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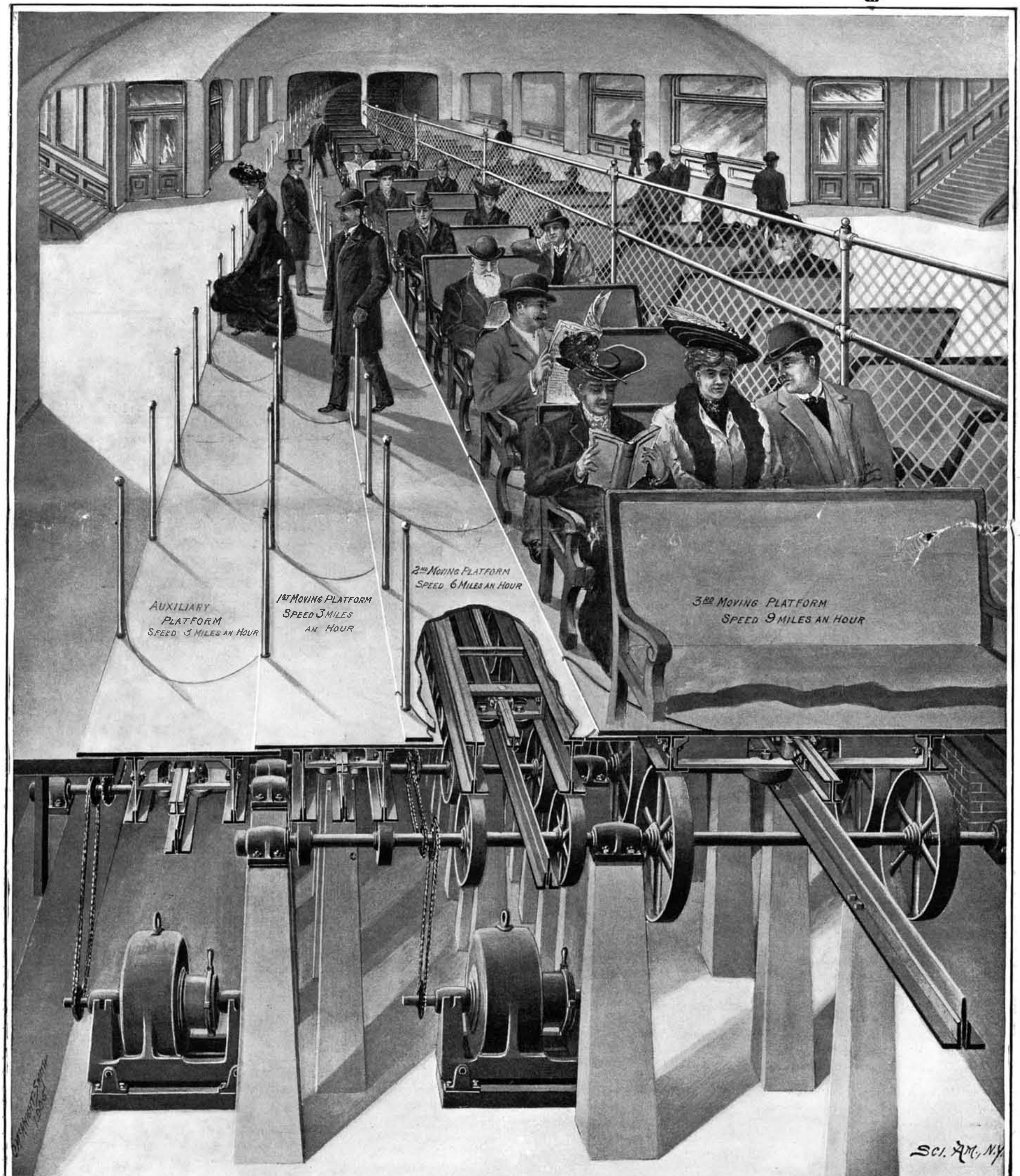

Speed of Seat Platform, Nine Miles per Hour. Capacity, 48,000 Seated Passengers per Hour.

MOVING PLATFORM SUBWAY FOR NEW YORK CITY.—[See page 382.]

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NEW YORK, SATURDAY, MAY 13, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE INTERNATIONAL RAILWAY CONGRESS.

Fittingly enough, the seventh international railway congress convenes this year at Washington—fittingly because, whatever may be the part played in other countries by the railroad, and far-reaching as its influence has been within their boundaries, it is to the United States we must turn for the more striking evidences of the economic revolution that perfected methods of transportation have wrought. Apart from the mere magnitude of our railway system, we may justly claim that the improvements we have made in permanent way, motive power, and rolling stock have been more marked than those of European roads.

The congress is not to be slightingly regarded as a convention of business men. It is a technical body, whose object it is to promote the engineering progress of railways as well as their economic advancement. Papers of a scientific character are to be read, and the widely-divergent opinions of expert traffic managers, engineers, and car-builders from every country in the world will be heard. In all, four hundred and fifty delegates named by railways of forty-eight countries have crossed the Atlantic and Pacific Oceans to convene at Washington.

Americans will undoubtedly learn much from the discussions that must inevitably arise in such a gathering. The problems faced and solved by the railway men of this country (problems that were well presented in the address of Mr. Stuyvesant Fish before the Congress) are vastly different from those that have confronted Europeans. Here we have been engaged chiefly in providing means of transportation where none previously existed, in threading fertile but unpeopled expanses remote from the sea. In Europe, on the other hand, the railway has been employed, not for the purpose of opening uninhabited regions, but for the more easily attained end of supplementing existing highways and waterways, and of providing a more rapid and efficient means of communication between crowded cities. Perhaps the difference will be more apparent when it is said that European cities were founded centuries ago; that in 1830 the greater part of this country (nearly the entire portion lying westward of the Alleghany Mountains) was an untraveled wilderness; and that seventy years ago there was but one city in America with a population of 100,000, and only twenty-two others with a population of 10,000. On the Atlantic seaboard conditions are fast approaching those of the more densely inhabited European countries. We have now thirty-nine cities of 100,000 inhabitants and over, among them three with more than a million each, besides some four hundred towns with populations of 10,000 to 100,000. Because of this tremendous upbuilding of our communities, we must learn the methods which the European railway builder and manager have found most adequate in dealing with the pressing problem of a rapidly-increasing population. Although the capitalization of our railways is now $63,186 per mile (still far below that of $277,475 of the railways of Great Britain) an increase must certainly be expected, necessitated largely by the laying of additional tracks and the elevation of roads in densely-packed towns. In coping with difficulties of this kind, we must look to Europe for help. And to Europe likewise must we turn for enlightenment on the problem of passenger and freight traffic. Despite the fact that in the middle and western States from seventy to eighty per cent of the revenues have been earned by the carriage of freight, the Atlantic States, according to Mr. Fish, have actually reached the British condition in which passenger preponderates over freight traffic. Only fifty-four per cent of the receipts in the States in question are derived from the carriage of freight.

The foreign delegates will learn how it is that American railways have created both traffic and production, and how the paradoxical situation has arisen which renders it possible for American roads, despite the great cost of labor, to carry freight more cheaply than any railways in the world. Our methods, startlingly different from those followed across the sea, and the products of American inventive genius, untrammeled by years of custom, will no doubt prove revelations to our foreign visitors. If the reports to be submitted at this session, and the discussion of them, are to be marked by the thoroughness of treatment which we have reason to expect of a scientific body, both Americans and Europeans will undoubtedly find that this seventh convocation has been productive of more enlightenment than any of its predecessors.

THE ECONOMICS OF THE MOVING PLATFORM.

We have discussed elsewhere in this issue the motives which have led the Rapid Transit Commission to reserve Thirty-fourth Street for a subway operated with electrical trains, and suggest to the promoters of the moving platform the use of some other less important crosstown thoroughfare. This action of the commission is not to be taken as a reflection upon the practical or commercial value of the moving platform proposition; and, indeed, a study of the mechanical features, as revealed in the engraving which we publish in this issue, and the fact that this system has the indorsement and backing of some of the best-known railroad and electrical experts in this country, afford a strong presumption that wherever the platform is installed it will be so successful as to become an important element in the future transportation facilities of large and crowded cities.

The most striking testimony in favor of the moving platform is that given last November by Mr. Stillwell, the electrical expert of the Interurban Railroad Company, in which he showed the great economic advantage possessed by the moving platform over the electric-car system for city transportation. As the author of the following figures is the electrical engineer for both systems his calculations may be taken as absolutely correct and free from all partiality. It seems then, in the first place, that the moving platform has a great advantage in respect of the dead weight carried per passenger; for whereas in the local Subway service 1,241 pounds of dead weight must be carried for each seat provided, and in the Manhattan six-car local service 790 pounds per seat, in the case of the moving platform the dead weight will amount to only 437 pounds per seat, or one-third of what it is in the case of the Subway. There is, moreover, a large saving of energy resulting from the fact that the moving platform does not stop at stations. In the local service of the Subway over two-thirds of the energy supplied to the cars is dissipated in braking. In other words, if the cars moved at uniform speed and never stopped at stations, it would require only one-third of the power plant to keep the whole system in operation. A comparison of the power required to move the trains and to move the platform shows that the Manhattan Elevated cars require at the power house 30 kilowatts per car, and Subway cars require, at equal speed, about 50 kilowatts per car. In the case of the Subway the energy required is practically 1 kilowatt per seated passenger; that is to say, 10 kilowatts at the power house are required to transport ten seated passengers in the Subway. Estimating the rolling friction of the platform at about 6 pounds per ton, Mr. Stillwell estimates that 10 kilowatts, instead of moving, as in the case of the Subway, ten passengers, would move 260 passengers if they were seated on the moving platform. This great difference of 1 to 26 is due to the small dead load, to the absence of stopping, and to the fact that the rolling friction per ton is very much less.

It has been charged against the moving platform that the speed, 9 miles per hour, is low; but it was shown by Mr. Stillwell and indorsed by Mr. Stuyvesant Fish, that, because of the frequent stops, say on the local elevated or Subway trains, and of the great delay at stations in rush hours due to insufficient means of ingress and egress to and from the cars, the higher speed of the elevated and Subway trains between stops is brought down, if the stops be included, to an average speed of 9.67 miles per hour, which is only a little over one-half mile per hour greater than that of the platform which maintains its 9 miles an hour continuously.

Finally, the capacity of the moving platform is vastly greater than even that of a four-track system when running under its shortest headway. The capacity of the four-track section of the New York Subway, using eight-car express trains at intervals of 2 minutes, and five-car local trains at intervals of 1 minute, is 28,080 seated passengers an hour in one direction; whereas the capacity of the moving platform in one direction is 47,520 seated passengers per hour, an increase of nearly seventy per cent. In the presence of such facts as these, facts of whose reliability, considering the source from which they come, there can be no doubt whatever, it is safe to predict that the moving platform will become an important element in the future rapid transit system of this and other large cities; and it is to be hoped that if the decision of the Rapid Transit Commission against the use of Thirty-fourth Street is final, the sponsors of the moving platform will make use of the opportunity presented for the use of Twenty-third Street or some other important crosstown thoroughfare.

THE STRENGTH OF TIMBER TREATED WITH PRESERVATIVES.

With the increasing use of timber, preserved in one way or another against decay and fire, it is important to determine the effect which the preserving process has upon the strength of the preserved timber. Many engineers believe that creosoted timber is more brittle and less capable of withstanding strains than the same timber before being treated with creosote. This is particularly true with bridge timbers and piling.

Actual tests are necessary to determine what relationship exists between the preservative process and the strength of the timber. Most of the tests hitherto made with preserved timber were made by comparing results of tests on treated sticks with results on untreated sticks. In many instances these turned out in favor of the untreated timber. The reason why such tests are unfair to the preservative is that in the process of preservation two factors enter: (1) The actual process of impregnation with a preserving substance, and (2) the preliminary processes of steam seasoning, in the majority of treating plants in the United States. A piece of timber subsequently treated with creosote may be steamed to such an extent that the timber becomes exceedingly brittle. This, obviously, will be the fault of the steaming and not of the creosote.

Timber preservation divides itself broadly into three stages: First, the preliminary preparation; second, the actual preservative process; and, third, the treatment of timber following preservation. The final strength of the timber may be influenced materially by each of the stages.

The Bureau of Forestry erected an extensive plant on the grounds of the St. Louis Exposition for carrying on a series of investigations of the methods for preserving timber, and of the influence various preservative processes have upon the strength of the timber. These investigations have been organized and outlined by Drs. Von Schrenk and Hatt of the Bureau of Forestry.

This general plan was pursued during the last few months at the timber treating and testing station at St. Louis in accordance with the following outline:

(1) To determine the effect of preliminary processes, such as steaming, on the mechanical properties of the timber.

(2) To determine the effect of preservatives on the strength of timber, eliminating the effect of the preliminary processes.

In order to determine the effect of these factors, the programme was divided into two parts—part 1, the effect of the preliminary process, and part 2, the effect of preservatives.

The effects of the preliminary process were determined only on loblolly pine. Both green and seasoned timber was used in determining the effect of the preservatives. The preservative fluids investigated included only creosote and zinc chlorid.

In making comparative strength tests of treated and untreated timbers, it is necessary to eliminate as far as possible the variations due to the great differences in quality of individual pieces of wood. This was accomplished in this case by using 11-foot timbers cut at the same time from one forest site. In testing the influence of preliminary processes of seasoning, a 3-foot section was cut from one end of each timber and sawed up into test pieces, which furnished a basis of comparison between (1) the results of tests on these "control" pieces, and (2) the results on test pieces taken from the remaining 8-foot section after the latter had been subjected to the various preliminary seasoning processes in the treating cylinder.

In testing the effect of preservatives themselves the entire 11-foot timber was subjected to the preliminary seasoning processes, after which a 3-foot section was cut from the end of each timber. The 3-foot section thus having been subjected to the preliminary seasoning processes formed a basis of comparison with the remaining 8-foot section, which was treated with the preservatives. In this way the separate effects of the preliminary processes and the effects of the preservatives could be isolated and determined.

