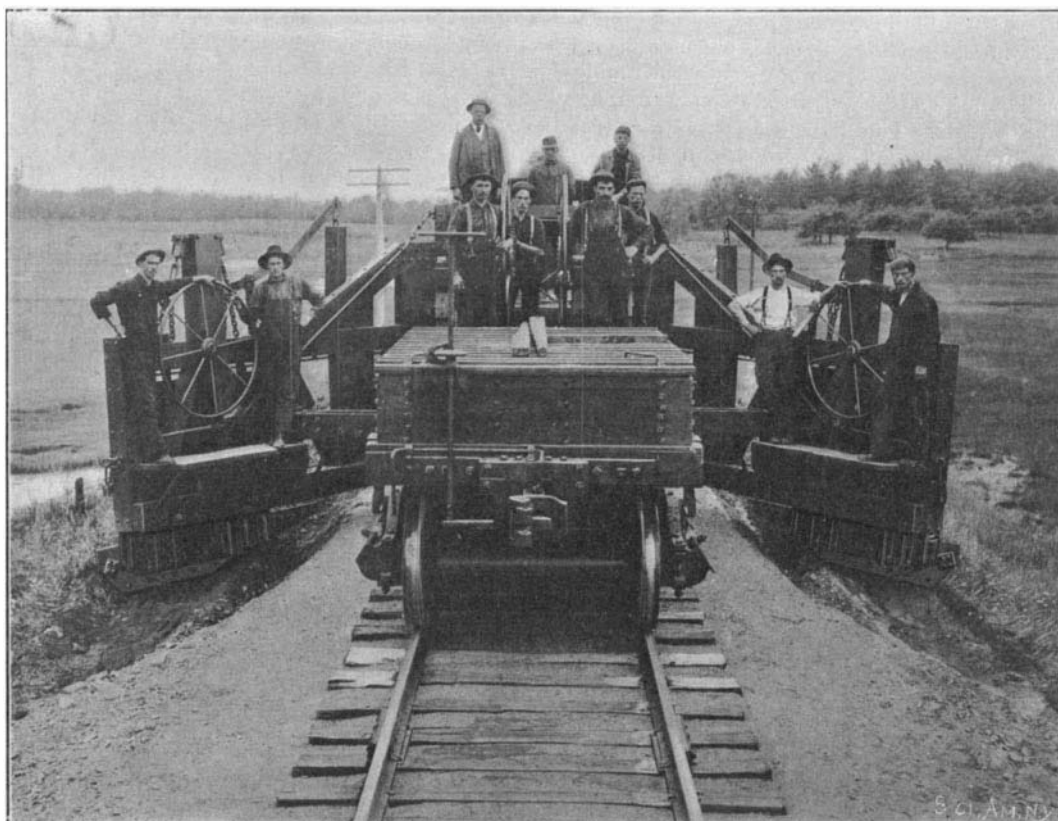
It is known as a roadbed shouldering and leveling car. It was built at the Concord shops of the Boston and Maine Railroad, early last season, and has now been in very successful operation for over twelve months on the various lines of the company.

The machine consists of a specially constructed flat car, of 70,000 pounds capacity, to the framing of which there are attached, one on either side, two massive extensible wings, which may be folded back against the sides of the car, or thrown out to give a maximum reach of 12 feet beyond the outside of the rail. The wings, which are of very strong timber construction, carry a vertically adjustable cutter, with a steel knife attached at its lower edge. In one type of car, the cutter is raised and lowered by means of a 10-inch air cylinder, which is bolted to the framing of the wings; but in the car shown in our illustration, the same duty is performed by means of a rack and pinion, the rack being secured to the cutter and the shaft which carries the pinion being carried on the wing. In the former case, one man is sufficient to raise and lower both wings, while with the rack and pinion, two men are necessary for each wing.

The operation of the car is very simple and is well illustrated in our engraving. The cutters are lowered to the proper level, with their cutting edges adjusted to the desired pitch of the embankment, and, as the machine is drawn forward by the locomotive, it forms a perfectly regular and even slope or shoulder on each side of the roadbed. The car is used for a variety of purposes, among which may be mentioned the following:

Leveling the sub-grade for a parallel track; widening a fill, or grading for additional tracks, in which work, by extending the wings, gravel or other material can be leveled off to a width of 12 feet or more from the track, and to any desired depth not exceeding 18 inches. The car is also used for weeding and cutting ditches on either side of the roadbed. In doing its special work of shouldering, it is particularly effective, judged from the standpoint of appearance, as it leaves the shoulder with lines exactly parallel to the rail, whether it is working on a straight or on a curved track. As a result, not only is a uniform cross section obtained but the drainage of the track is greatly improved, and a large amount of "shimming" is avoided during the winter months.