Because of an apprehension that defects of brittleness of treated timbers might not be evidenced by the ordinary tests under slowly applied loads, provision was made for both static tests and impact tests. The test pieces were subjected to crossbending strain, compression along the grain under both static and impact conditions, and under shearing parallel to the grain and compression at right angles to the grain under static conditions. The data taken include the moisture conditions, specific gravity, and rate of growth. During the treating operations, records were kept of the temperature to which the timbers were subjected at all stages, the amount of water lost or gained, and of the amount of preservatives absorbed, as indicated by gross weight and subsequent chemical analyses of the test pieces.

Ordinarily the strength tests were made immediately after treatment in the cylinder. In order, however, to determine what weakness might be introduced by changes in the physical condition of the preservatives in the wood through lapse of time, a complete series has been set aside for subsequent operations. An additional set of test pieces has been loaded with different percentages of the strength, as exhibited under the ordinary tests, and this load allowed to act for long periods of time, the deflections being measured from day to day.

While this programme is not sufficiently advanced to allow the drawing of final conclusions, yet the preliminary results are fairly indicative of what may be expected. It is found that the steaming process weakens the resistance of the wood fiber to both static and impact loadings. It may be stated that this diminution of strength is very nearly in direct proportion to the length of time that any given steam pressure is applied. The diminution of strength was found to be 25 per cent after a pressure of 20 pounds was applied for ten hours to green loblolly pine, and 10 per cent when a pressure of 20 pounds was applied for four hours. This diminution of strength increased very rapidly when the pressure rose above 20 pounds, and amounted to about 25 per cent when a pressure of 50 pounds was applied for four hours.

It will be easily seen that when the conditions of time and pressure are made very severe, the conditions prevailing in a pulp mill industry will be approximated. Evidently it is well to avoid when possible the use of these preliminary steaming operations in the wood-preserving industry.

With relation to the effect of preservatives themselves, the latter is distinct from the preliminary process. It may be said that the treatment with zinc chlorid does not seem to further reduce the strength of timber beyond the effect of the steaming process. This might have been expected when it is considered that the strength of the zinc chlorid solution ordinarily used does not exceed 2½ per cent. The strength of timber that has been treated with the 2½ per cent solution of zinc chlorid after having been steamed four hours at 20 pounds pressure was the same as that of timber which had been steamed without the subsequent application of zinc chlorid. The same statement may be made of timber treated with an 8½ per cent solution of zinc chlorid. It may be that subsequently the crystallization of the zinc chlorid will weaken the wood fiber. This remains to be determined.

The effect of the creosote appears to be the same as that of an equal amount of water in weakening the fiber. That is to say, the strength of creosoted timber is that of green timber. The difference is that while green timber gains strength upon seasoning, the creosote oil remains in the wood, and it appears from analysis of a pile 35 years old, that the oil remains in a liquid condition. Consequently, comparison between seasoned timber and creosoted timber will always result to the disadvantage of the latter as far as its strength is concerned. In the case of creosoted wood, it also remains to determine what changes in the wood fiber take place through lapse of time in the presence of creosote oil.

It is expected that a bulletin will be issued upon the results of these investigations when the tests are completed. This bulletin will also contain the results of the investigations to determine the best methods of preserving wood so that the maximum impregnation may be obtained with the least expenditure of oil per cubic foot of timber.

A VISIT TO THE INTERIOR OF THE CRATER OF MONT PELÉ AND A PARTIAL ASCENT OF THE NEW "DOME."

As far as is known to Mr. E. O. Hovey, the Abbé J. Yvon (of Martinique) and Franz Beaufrand, manager of the Habitation Chalvet, are the first persons to have made a descent into the crater of Mont Pelé since the present series of eruptions began in May, 1902, and to have made a complete circuit of the "Dome" of the mountain. Their visit was made on October 24, 1904, and is described at length under the caption "Dans le Cratère du Mont Pelé" in La Martinique for November 23, 1904, and we can do no better perhaps than to publish Mr. Hovey's free translation of the Abbé's account of the trip.

"The day was perfectly calm, and we were at the summit of the mountain about two o'clock in the afternoon, accompanied by the faithful Latour, the domestic of the presbyter of Basse Pointe, who acted as our porter. The summit of the mountain was covered by a rather thick cloud, but this cleared away about three o'clock and we prepared at once for the descent into the crater.

"We directed our steps toward Morne Lacroix, and from there followed the lip of the crater toward the north and west, trying to find a place where the wall was neither too high nor too difficult, because we had brought with us a rope only 12 to 15 meters long. I was expecting to go almost as far as the talus of blocks of the Rivière Blanche, but at about 200 meters north of Morne Lacroix my companion, much more intrepid than I, stepped on the edge of the crater, examined the ground, and said with admirable assurance, 'Here is where we must go down.' Without giving me time to offer the least objection, he put the knotted end of the rope in the hands of Latour and myself, threw the rest of the rope into the crater, and began to descend.

"When he disappeared below the brink, a dreadful uncertainty came over me; who knows whether our little rope of '*maho*' will be strong enough, and then, after the first 12 or 15 meters of depth, there remains another 50 meters to descend, and from above that appeared almost impossible. I was in all sorts of doubts, when the cord vibrated vigorously. What had happened? An accident, perhaps! Happily, nothing had happened. Franz had simply shaken the cord and continued to descend, scrambling along the wall.

" 'You can come,' he cried to me. 'It is very easy.' I must confess that I was not entirely convinced. Still it was my turn; it would not do to hesitate, though a complication had arisen. At the top of the crater, there would remain Latour alone to support me. Would he be strong enough for the task? As a measure of precaution, I made him lie down and stick his feet into two holes which we had dug in the ground, so that he might anchor himself and hold onto the rope to advantage. It was a good idea, and Latour did his part well.

"We were not, however, at the bottom of the crater, and there was opportunity for performing gymnastics. At first, it was impossible to stand erect. It was necessary to sit upon the rocks projecting from the wall, and climb from one to another by the use of both hands and feet. This was hard work, and one left on the rocks the skin of his hands, the bottom of his trousers, and the leather of his shoes. At last, after a quarter of hour of this exercise, we arrived at the bottom of the valley at the base of the Dome, which fills completely the avenue of communication with the interior of the earth.

"It is an error to suppose that there exists, in the bottom of the crater of Mont Pelé, a hole from which lava and gases have come out. At present, there is there a tremendous cork of andesite which is called 'The Dome,' and which must have as its dimensions a diameter of 800 meters at its base and an altitude of from 350 to 400 meters. On all sides of the dome there are fumaroles, some of which (especially toward the north) throw out a reddish smoke, others (on the south and southeast sides of the dome) discharge whitish vapors, and still others, along the bottom of the crater near the base of Morne Lacroix in particular, are surrounded with a carpet of sulphur covering the earth over a surface of several square meters. The temperature of the last-named fumaroles must be relatively low, as sulphur melts at 110 deg. C. to 120 deg. C.

"We went to one of these fumaroles at about 50 meters from the base of Morne Lacroix, and there we noticed several rocks covered with little crystals of sulphur and likewise a deposit 5 to 15 millimeters thick of a kind of salt which had a taste resembling potash. At this fumarole the ground was not excessively hot, about 65 deg. to 70 deg. C., but it was very wet, closely resembling the heavy sands and muds which one encounters at the seashore. The sulphur emanations produce considerable discomfort in breathing, but they are incapable of asphyxiating a person in a short time. In the smoke itself, one can breathe three or four times without being obliged to leave. Still, we did not stay long at this spot, as it is extremely dangerous to remain there on account of the avalanches from the dome. These avalanches no longer occur only on the side of the Rivière Blanche; they are more numerous on the east side, and tend to fill the crater near Morne Lacroix. At present the avalanches are very frequent, and probably not two minutes passes without one occurring at some point or other on the side toward Morne Lacroix.

"When these avalanches are large, they cause in their descent from the dome small clouds of very fine white dust, which can easily be confounded at a distance with smoke. This dust is carried away by the wind, and deposited upon different parts of the mountain. During the night from October 20 to 21 [1904] when one of the two great teeth which surmounted the dome was destroyed, dust fell as far away as the hamlet of Ajoupa-Bouillon.

"But let us return to our excursion. We were 50 meters from the base of Morne Lacroix, near the sulphur fumarole, and were just quitting it, when a rather thick cloud invaded the crater, and prevented our seeing more than 15 meters. We could no longer perceive the courses of the avalanches. It was very disquieting, and each moment we thought that they were coming upon us. Latour, perched above upon the rim of the crater itself, was extremely anxious for several minutes. The cloud concealed us from his sight, the avalanches seemed very strong, and he questioned whether we were not already killed. He began to call to us at the top of his voice, and we hallooed in response, demanding of him what he wanted. The reply came that 'the evil spirits of the mountain were abroad, and that we ought to come out of the crater with all speed.' It was simply an exhortation for prudence, and Latour was right. The avalanches becoming more and more frequent and nearer and nearer, it was indeed wise to leave the spot where we were. Even when the avalanches seemed to take a direction far enough away from us, we were in fear because the immense blocks which descended from the summit sometimes struck and broke off in their course other blocks which were already hardened and seemed secure. Furthermore, there were on all sides discharges of stones like the explosions of shells, accompanied with rather troublesome clouds of hot dust.

"On our way back to our point of descent, we discovered at about 150 meters from the base of Morne Lacroix, toward the north, a fumarole the temperature of which attained not less than 150 deg. C. at the orifice. At two meters above the ground one could not bear the hand for a moment in the vapors.

"We vainly tried to climb the lip of the crater at the spot where we had descended. The rope of *maho* was much too slender, and the good Latour was by no means strong enough to support alone the jerks of the ascent. It was necessary then to go as far as the talus of fragments of the Rivière Blanche, to find a place to get out. The walk was not agreeable. In fact, the nearer one came to this point, the larger were the blocks which had been thrown down by the avalanches. Advance could be made only by leaping from one rock to another, and the rocks had broken edges as sharp as a cutlass, so that it would have been easy to break an arm or a leg, if one were awkward enough to lose his footing.

"We were especially impressed with the peculiar aspect of certain of these blocks. On one side they presented a highly-polished surface which reminded one of the former great 'Spine,' which surmounted the crater during part of a year and which was called 'The Cone.' Between these blocks, in the very bottom of the crater and at the point of junction of the dome with the crater wall, we found a species of moss growing, a fact which indicated that no hot cloud had passed over that particular spot for a long time.

"At last we were at the famous talus of fragments, a little above and at the north of the rocky cliff which is called the Petit Bonhomme. It is a spectacular and at the same time grand and terrible scene that this immense, whitish slope presents, beginning at the summit of the dome and extending to the sea. The slope toward the east [west?] is at first extremely rapid, then diminishes gradually as one approaches the site of St. Pierre. If my eyes did not deceive me, the dome has from this spot nearly 500 meters of altitude and the same diameter of base.

"Needless to say, we did not prolong our stay unnecessarily beside this famous talus of fragments. For my part, I recalled that all the destructive clouds of 1902 and 1903 had issued from this spot, and at the thought my blood almost ran cold. Accordingly, I begged my comrade to hasten and to climb with me the seven or eight meters which it was necessary to surmount to attain the rim of the crater. In a few seconds this was done, and I was expecting to welcome at last the termination of my adventures, when looking toward the side opposite to the crater, I saw that we were obliged to walk along a narrow ridge, balancing ourselves between two precipices, the crater on one side and the abysses of Prêcheur on the other.

"I assure you that I was almost discouraged, and I had for the moment the idea of retreating and descending by the bed of the Rivière Blanche and of sleeping at Carbet. Fortunately, my 'mentor' was present. With unequaled audacity and agility, he ventured upon the dangerous ridge and invited me to follow. Thus was I obliged, through pride, to pass where he had passed, and I followed him.

"For about 100 meters it was death or balancing at every step, and we performed feats of agility, of strength, and of daring and prodigies of skill that I shall never forget. Arrived at the plateau on the summit of the mountain, we cast a last look over the route which we had traversed. A great sigh of relief escaped us, and we rendered thanks to God for having been able to accomplish without accident an excursion which might well have cost our lives.

"This tale may perhaps pass for romance in the eyes of some skeptics. As proof of its truth, we have planted a flag at the bottom of the crater, at about 50 meters north from the base of Morne Lacroix. We have likewise brought here with us some rocks covered with sulphur and other salts which we do not recognize, stones which we found within the crater, and finally we have a photograph taken in the bottom of the crater at the north of the dome."

A NEW TYPE OF COW-MILKING MACHINE.

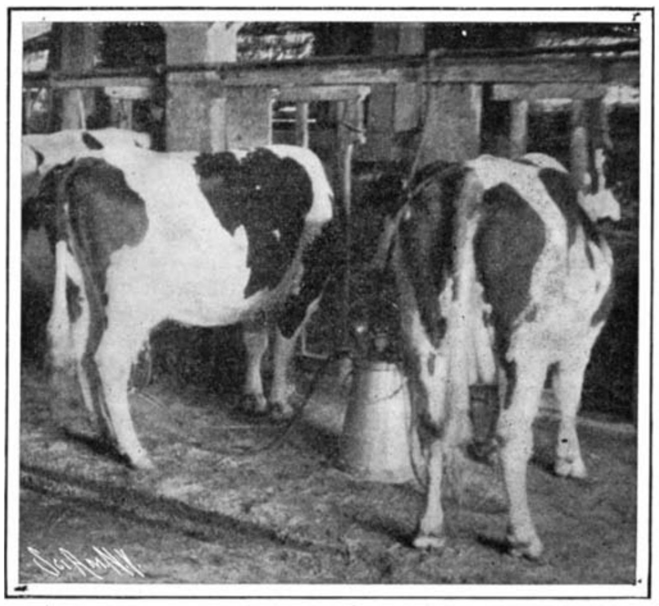
To construct the perfect milking machine has been the ambition of many inventors. In the records of the Patent Office at Washington may be found hundreds of the attempts to solve the problem. These are the results of patient thought and labor by men in nearly all the walks of life, but principally by farmers, dairymen, engineers, and scientists. Many of these inventions show great ingenuity and some are fairly practical notwithstanding the more or less slight defects that they exhibit.

One of the great advantages of the milking machine is that it supplies an exceedingly important but missing link in the chain of the sanitary transmission of milk from the cow to the consumer. Unless the most rigorous conditions of cleanliness prevail, hand-milking is a danger point in even the best of modern dairying processes. In using the mechanical milker, the milk passes directly from the cow into a closed receptacle, and the danger of the entrance of bacteria into it from the hands or clothing of the operator is, of course, entirely obviated. It is self-evident that in hand-milking the danger that the milk may become infected by disease germs from the person of the milker, is ever present. And, should the person in question be a sufferer from tuberculosis or some other infectious disease, the danger is enormously aggravated. Besides adding this sanitary safeguard, the successful milking machine must fulfill two further conditions—it must decrease the time necessary entirely to extract the milk, and it must make the operation less troublesome to the animal.

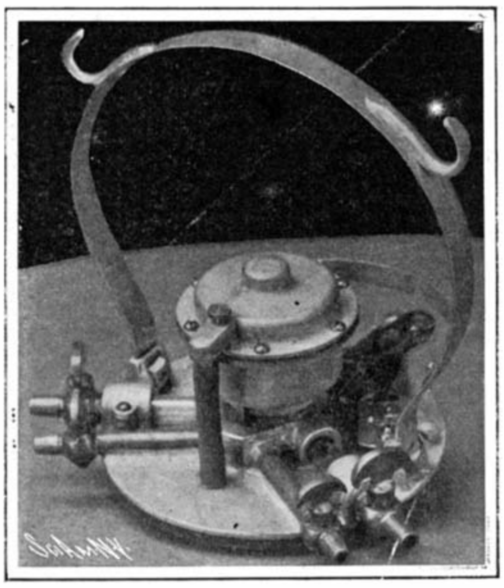
One of the latest of these machines has been invented by Loomis Burrell, of Little Falls, N. Y. It is claimed that in his invention, Mr. Burrell has succeeded in designing a machine that fulfills the conditions described above, and one that has overcome the defects that are found in nearly all of the machines hitherto constructed. Reputable investigators fully substantiate this statement. The following is a brief description of the operation of the machine. The illustrations show the method of applying it.

When suction is applied to the milk pail or vessel, a piston-valve moves slowly up and down in its cylinder and produces pulsations in the milk and air tubes connected therewith. These pulsations take place in such a manner that when the suction is applied to the milk-pipes and through the same to the internal compartments or spaces of the flexible linings of the teat-cups, the external air is admitted to the air-pipes and through the same to the external compartments of the teat-cups outside of the linings, thereby applying the suction to the teats within the linings and at the same time applying external air-pressure to the outer sides of the linings. In this manner the teats are squeezed at the same time that the suction is applied to them. When the suction is cut off from the milk-pipes and the internal space of the cup-linings, the suction is applied to the air-pipes and the outer sides of the cup-linings, and thus the linings are drawn away from the teats against the shells of the cups, and the teats are allowed to hang nearly free in them. The vacuum in the linings is relieved quickly when the suction is cut off by the air entering the milk-pipes through the connector. In this manner pulsations are produced simultaneously inside and outside of the cup-linings, the operation alternating in such a manner that when the suction is applied to the interior of the lining to draw the milk from the teats, the external air is admitted to the exterior of the lining to squeeze the teats; and when the suction is applied to the exterior of the linings to draw the latter away from the teats, the external air is admitted to the interior of the linings to break the vacuum therein and quickly relieve the teats from the suction. The linings are in this manner positively moved both inwardly and outwardly, and sharp and effective pulsations are produced. When the suction has been relieved on the milk-pipes and the lining has been drawn away from the teat, the cup nevertheless stays on the teat, partly because a slight vacuum remains in the interior space of the lining and partly because the flexible mouthpiece of the cup holds the latter on the teat after the cup has once been drawn up to place thereon.

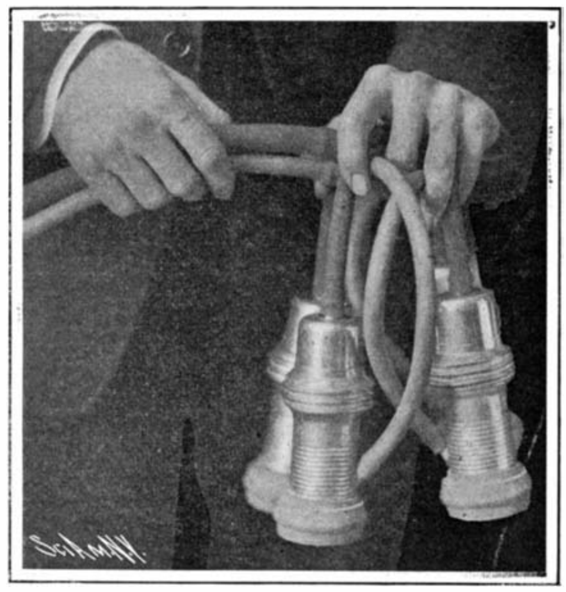
The reciprocating movement of the piston valve is effected by a reversing-valve and an exhaust chamber and diaphragm. The milk-pipes are partly of glass, to show whether the flow of milk is constant, and enable the operator to control the working of the machine.



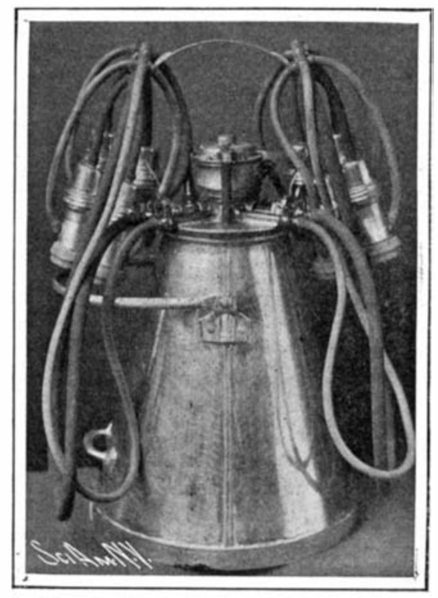
The New Milking-Machine in Use.



The Pulsator and Its Connections.

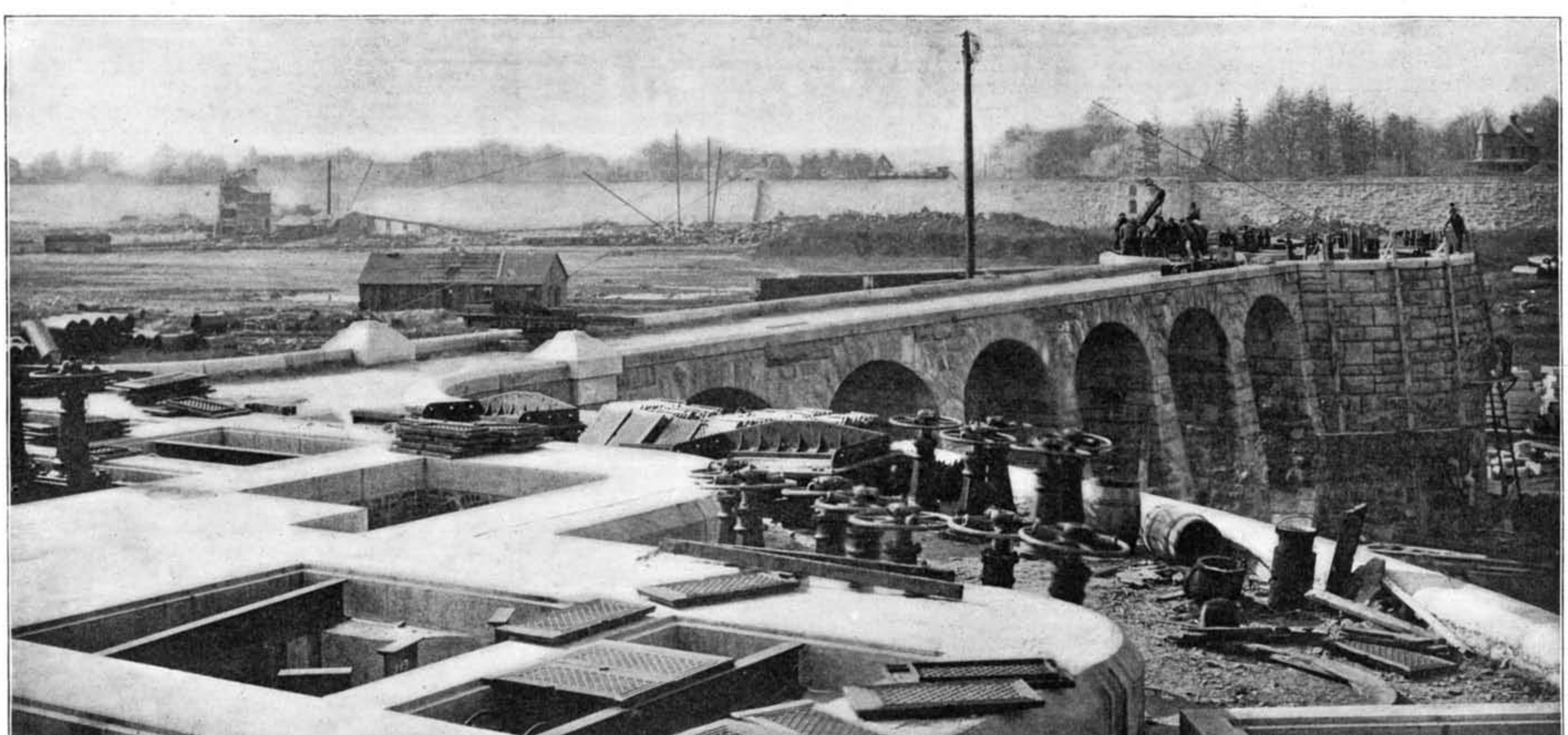


The Cups, and Milk and Air Pipes.



The Entire Machine.

A NEW MILKING MACHINE.



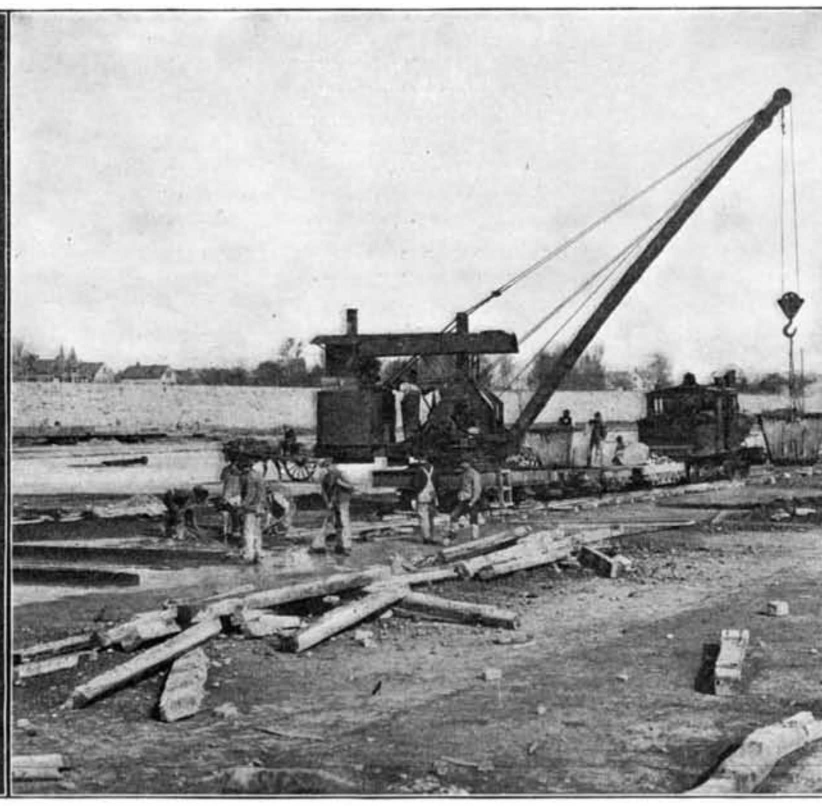
View of the New Croton Reservoir at Jerome Park, Looking from Gatehouse No. 5 Toward Westerly Wall.

COMPLETING JEROME PARK RESERVOIR.

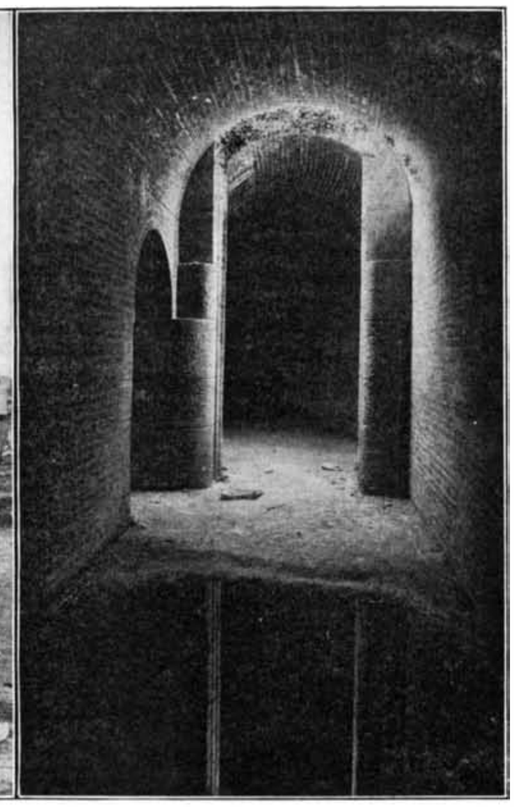
COMPLETING THE JEROME PARK RESERVOIR.

Nature has provided a magnificent supply of pure water in the annual rainfall of the watershed of the Croton River, and when the city authorities were considering, some sixty years ago, the question of providing a larger water supply, they selected this locality

The Gate at End of Chamber Leads to Reservoir.