As compared with hand labor, the machine has proved to be extremely economical, and the saving in cost of labor being estimated at 85 per cent. As an instance it may be mentioned that a 30-mile section of the Boston and Maine Railroad was trimmed with the car in four days; whereas the same work, if done in

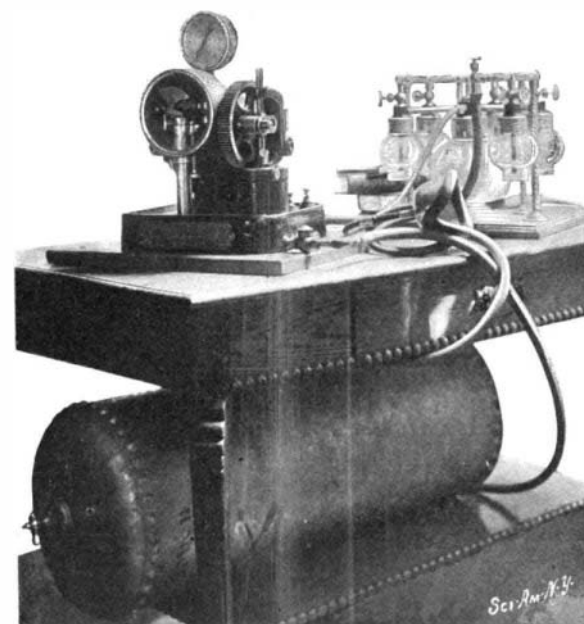


**SHOULDERING CAR FOR TRIMMING ROADBED.**

the same time, would have required the employment of 375 men. As it was, the working force required, in addition to the locomotive, consisted of a train crew, a foreman, and four men.

**Alcohol Obtained from Wood Electrolytically.**

A new process has been devised in France by Magnier and Brangier for obtaining alcohol from wood by an electrolytic method. It is not, however, the methylic or wood alcohol which is obtained, but ethyl alcohol. The idea of the process is to transfer the cellulose of the wood into dextrine, glucose, and finally to



**PUMP ARRANGED FOR PHYSICIANS' USE.**

alcohol; this is accomplished by electrolyzing under pressure the wood fiber, this having previously undergone a suitable treatment. The wood is reduced to small fragments and is digested for two hours at the boiling point in a vat containing milk of lime, to which a certain proportion of chloride of lime is added; toward the end of the operation sulphuric acid is added in sufficient quantity to give a slightly acid reaction. The matter is transferred to another tank and heated to the boiling point with sulphuric and phosphoric acids in the proportion of two per cent; after several minutes, when the attack is considered sufficient, the mixture is introduced into a closed vessel and treated at a temperature of 150° to 160° C. The transformation of the cellulose into dextrine and finally to glucose takes place with great or less rapidity according to the temperature of the operation. The matter is then submitted to the action of an electric current, which renders the saccharine matters susceptible of fermentation under the action of appropriate ferments; it is then placed in fermenting vats, and a certain proportion of albuminoid substances added, and after the process is completed, the resulting alcohol is obtained by distillation. This method of operation is said to give very successful results, and different fibers, such as straw or vegetable stalks may be thus treated.

**The Dunes of Gascony.**

The dunes of Gascony are most remarkable. They rise, in one case, as high as 290 feet and very frequently rise to 130 feet over a belt of several miles wide and 150 miles long. Near the sea the ridges lie north and south, parallel with the shore. Further inland they trend east and west, parallel to the prevailing winds. Fields and forests were buried and the villages were overwhelmed by the advancing sand; mouths of streams were blocked and lagoons were pushed inland, invading and drowning fields and villages. Now, says Science, after many years of "experimental effort and nearly a century of systematic work, the advancing dunes have been arrested. A half artificial dune or dike runs along the beach with a very gentle slope to the sea. Here the wear of the winter storms must be repaired during the succeeding summer. Next follows a protection zone, 1,000 to 5,000 feet wide, covered with stunted firs and bushes where the first strength of the sea wind is expected. Then comes the great artificial forest of firs and oaks, under whose cover the invasion of the dune has entirely ceased.