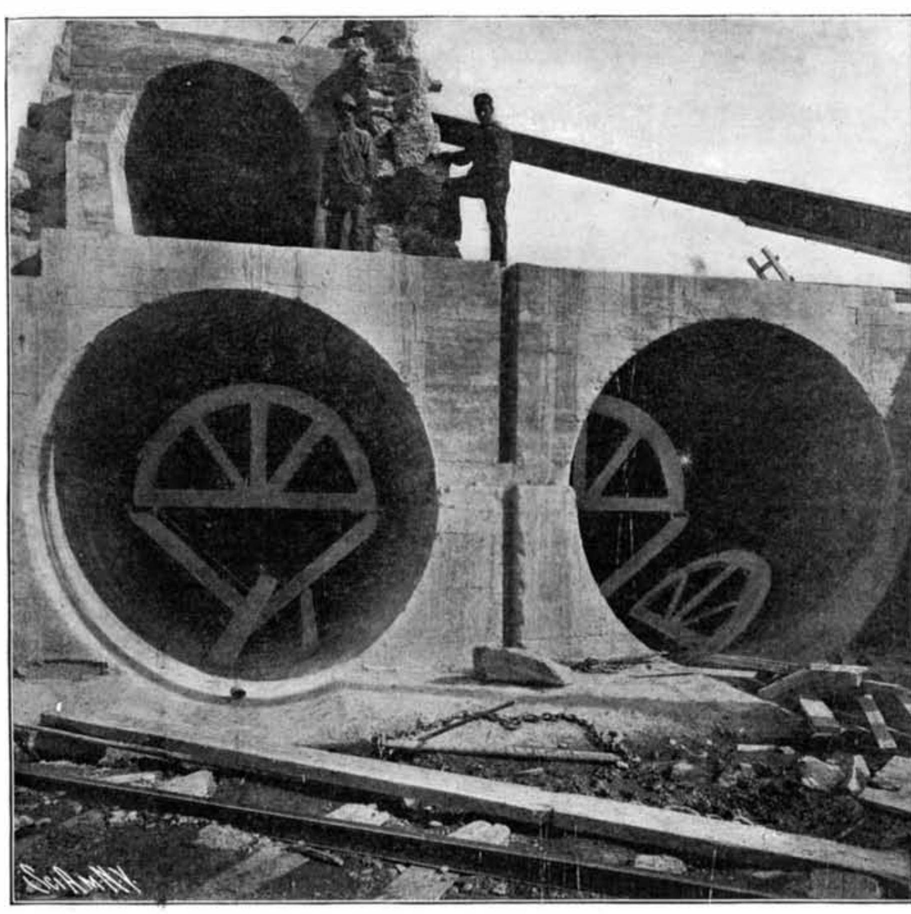
Laying the Concrete Floor in the Reservoir.



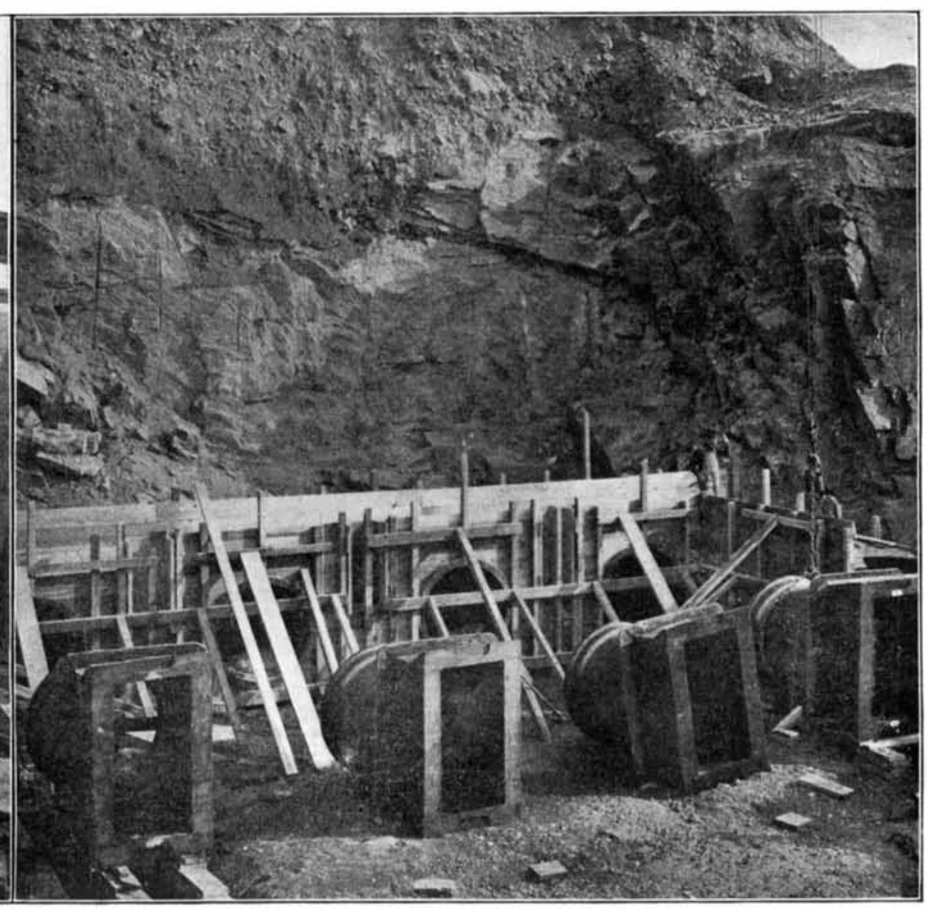
Where the Aqueduct Enters Gatehouse No. 5.

for the construction of a new reservoir. If we bear in mind how much smaller New York was in the decade 1830 to 1840, when the new work was undertaken, than it is to-day, we shall appreciate the forethought and enterprise which led the authorities to build a costly reservoir fully forty miles north from the city and lead the waters across the intervening distance in a solid masonry conduit. The Croton aqueduct, or, as it is now called, the old aqueduct, is a familiar landscape feature to travelers over the old Albany post road, and the unbroken service which it has rendered for more than half a century testifies to the excellent quality of the work. The maximum safe capacity of the aqueduct is 75,000,000 gallons in twenty-four hours.

In 1890 the new aqueduct, with a capacity of 300,000,-



Section of Dividing Wall Containing the Old (Upper) and New (Lower) Aqueducts.



Laying the Reducing Pipes at Gatehouse No. 5.

COMPLETING JEROME PARK RESERVOIR.

000 gallons per day, was completed. This structure, unlike the old one, which was built almost entirely upon the side hill and above ground, was constructed as far as possible in tunnel, and was carried, as far as practicable, in a straight line from Croton reservoir to the Harlem River. Both aqueducts discharge directly into a terminal gatehouse, situated at 135th Street and Amsterdam Avenue, from which the water is led by twelve 48-inch pipes into the city mains and into the Central Park reservoirs. The latter have a capacity of a billion gallons of water, or sufficient for five days' supply of the city. As a matter of fact, however, the high-water level of these reservoirs is only 115 feet above the sea, and before they can be entirely exhausted, the pressure fails and the remaining water ceases to be available on the higher floors of the city buildings.

For this reason the actual supply is limited to three and a half or four days, and in the event of a failure in the Croton reservoir, or of the two aqueducts above mentioned, the city would be brought within measurable distance of a water famine. Although such a contingency as the failure of both aqueducts or of the reservoir is remote, the aqueduct commissioners determined, some ten years ago, to enlarge the reservoir capacity at the city end of the line by constructing an additional storage basin which would have about double the capacity of those in Central Park. This would give the city a reserve of three billions of gallons, or about fourteen days' supply. Work was started in 1896, and the westerly basin will be completed and in service by the close of the present year.

The site chosen for the reservoir lies on the high ridge of land which runs in a general north-and-south direction between the New York and Putnam and the Harlem railroads, and judged from the engineer's point of view, it is well adapted to the purpose. It forms a general depression on the summit of the ridge, and Nature has helped to lessen the labor of digging out and embanking this huge artificial basin, the depth of which is 26½ feet and its area 239 acres, by surrounding it for half the total distance with rising ground. The other half of the distance has been shut in by an embankment and retaining wall. The original design called for a core-wall embankment around the greater part of the perimeter of the reservoir; but as the work proceeded, the character of the ground underlying the foundations proved to be so unsatisfactory that it was decided to substitute a solid masonry retaining-wall along the westerly and easterly sides of the reservoir. As the inner face of this wall is nearly perpendicular, it followed that the area of the bottom of the reservoir was greatly increased, the additional area being that contained between the line of the toe of the earth slope, as designed, and the line of the inside foot of the perpendicular wall. The enlargement amounted to about 10 acres.

In spite of the natural basin that existed at the reservoir site, the amount of excavation has been enormous. No part where the natural surface was less than 16 feet above the proposed bottom, which is 29 feet below the crest of the retaining wall, and 31½ feet below the top of the finished embankment. The total amount of excavation is about 7,200,000 yards, and as the excavated material occupies more space than the material before excavation, some 11,000,000 cubic yards have been blasted out and excavated, the larger part being carried to the Sound, some six miles away, and dumped on the low land or tide flats. Some of the material, however, was used in filling in property and streets of the Bronx; and a part was deposited for filling in Van Cortlandt Park. All of this work but about 10 per cent has been completed.

Both the old and the new aqueducts pass through the reservoir site on their way to the city, the former at the ground level, the latter some 100 feet below the surface. As the bottom of the reservoir lies below the old aqueduct base or foundation, it has been necessary to remove the latter structure altogether and rebuild it; this has been done. At a point about a mile to the north of the reservoir the new aqueduct is at the ground level, and it is here that it is depressed and carried in a tunnel to the deep level above mentioned, at which it is carried under the Harlem River. At about the center of the reservoir a vertical shaft, known as Shaft 21, rises from this aqueduct to the bottom of the reservoir. At the point to the north above mentioned, where the change of grade occurs in the new aqueduct, a deflecting gate chamber is being put in and a surface branch aqueduct is being built, which branch runs parallel with the old aqueduct, until the northern end of the reservoir is reached. Here the two aqueducts are continued in one compact masonry structure, known as Gatehouse No. 7, where the flow can be discharged into either the east or west basin or continued south through the masonry division wall. This division wall is built upon the solid rock and runs through the reservoir from north to south, dividing it into two approximately equal and entirely separate basins, the top of the structure being at elevation 136.5 and level with the top of the embankment, or 5 feet above the maximum high-water level in the reservoirs.

At the center of its length, and opposite the Shaft 21 leading down to the new aqueduct, a large main gatehouse (No. 5) has been built, from which a short conduit leads across to connect through this shaft with the new aqueduct below ground. To the south of the main gatehouse two conduit aqueducts are continued at bottom elevation 107, for distributing the supply, each conduit being 11 feet in diameter. The old aqueduct is carried above these at its former elevation. At a point 1,500 feet to the south of the gatehouse one distributing conduit leads into the western and the other into the eastern half of the reservoir. By this arrangement six separate systems of distribution of the water are secured. Water also can be discharged into the east reservoir from the old aqueduct at Gatehouse No. 6, or may be taken thereat. The reservoir may be filled or the water distributed directly from either the old or the new surface aqueducts, or from the subterranean aqueduct through Shaft 21, the operations being all controlled at the main gatehouses, Nos. 5, 6, and 7.

Six lines of 48-inch pipe radiate from the main central gatehouse, No. 5, two of which leave the reservoir at Van Cortlandt Avenue Gatehouse No. 2 to the northwest, two at Sedgwick Avenue Gatehouse No. 3 to the west, and two at Jerome Avenue Gatehouse No. 4 to the southeast, one of which leads to a high-service pumping station; also two 48-inch pipes will lead away south to Manhattan, from Gatehouse No. 6 at Kingsbridge Road. A gatehouse has been built at each point of exit. The main gatehouse connections are so arranged that these pipes may be supplied with water from either basin of the reservoir or directly from either the old or new aqueduct. The 48-inch pipes, with the aid of the new pumping stations, will serve the annexed district to the north of the Harlem River, and it is also proposed to carry a double line of 48-inch pipes south across the Harlem River to connect directly with the city mains on Manhattan Island. This would give an independent source of supply in case of any accident to the present aqueducts where they cross the Harlem River. It has also been arranged to take off four lines of 48-inch pipes east and west from Gatehouse No. 7, north end, connecting with the city system, should the reservoirs require cleaning, etc.

It is the determination of the Aqueduct Commission to finish the westerly half first, and put it immediately in service. The final work of concreting the bottom was begun in 1904, and 30.25 acres were laid in that year. On March 27, 1905, work was again started on a scale that would insure its completion by the following Thanksgiving, or before the frost set in. By April 27, between three and four acres had been laid, with only half the concreting plant installed. It was estimated that twelve mixers would be sufficient to complete the work in the year; but the contractors have ordered sixteen, and nine of them are at work. It is hoped to exceed the estimated output of concrete by 20 per cent, and carry the total per day up to 3,000 square yards, or seven-tenths of an acre. The task is a truly gigantic one, as 101.25 acres have to be covered with concrete 6 inches in thickness, which means that a total of 1,750,000 cubic feet must be mixed, carried to the site and carefully tamped and surfaced. It will take at least a year more to complete the easterly basin. We are indebted to Mr. J. Waldo Smith, the chief engineer of the Aqueduct Commission, and to Mr. F. S. Cook, division engineer in charge of the construction of this work, for courtesies extended during the preparation of this article.

THE AUXETOPHONE FOR REINFORCING GRAMOPHONE SOUNDS.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Some time ago we drew attention in the Scientific American to the ingenious invention that had been devised by the Hon. C. A. Parsons, inventor of the steam turbine, and Mr. Horace Short, by the employment of which the reproductive sounds of phonographs and similar machines could be appreciably reinforced. At that time the invention was in a purely experimental stage. In the interval, however, the inventors have been perfecting it so as to be a commercial and practical attachment to talking machines. In this direction they have now succeeded, and recently an interesting demonstration of its practicability was given in connection with a gramophone.

In this device, which is called the auxetophone, the usual diaphragm of glass or mica in the producer is replaced by a small valve, which controls the admission of compressed air to the trumpet. The air is supplied from a small pump or bellows contained in the pedestal supporting the instrument at a pressure of about two pounds to a square inch. The valve, though

THE PARSONS AUXETOPHONE.

of small size, consists of a fine comb of aluminium or magnalium, and the teeth of this comb just cover the gaps in a corresponding comb of brass, through which the air tries to escape from the compressed-air chamber connected with the supply tube.

The little magnalium valve, which is very light, is hinged on steel springs, so that when its teeth are slightly lifted from the brass comb or valve seat, the air is allowed to escape at both sides of each tooth in very large quantities up through the two combs and into the trumpet. When, however, the two combs approach closely and almost touch, the escape of air is checked and almost ceases.

It will thus be noticed that the slightest movement of the magnalium valve on its supporting springs greatly varies the admission of air into the trumpet; and being connected to the needle of the gramophone, the motion of the valve corresponds exactly to the motion imparted to it by the record, and also to the original wave of sound as recorded by the recording instrument when the record was made.

The auxetophone reproducer may therefore be called an air relay, for by its use the gramophone record has only to work a valve of special construction, which controls the power of the compressed air. It is therefore of much greater power and volume than the diaphragm reproducer hitherto used, while it has the additional feature of enforcing the harmonics, which gives increased fullness of tone.

The reason of this remarkable change in tone is somewhat complex to explain, but the velocity of motion of the valve causes, or corresponds to, acceleration of the velocity of air in the trumpet, and that acceleration in the motion of the valve corresponds to double acceleration of the air in the trumpet. When this is worked out mathematically, it is found that the air wave provided in the trumpet is the differential of the wave on the record; in other words, the harmonics are reinforced, or a richness is imparted to the sound. Another feature of the auxetophone is an ingenious little "viscous connection," as it is called, introduced between the needle and the valve, which adds to the softness of the tone, and its action may be compared to the effect of the moisture in the throat of the singer, or the effect of age and playing in mellowing and loosening the fibers in the wood of the violin.

The auxetophone is a very powerful reinforcer, and on a calm day may be heard distinctly for two or three miles, and speech may be followed in every word from two to five hundred yards at least. The device has been acquired by the Gramophone Company, of London. It is intended, as soon as a few adjustments and simplifications have been made to coincide with public requirements, to install auxetophones upon transatlantic liners for the amusement of passengers.

MOVING PLATFORM SUBWAY FOR NEW YORK CITY.

Toward the close of November last year, there appeared before the Board of Rapid Transit Railroad Commissioners of this city several leading railroad officials and engineers, with a proposal to build a moving platform subway below Thirty-fourth Street between First and Ninth Avenues in this city. The sponsors of the new scheme are men of broad experience and high technical qualifications, as will be seen when we mention that they included Mr. Stuyvesant Fish, president of the Illinois Central Railroad, Gen. Eugene Griffin, first vice-president of the General Electric Company, and Mr. Louis B. Stillwell, the electrical engineer of the Interborough Rapid Transit Company; and in the record of their testimony, given before the Rapid Transit Commission, the proposed moving platform is indorsed with a unanimity which is a guarantee that, so far as the mechanical and commercial aspects of the scheme are concerned, it is thoroughly practicable. The proposal was to build a continuous moving platform across Manhattan Island, under 34th Street, with a loop at each end, both the easterly-moving and westerly-moving sections of the platform to be contained within a single tunnel. The platform was to be built in four sections: First an auxiliary section, to be stationary during the greater part of the time, and operated only during the midnight hours, and three moving sections, traveling at the respective speeds of three, six and nine miles per hour, the fastest section to be provided with cross seats throughout its entire length. The company stated, before the Rapid Transit Commission, that the platform would have a capacity for delivering at a given point forty-eight thousand seated passengers per hour, and it was stated that an arrangement would be made with the present Subway Company for a transfer of passengers.

Subsequently to the presentation of the scheme, the Metropolitan Street Railway Company, which controls all the street railways in New York city, and intends to be one of the most active bidders for the construction of further subways, argued strongly against the giving over of such an important thoroughfare as Thirty-fourth Street to a moving platform, and offered to build a subway system which would include Thirty-fourth Street as an important link therein. The matter was thoroughly argued before the Rapid Transit Commission, and that body decided at its last meeting to reserve Thirty-fourth Street for a four-track subway, not necessarily as a part of the Metropolitan scheme, but for whatever company might be the successful bidder for a subway system that included the Thirty-fourth Street subway as part of it. At the same time, it was intimated to the promoters of the moving platform subway that if they were willing to consider some other important cross-town street, such as Twenty-third Street, the Rapid Transit Commission would be ready to entertain a proposal.

In coming to this conclusion six out of seven members of the Rapid Transit Commission that were present voted against the installation of the moving platform on Thirty-fourth Street, the objections being directed, not against the moving platform as such, but against its appropriation of a thoroughfare which, because of its contiguity to the new Pennsylvania Railroad station, would form the most important crosstown link in the future complex system of subway transportation in New York. We cannot but think that, all things considered, the decision of the Commission was a wise one, and that the first level below the street surface on Thirty-fourth Street should certainly be reserved for a system of transportation identical with that under which the greater part of the future subway system will be operated. At the same time, there is unquestionably a great future for the moving platform. Its enormous capacity, which is far greater than that of a line operated by electrical cars, renders it an ideal system for operation where traffic is greatly congested, and it is to be hoped that the suggestion of the Rapid Transit Commission as to Twenty-third Street will be adopted, and a moving platform subway built below that important thoroughfare.

The engraving which we give on the front page of this issue shows clearly the general arrangement and detailed construction of the moving platform. It is a sectional perspective view, taken at one of the stations, of which there will be one to every block to the number of ten in all. The subway itself will be constructed of reinforced concrete, and between the stations it will be divided into two equal halves by a vertical partition wall provided with manholes. The whole section of the tunnel will be 30 feet wide by 14 feet in height. Eight feet of this height will be above the platform level and 6 feet below, the last-named dimension being sufficient to give headroom for operators and inspectors of the driving machinery. The moving platform proper consists of three continuous lines of steel plate covered with rubber to insure a safe footing. The plates overlap laterally at their edges. The fourth platform, shown in our drawing as adjoining the station platform, is an auxiliary which will be run at a speed of 3 miles an hour, and used only for a few hours after midnight when travel is lightest, at which time the main moving platform will be stationary. The first moving platform will run at a constant speed of 3 miles an hour; the second at 6 miles, and the third platform at 9 miles an hour. The first two platforms will be known as stepping platforms, and the third, which is considerably wider, will be provided with transverse seats. To assist passengers in moving from one platform to another, the two stepping platforms will be provided with lines of vertical posts placed at frequent intervals.

The platforms will be built in sections, each of which will be about 6 feet long, and the abutting ends of the sections will be struck to a radius which will permit of the platform curving around the terminal loops at First and Ninth Avenues. Extending longitudinally beneath each platform is a pair of I-beams, the upper flanges of which are riveted to the bottom of the platform, while the lower flanges serve to support the weight of the platform upon pairs of wheels which are carried upon transverse shafts mounted at intervals of 2 feet 9 inches, upon concrete piers, as shown in the engraving. Between each pair of longitudinal I-beams is carried a pair of horizontal guide wheels, which engage a guide rail that serves to keep the platform in proper alinement. At every 75 feet, 10-horse-power motors are mounted on the floor of the subway, and are connected by a chain drive with the transverse shafts, which carry what might be called the driving wheels of the platform. The gradation in the rate of speed of the sections of the platform is secured by varying the diameter of these driving wheels, which are 8 inches in diameter for the 3-mile, 16 inches in diameter for the 6-mile, and 24 inches in diameter for 9-mile platform. The driving wheels are covered with rubber, as are the horizontal central guide wheels, and consequently the motion of the platform will be both smooth and silent. The successive sections of the platform are coupled together by means of long links 46 inches in length, and the coupling pins are placed at the center from which the curves of the abutting ends of the platform sections are struck; consequently, the opening between the joints may be reduced to a minimum, and a smooth and continuous surface presented for walking, with no open spaces to bewilder or trip the passenger.

The stations on each block are provided with two exits and two entrances, which are equipped with moving platforms arranged as escalators. There are two chopping boxes on each side, and eighteen turnstiles are provided for exit, so that there is no interference between incoming and outgoing passengers.

Meteorological Summary, New York, N. Y., April, 1905.

Atmospheric pressure: Highest, 30.40; lowest, 29.30; mean, 29.88. Temperature: Highest, 76, date, 21st; lowest, 31, date, 17th; mean, 49.8; normal, 49. Warmest mean, 54, 1871. Coldest mean, 41, 1874. Absolute maximum and minimum for this month for 35 years, 90 and 20. Average daily temperature deficiency since January 1, —1.2. Wind: Prevailing direction, NW.; total movement, 8.628 miles; maximum velocity, 56 miles per hour. Precipitation, 2.45. Average for this month for 35 years, 3.28. Deficiency, —0.83; since January 1, —2.11. Greatest, 7.02, 1874; least, 1.00, 1881. Thunderstorms, 4th, 5th, 10th, 14th, 21st. Snowfall, trace. Killing frost, 19th.

Motor vehicles are to replace the horse-drawn omnibuses in Berlin. It is intended that in the course of the next twelve months the omnibus horses shall be completely abolished in the German capital. If true, this is good news for the continental motor manufacturers.

Correspondence.

Power Below the Niagara Falls.

To the Editor of the Scientific American:

In your editorial of April 8 *re* the vandalism at Niagara Falls, you spoke of the danger to the beauty of the famous and delightful "Falls of the Niagara." Now, why is not some mention made of that great source of power to be obtained from that 106 feet difference of level between the foot of the falls and the town of Lewiston? Could not this power be made available by means of a dam somewhat similar to that now nearing completion at Croton?

It seems to me that modern engineering practice should be able to overcome the difficulties there, and make Lewiston and the neighborhood the greatest power district in the world, and give to mankind unlimited quantities of that clean and ever-increasingly useful source of power, light, and heat.

Walkerville, Ont., April 24, 1905. M. Price.

[It would be quite possible to develop the energy of that portion of the Niagara River lying between the falls and the lake; not by building a dam, but by a shaft and tunnel. It would, however, be a very costly undertaking.—Ed.]

Dangers in the Use of Soap.

To the Editor of the Scientific American:

In the Scientific American of March 4 there was an article by Mr. G. F. Shaver, telling of the awful effects following the use of the soap in public toilet rooms. I beg leave to tell the other side of the story. While in the employ of the State Board of Health of New Hampshire, I performed a large number of experiments to determine the relations of the use of various soaps to the transmission of disease. I made careful bacteriological study of seventy-five cakes of soap, obtained from as many sources, including hotels, machine shops, railroad stations, a sewage disposal plant, various kitchens, two abattoirs, and a number of specimens from a public bath, and was unable to find living germs on any of them. Another set of experiments was conducted, to find how long germs would live on soap. A cake of soap was put in a sterile dish, and inoculated with living germs from strong cultures and placed in the incubator. This was repeated with many varieties of soap and twelve of the most virulent varieties of germs. In no case did the germs live more than four hours, and that only once. The germs were all dead in less than a half hour, with but three exceptions. Bacteriological examinations were made of twenty new cakes of soap, and no bacteria were found on any of them, although on one cake of "antiseptic soap" we found a pure culture of a non-injurious mold, and we were able to grow this variety of mold on other cakes of the same soap, but not on the ordinary soaps, such as most commonly used. We found that the soaps selling for five and ten cents per cake would kill the germs planted on them in slightly less time than the higher-priced soaps; this probably being due to much greater alkalinity.

These experiments were not done for any soap company, but were in connection with an extensive study of sterilization for operations in places other than hospitals. We concluded that soap in the farmhouse of ordinary cleanliness is safe to use for any purpose of cleaning. A. P. Merrill, M.D.

519 North Street, Pittsfield, Mass., April 30, 1905.

A Hint to Inventors.

To the Editor of the Scientific American:

It frequently happens that even some of our most prolific inventors are at a loss for something to invent, and a hint now and then, if acted upon, will "help them out." Successful inventors usually cast about for something for which there is an urgent demand, and which would come into general use. Just now there is a demand for a reliable signal to prevent railway collisions, i. e., a certain *class* of collisions. The causes of collisions are so various in their character, that they may properly be classified. But this proposition has nothing to do with collisions between stations, but more particularly with such as occur in yards, or on sidings at small stations, or at any place on the line where there is but one siding.

It frequently happens that the siding is too short to accommodate a train and keep the main line clear. This class of collisions is far more frequent than formerly. The roads have increased the length of trains, while the length of the sidings remains the same, and the trains, being heavier than usual, frequently get stalled before they can clear the main line, even if the side tracks were long enough. It not infrequently happens that the side track is so short or the train so long that the train on the siding covers the main line at both ends. This state of things will bring disaster to trains running in either direction and the one on the siding, as has been reported on several occasions.

Within the last few years the most disastrous collisions have resulted from the inability of too long and too heavily laden trains to clear the main line in time to prevent disaster. Sending a flag by day or a lantern by night to warn the incoming trains are wholly unreliable precautions. In dark, foggy weather, or at night, semaphores, flags, or lanterns cannot be seen in time to prevent accident, and the only reliable signal is something in the nature of an explosive. It often happens that the train crew are asleep, and pass all visual signals unheeded, and the only sure preventive of disaster in such cases is a system of ordinary track torpedoes operated by small wire cables, operated by trainmen or some responsible person, a part of whose duty will be to superintend the operating and keeping in repair of the signal appliances. This is not intended to act automatically. The idea is to stretch a small wire cable along the track on the ties or telegraph poles or on short posts, reaching far enough from the station to give an incoming train warning in time to stop before reaching the place of danger. At the far end of the wire or cable would be placed a number of torpedoes in a box or housing, this to be connected by the cable to a suitable contrivance to act as a wire stretcher, located at some convenient point at the station. When desired to place the signal, the person in charge would turn a hand-wheel, or move a lever, or operate whatever mechanism may be in use to pull the wire, which would place the torpedoes on the rail. The wire or cable would be stretched taut on friction rollers, so that only a movement of the wire for a few inches would be required to place the explosives on the rail. A small cable made of about three small wires would be preferable to a single wire, on account of greater pliability. There are various appliances for stretching wires, some of which would operate this signal apparatus admirably.

There are other details that would be necessary to make such a contrivance perfect, but they will readily become apparent to anyone who essays to complete a signal after the above outline.

Within the last few years more lives and a greater amount of property have been destroyed for want of proper or reliable signals to prevent this class of collisions than from all other causes combined; and the explosive system, if properly constructed and kept in order, is more reliable than any other kind of signal yet devised. William S. Huntington.

The Current Supplement.

The current Supplement, No. 1532, opens with an account of the recent explorations in Peru, carried out under the auspices of the University of California. As the result of these investigations, it will be easier to give correct chronological position to each Peruvian culture which may be discovered. Excellent illustrations accompany the article. The famous French chemist, M. Berthelot, writes on "Receptacles of Quartz and Their Uses in Chemistry." Prof. William J. S. Lockyer concludes his highly instructive paper on "Our Sun and Weather." A great many although not all deep-sea fishes possess luminous organs, which vary remarkably in details in the different species, yet show a general resemblance to one another and to the analogous organs of cuttlefishes. These luminous organs are described in an interesting paper by Prof. Brauer. Dr. Alexander Roberts gives a simple explanation of variable stars. The new section of electric railroad which has been built up Mount Vesuvius is fully described and illustrated by the English correspondent of the Scientific American. The well-known naval architect, George W. Dickie, discourses eloquently on "The Man and the Ship." Perhaps in no country in the world are workingmen so protected by the state and cared for as in Germany. Insurance is more or less compulsory. The system which has been worked out by the government is disclosed in an instructive article. Thomas Holgate reviews recent gas and oil engine generators. The usual Electrical Notes, Engineering Notes, and Science Notes will be found in their accustomed places.

Discovery of a Tenth Satellite of Saturn.

Prof. W. C. Pickering, of the Harvard University Observatory, has discovered a tenth satellite of Saturn. The stages of the discovery from the first suspicion of its presence to the confirmatory evidence extended over some years.

The discovery of the ninth satellite was also made at the Harvard Observatory by Bond in 1848. The new satellite has a period of revolution of twenty-one days, or a little less than that of Hyperion, a near-by satellite, which revolves around Saturn in twenty-one days and six hours.

The new satellite has an estimated diameter of 200 miles. It is just beyond even telescopic vision and only the sensitive photographic plate can catch it. The motion of the satellite is direct—against the hands of the watch viewed from the north—in a plane considerably inclined from the plane of the rings.

THE VIAGRAPH: AN INSTRUMENT FOR MEASURING ROAD WEAR.

BY CHARLES LAVELL.

A most ingenious invention is the viagraph, an instrument for measuring and registering wear in road surfaces. During a recent dispute between the London County Council and a firm of paving contractors, it furnished data of the most valuable and unimpeachable character, putting into evidence facts which there was no disputing. In appearance the viagraph somewhat resembles a child's sled. Its body consists mainly of two parallel runners, 12 feet long, made of mahogany, with brass fittings. Between these, and protected from the elements by a glazed cover, is placed the recording mechanism, a combination of highly ingenious yet easily comprehended devices.

When the viagraph is prepared for a test, the principal recording factors—a steel-shod skate, shaped like a section of an ordinary cart wheel, 40 inches in diameter, and a cog-wheel—are both brought into contact with the surface to be surveyed. The skate and wheel are each connected, by means of delicately adjusted levers, with a paper-bearing cylinder, upon which, as the instrument travels, two lines are reproduced by means of pens; one records the profile of the road traversed in a more or less agitated line, on a scale of ⅛ inch to the foot; the other indicates a datum line. As the skate drops into a rut, so the lever connected therewith records the inequality upon the paper chart.

Not only does the instrument record in a profile map the inequalities over which it passes, but it places the fact in an even more comprehensive form by indicating, on a system of decimal dials, the sum total of such unevennesses in feet per mile. By means of a ratchet wheel and delicate triple pawl, the registration of upward movements, i.e., where the instrument passes over pebbles or other loose rubbish lying above the surface, is avoided.

It will be obvious that in order to compare the condition of one tested surface with another, a standard length of road must be employed as a unit. For this purpose, 88 yards, as being the 1-20 of a mile, is measured automatically upon the paper cylinder, and a bell warns the operator when this distance (represented by 33 inches of paper on the drum) has been covered, when his assistant immediately ceases towing.

By taking impressions of recognized excellent roads, comparisons can easily be made between the tested surface and others.

It is usual in making these tests to take several diagrams from the crown and sides of the road under survey, striking an average to arrive at the amount of depreciation.

The following table has been drawn up, which will enable the surveyor to see at a glance under which head the road he has surveyed with the viagraph may be classified.

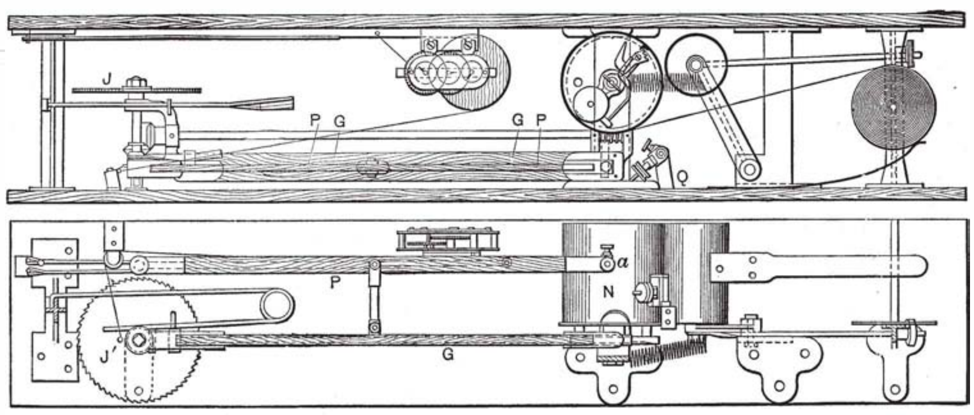
The instrument is drawn over the road under test by means of a cord, which should be handled intelligently, as uneven towage, jerking, or twisting the apparatus is apt to affect the accuracy of its results.

Such an instrument cannot be too highly recommended to the notice of road surveyors and others who are responsible for the making and upkeep of highways. In disputes between municipal authorities and contractors, the value of such an infallible means of checking wear and tear upon roads will be obvious.

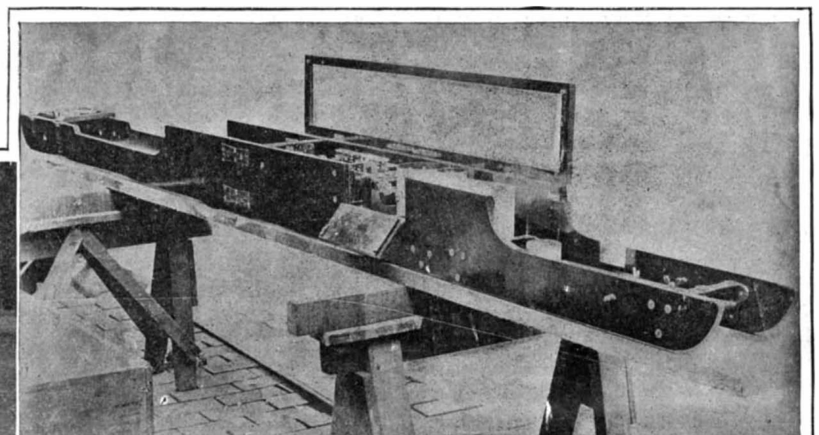
Eye inspection in such cases is most misleading, and its value practically *nil*, because no two witnesses could estimate the depreciation alike. And in binding contractors to a definite quality in maintaining and laying down roads, the viagraph affords undeniable proof of its merits, as it will indisputably convict the contractor in the case of excess of wear or neglect—or worse.

The writer is indebted to Messrs. Glenfield and Kennedy, of Kilmarnock, Scotland, N. B., for diagrams reproduced here.

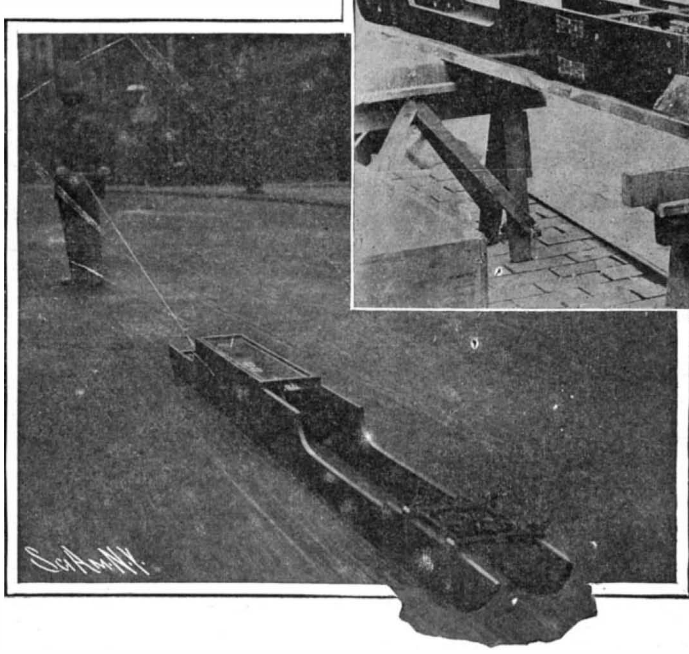
Numerical index of unevenness in feet per mile.	Condition of road surface.
15	Excellent.
30	Good.
45	Fair.
60	Passable.
80 to 100	Bad.



The Operative Mechanism of the Viagraph.



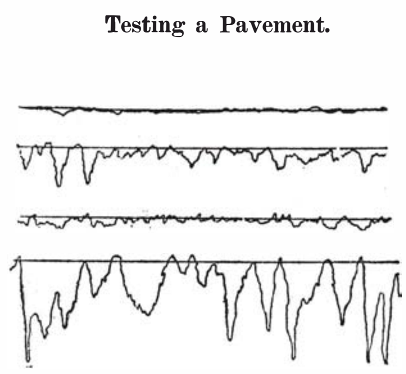
Showing Hinges Which Permit Runners to Fold Back for Easy Transportation.



On the Road.

Testing a Pavement.

Getting Ready for a Test.



Viagraph Tracings from Different Roads.

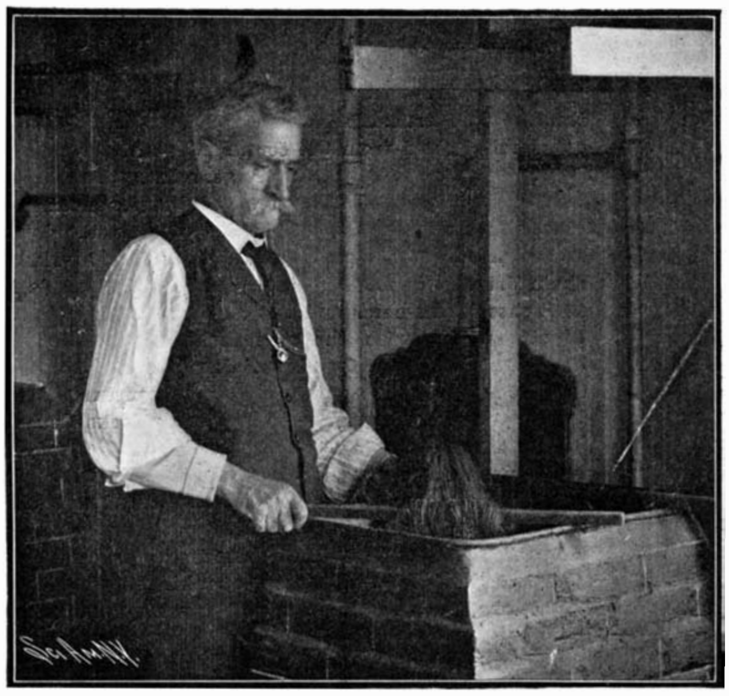
THE VIAGRAPH: A ROAD-TESTING MACHINE.

A new process, of taxidermal value, has been devised by an English naturalist, Mr. Charles D. Head, for stuffing animals and birds, the feature of which is that the objects are rendered life-like. The skins are made permanently soft and pliable, and can be moved freely into natural positions. The process is principally a specialty in skin-dressing, and free movement is left in every joint of the body. Another point is that the skins and feathers wear well, and can withstand considerable rough usage.

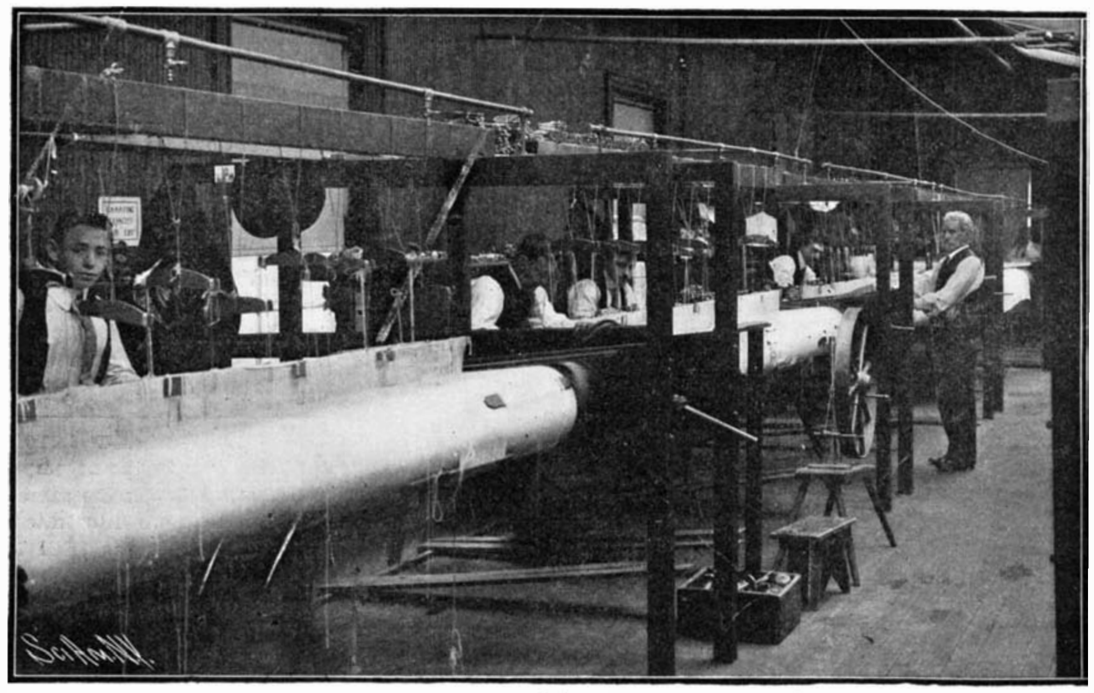
THE MAKING OF A GOBELIN TAPESTRY.

The art of transmitting ornamental figures or designs on the loom is probably nearly as old as that of painting them on a wall or a panel. The Egyptians, the founders of so many industries, knew at an early age the art of ornamenting fabrics by weaving, embroidery, and the application of colors. In the subterraneous temples at Beni-Hassan, the wall paintings, which date back to 3000 B. C., show the representation of an upright loom, which in general arrangement and even in detail is singularly similar to that used to-day. Nor are historical proofs wanting that the Egyptians of the time of the Pharaohs produced fabrics of extraordinary richness and fineness, which might be compared favorably with examples of the modern industry. The same may be said of western Asia and Greece. The ancient authors are unanimous in proclaiming the magnificence displayed by Babylon and Nineveh in textile hangings and carpets, and there are many records of the enormous prices paid by nobles and patricians of Rome for Babylonian tapestries. The oldest pieces of tapestry extant to-day do not date back further than the end of the twelfth century, and there are but a few of these. Undoubted evidence exists that all these specimens were produced in Germany about the year 1200. During the thirteenth century, tapestry making is supposed to have found its re-birth, and according to the old historians many important examples must have been produced, though only one exists to-day. The fourteenth century saw the rise of the art to great strength and importance, especially in France and Flanders. Paris, Arras, and Brussels secured for themselves the supremacy, owing to the skill of their weavers. The fifteenth century was the golden age of tapestry making, and the ateliers of northern France and Flanders rose to a height and attained a perfection in this art hitherto unknown, Arras eclipsing all its rivals. In this century the industry was started in Italy by emigrant weavers from France and Flanders, and soon the Italian painters furnished designs for tapestry, not only for their own weavers, but also for those of all other countries. The sixteenth century and the Renaissance consecrated the part the middle ages had assigned to tapestry, and saw the rise of the Italian weavers to an equal with those of other nationalities. In the seventeenth century occurred the establishment of the world-famous Gobelin factory in Paris, and from that time France steps into the front rank in the art of tapestry making, which it has held ever since. During the eighteenth century tapestry held its own or even increased in popularity though changing in style, but with the end of that century we come to the end of the last important era of the industry, followed by its gradual decay. Up to within a few years the Gobelin factory alone, of the innumerable ones formerly engaged in the industry, has continued in operation since the period above mentioned.

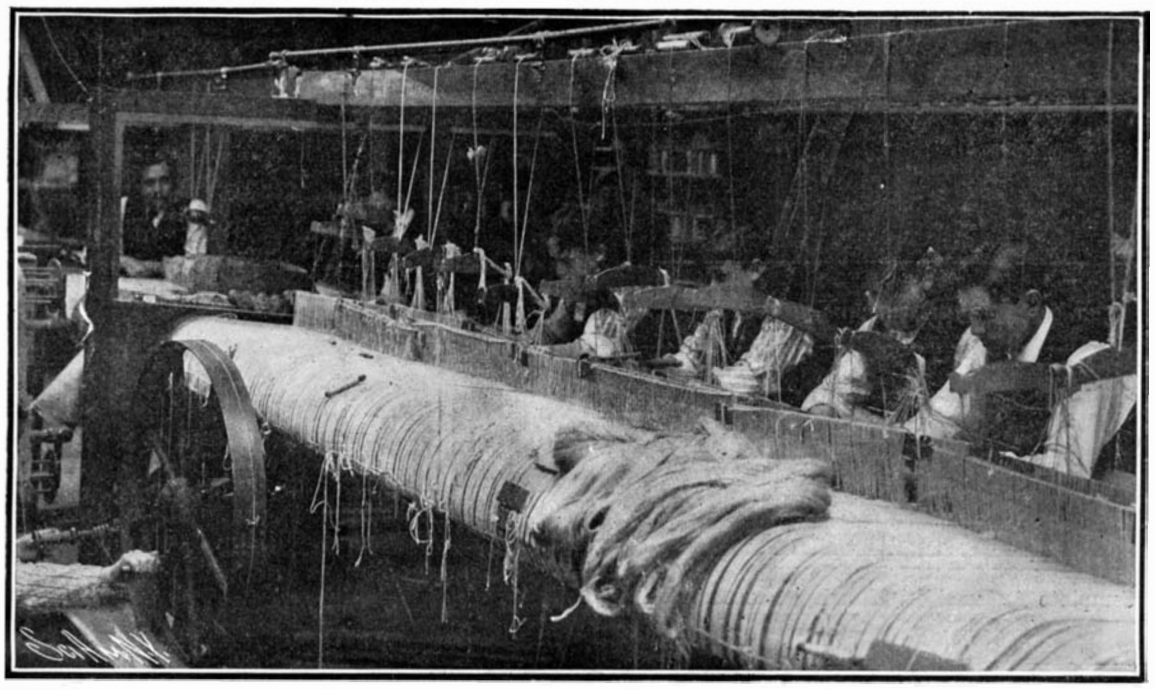
In recent years tapestry making has had a sort of revival, and thanks to the efforts of a few men of taste, is beginning to take its rightful place in the world of art once more. Besides the two factories of the French government, the Gobelins and the Beauvais, there are a number of private establishments of some importance in France, in Italy, and in Germany. A factory was started in England in 1876, but was



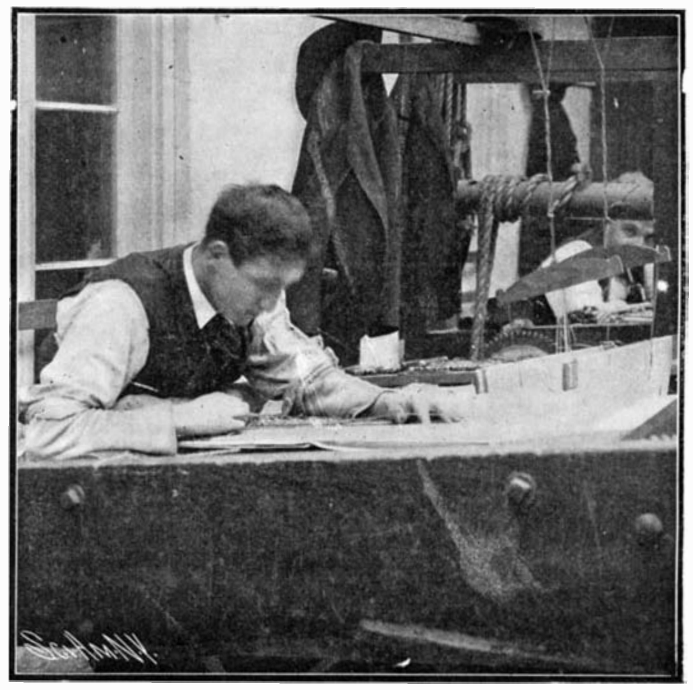
Dyeing the Yarn.



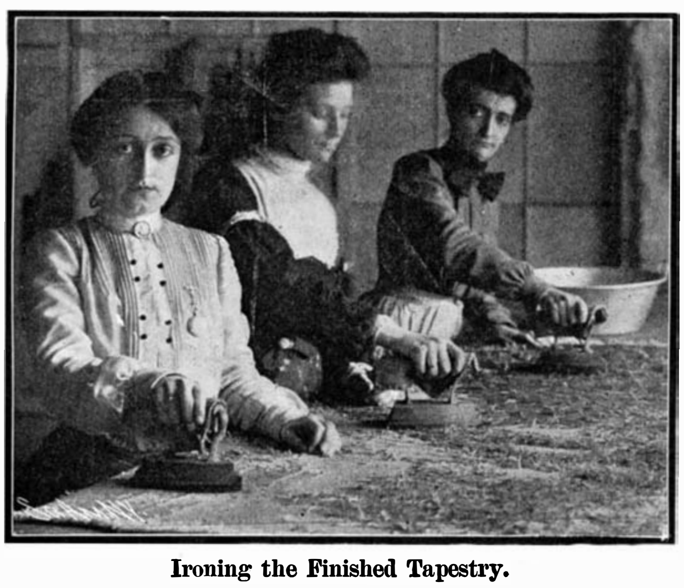
Low-warp Horizontal or Basse Lisse Loom.



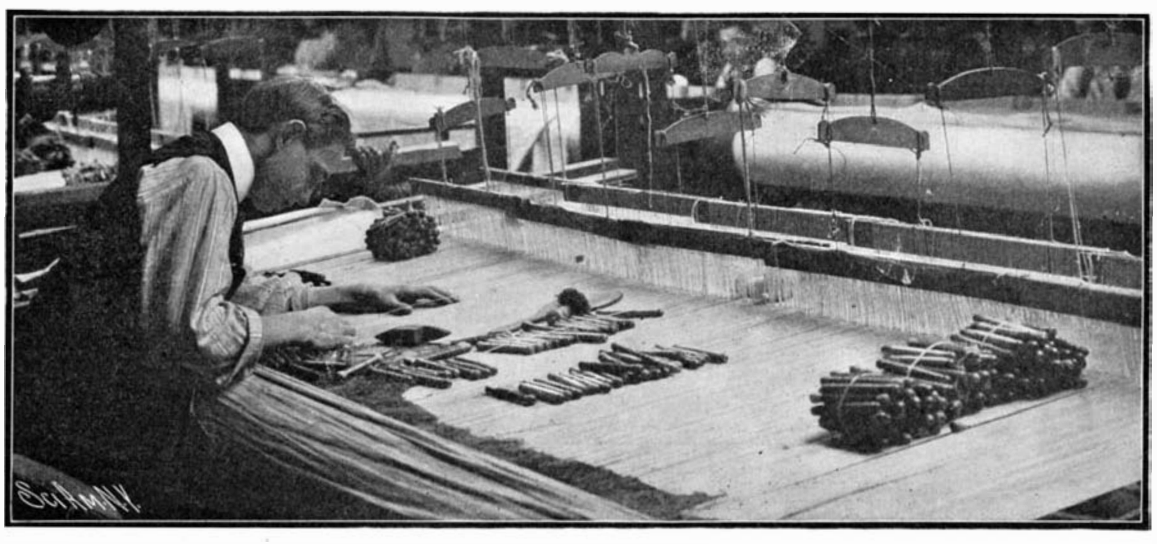
Loom with Heddles for Lifting Alternate Warp-threads to Allow Passage of the Bobbin.



Passing the Bobbin Under the Warp-thread.

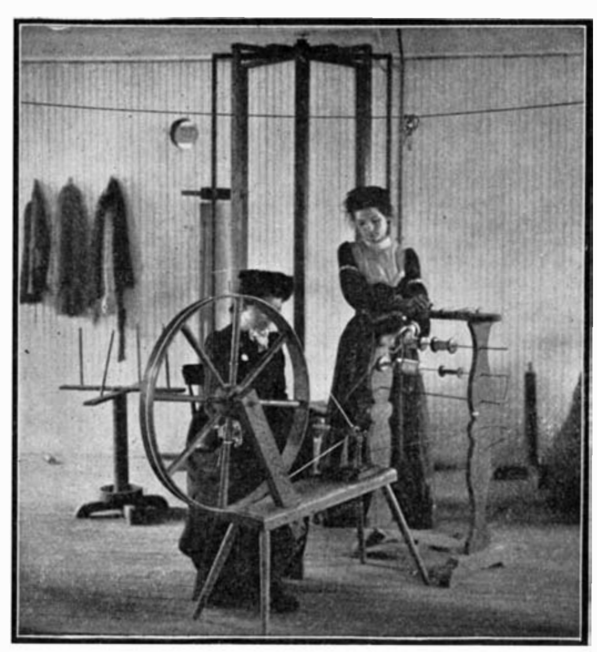


Ironing the Finished Tapestry.



Passing the Bobbin under the Warp-thread.

Sewing and Finishing the Tapestry as It Comes from the Loom.



Winding the Large Bobbins.

THE MAKING OF A GOBELIN TAPESTRY.

not economically managed, and failed. The making of tapestry in this country is only of comparatively recent date and, we believe, was first introduced in 1893, when Mr. William Baumgarten, of New York, set up the first loom in this city, and imported the first French weaver. Since then, this modest beginning has grown into a factory of considerable size, located at Williamsbridge, New York. While most of the workmen are French weavers imported from Europe for the purpose, Mr. Baumgarten has wisely begun to apprentice American boys to the trade, with the intention of eventually making the industry truly a native one.

Tapestry making is intermediate between embroidery and true weaving. Tapestry is a fabric worked on a chain of threads, which are drawn vertically, *haute lisse*, or horizontally, *basse lisse*, and around which are woven the colored threads of silk or wool, thus making one body and producing a stuff in which the lines and tints form combinations analogous to those which the painter obtains with his brush or the mosaic worker with pieces of colored marble. The laying in of the colored threads is done entirely by hand, and the weaver follows line by line the painting he is to copy. In the high-warp or *haute lisse* loom, two uprights of wood or iron support two movable cylinders, *ensouples*, one at each end, on which the warp threads are stretched at will. These threads are usually the length of the tapestry, which is rolled up on the lower cylinders as the work progresses. The weaver works at the back of the loom, where the design is sketched on the warp threads. He places the cartoon behind him, using it to get the design and match the colors. Occasionally he steps around to the front to get the effect on the right side. The threads are woven in and out like basket work, a little patch of color at a time, the different colors being wound on separate spindles or bobbins, and the proper warp threads being lifted by hand to permit the passage of the bobbin. Each portion of the weave must be traversed twice, as only alternate threads are covered on the right side. Thus tapestry is a double cloth. When the thread has been woven only one way, it is called a half-pass; when it is turned back the other way, completing the covering of the warp, it is called a woof. When the weaver has finished using a given color, he does not break the thread, but leaves the spindle hanging at the back till he requires the color again. When two or three threads have been added to the weave, they are forced or compacted together and against the already completed portion by means of a flat, short-toothed, metal comb in the hand of the worker. It will readily be seen that in the vertical lines of a design, in weaving the colors, open slits will be left, which must be afterward sewed together. For this reason many of the Oriental tapestries have no lines running in the direction of the warp, but only zigzags.

The low-warp or *basse lisse* loom is similar to the above, with the difference that the two cylinders are fastened to supports parallel to the ground, so that the warp threads instead of being vertical are horizontal. The cartoon is placed beneath the warp threads, so that the weaver may watch his work and the model at the same time, the design not being sketched on the warp threads. In this loom the warp threads are moved by heddles connected to treadles, leaving both hands free for the weaving. The work may consequently be done more rapidly, but is not as satisfactory, as the weaver can see it but imperfectly till it is completed. The colored threads are first wound on large bobbins, and then as the weaver requires them are wound on the small bobbins used in the work.

The warp threads are white cotton or wool, while the colored threads are wool or silk with silver or gold threads as required by the design. The dyeing of the multitude of tints used in the work is in itself an art requiring no little skill. The most imperishable vegetable dyes only are used, and the raw cotton, wool, or silk is all of American manufacture.

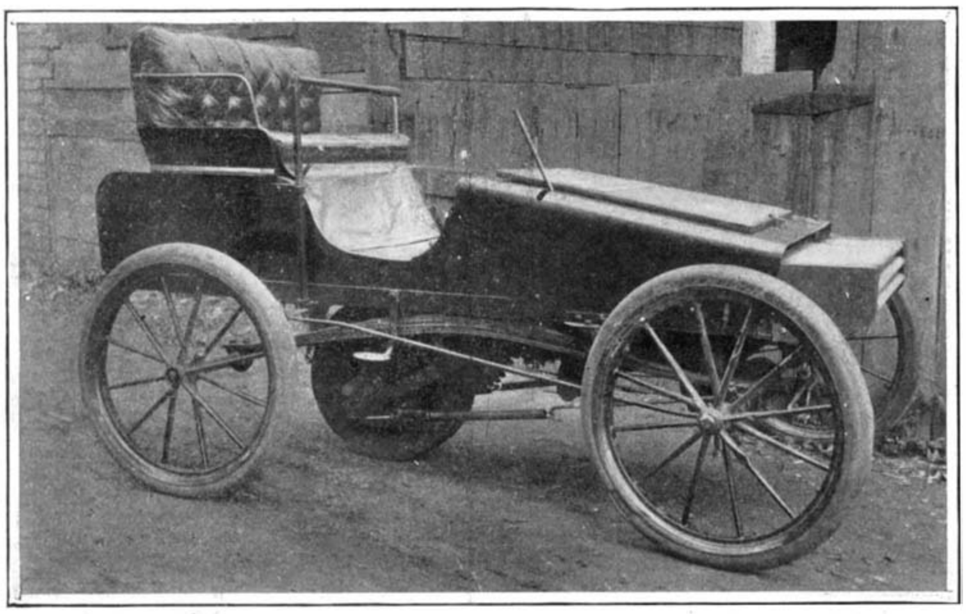
The very finest work is done on the *haute lisse* looms, though it is claimed that there is really little difference in the quality of the tapestry from these and the *basse lisse* looms. The looms shown in the photographs are all of the latter kind. It appears almost marvelous that representations so true to life, so accurate, and of such beauty in drawing, coloring, and execution, can be made with so primitive an apparatus, and to the skill alone of the weaver and of the designer is credit really due.

A NOVEL FIVE-WHEELED AUTOMOBILE.

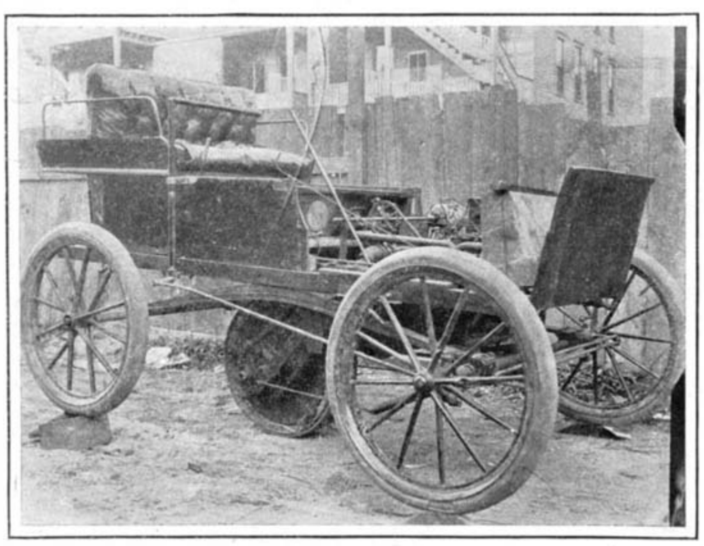
The automobile shown in the accompanying illustrations has been designed upon the same principle as a snow locomotive which we illustrated in our 1903 Automobile Number. It is propelled by a drum-like fifth wheel, arranged under the center of the vehicle to run in bearings on two hinged arms, which project downward at a slight inclination, and are drawn forward by tension springs. The idea of these springs is that they tend to hold the wheel against the ground, and increase its tractive power. This tension is under the control of the operator when the machine is traversing a bad road. On any other than a very bad road, it is entirely automatic. When the engine turns the drive wheel, and the vehicle is hard to start owing to a bad road, or an obstruction in front of the wheels, the drive wheel will take practically the entire weight of the vehicle on itself, thus increasing its traction and relieving the other wheels of any considerable weight. The drive wheel is made hollow and used as a muffler, or, when a steam engine is used for power, it can be both the muffler and water tank as well. Besides doing away with the differential gear, this simple fifth-wheel arrangement makes possible a solid rear axle, and also renders unnecessary the use of rubber tires on commercial vehicles. The construction of the wheel may be seen from the illustration showing the rear of the automobile. It has two side disks, between which are bolted face plates of soft cast steel, which are practically indestructible, and which, on granite or stone pavement, will not slip, as this metal will hold on stones when the weight is all upon a single driving wheel. These plates are readily removable, and can be replaced in winter by toothed plates for use on ice or snow. When the machine is running on soft sand or mud, it is driven through the flat plates, but on any ordinary road, the side disks do the driving. The vehicle shown has a 4 x 4 four-cylinder, horizontal, gasoline moter, placed at the front. The transmission is from the engine to a countershaft, and from the countershaft to the driving wheel by means of a chain. A gear transmission can be used, and is found preferable with heavier machines. In the side view of the complete automobile, the drum is shown driven by gears, while in the rear view a chain drive is employed. The drum of this vehicle is 26 inches in diameter and has a 5-inch face. A drum of this width, with the side disks shod with rubber tires, has been found sufficient for an ordinary two to five passenger automobile. The picture showing the machine mounting four 6-inch blocks demonstrates its tractive ability. As most of the weight comes upon the center driving wheel, the latter easily raises the car over obstructions. With longer arms for carrying the driving wheel, the inventor has been able to easily surmount 10-inch blocks in the manner shown. These driving arms are hinged about the countershaft, which also carries a planetary gear transmission. The tractive ability of this little machine is shown by the fact that it hauled two heavy coal wagons, weighing two tons each without a load, but with the wheels of one of them locked so as to slide. It was necessary to place two men on the rear of the machine to keep it from being lifted off the ground, and every time the machine was started, the front end would be lifted momentarily, and afterward rest but lightly on the ground.

The inventor of this machine, Mr. George T. Glover, of Chicago, Ill., states that this principle can be applied to heavy commercial automobiles, which can be made not only to propel themselves successfully, but also to haul heavy loaded trucks. He has under construction trucks of 100 and 200 horse-power, the latter being fitted with a twelve-cylinder engine, and being designed for the purpose of hauling a train of stone-laden wagons.

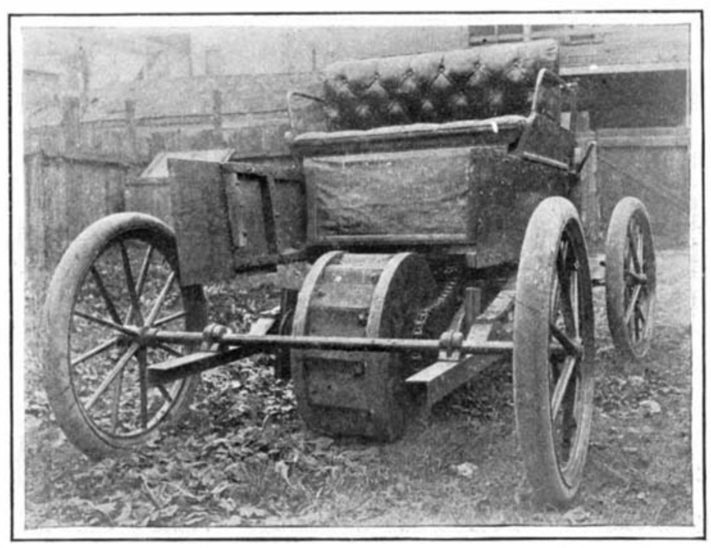
The fact that the fifth-wheel automobile carries practically all the weight on its driving wheel, which has a tendency to raise the machine and get under the load when power is applied, makes it possible to use this machine under conditions where the ordinary method of propulsion by the rear wheels has been found wanting on account of insufficient traction. Such a machine can, therefore, be used on plowed fields or muddy roads, and should be found invaluable to the farmer for haulage work about the farm, as well as for drawing his produce to market. The fact that this system of propulsion has been in successful use for several years on a huge snow locomotive, thus demonstrating its entire practicability, should make it apparent to all that it is a step in the right direction toward the perfecting of commercial vehicles.



Side View of the Complete Automobile, Showing Transmission of Power to Drum by Gears.



The Machine with Bonnet Removed, Showing Small Amount of Machinery Beneath.



Rear of Car, Showing Construction of Drum, Which is Here Shown Driven by a Chain.

AUTOMOBILE PROPELLED BY A FIFTH WHEEL, OR DRIVING DRUM.

A gasoline motor omnibus traffic service has been inaugurated in the Isle of Wight, which will perform the various functions of transporting passengers, freight, newspapers, and collecting mails. All the principal towns and villages of the island are to be linked together, so that a cheap, frequent, and rapid service is offered to even the most rural outlying parts. The omnibuses are provided with accommodation for transporting five hundredweight of freight on the roof, without in any way impeding the view of outside passengers. Also, each omnibus is fitted with a pillar-box for the collection of letters. By an arrangement with the Postal Department, passengers and the general public will be able to post letters at any of the usual stopping-places. Every village in the island will therefore have as many dispatches as the principal town of Ryde, from which the service runs.

BEE CULTURE FOR MEDICINAL PURPOSES.

Good probably does not follow the use of insects as a cure for disease. Nevertheless, the theory of the rheumatism-relieving power of the bee is one of long standing, especially in some country districts. Scientists have, on the whole, been very skeptical of the value of this discovery, and of late years little has been heard about it. Recently, however, the subject has been revived, thanks to judicious advertising by bee-raisers. Its recrudescence has been such that a large firm of manufacturing chemists of Philadelphia, so the fable runs, is buying up bee stings, with the noble intention of eventually cornering the supply.

An apiarist of Philadelphia, who has placed a collection of bee-hives on the roof of his place of business, imagines that bee stings can be sold with profit at $10 a thousand.

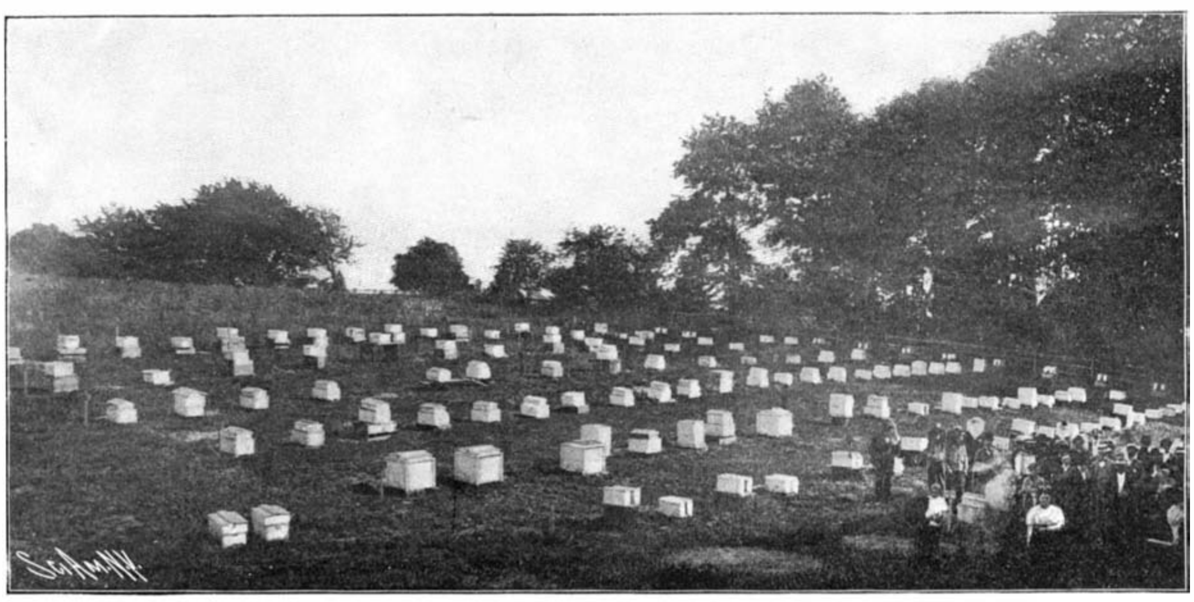
The method of obtaining the stings presents the only real difficulty, the supply being practically unlimited. This genius proposes to make use of the bees' well-known aversion from the odor of a horse. He thinks that the insects will considerately shoot their darts into a rubber cloth which has been rubbed upon a horse, and that they will thus supply him with a million stings a week.

To ascertain the rapidity with which the stings could be removed from the insect, the apiarist allowed the bees to sting his arm, which ordeal he endured with true scientific fortitude. He found that the stings could be collected in this manner at the rate of one in two seconds. He cherishes the popular delusion that while the bee dies when the dart is removed, the latter remains very much alive apparently, and bores its way deeper into the skin through some reflex muscular action. The expert advanced the fanciful opinion that the poison of the honey bee is a neutralizer, attacking the irritant and relieving the pain by neutralizing the acid in the blood.

Prof. Benton, the bee expert of the Entomological Division of the Agricultural Department, when consulted on this subject, by no means agreed with the sting-collector. While not denying the remote possibility that the poison of the bee may be efficacious in some rheumatic cases, it has no effect in most. He himself has rheumatism at certain times of the year, although he has been stung by bees many thousand times. At his own suggestion, he took a honey bee, and holding it by its wings, allowed the insect to sting his hand, and then separated the body from the sting. This, however, the bee is able to do by its own strength. Then the sting, by a convulsive muscular action, forced its way still deeper into the flesh, as explained before. But the separation of the sting from the body of the bee by no means kills the bee. That result depends upon the amount of tissue taken from the body of the insect with the dart. Very often this is sufficient to cause death; but if the sting be broken off close to the body, no permanent harm to the bee itself will result, save that the sting is not restored.

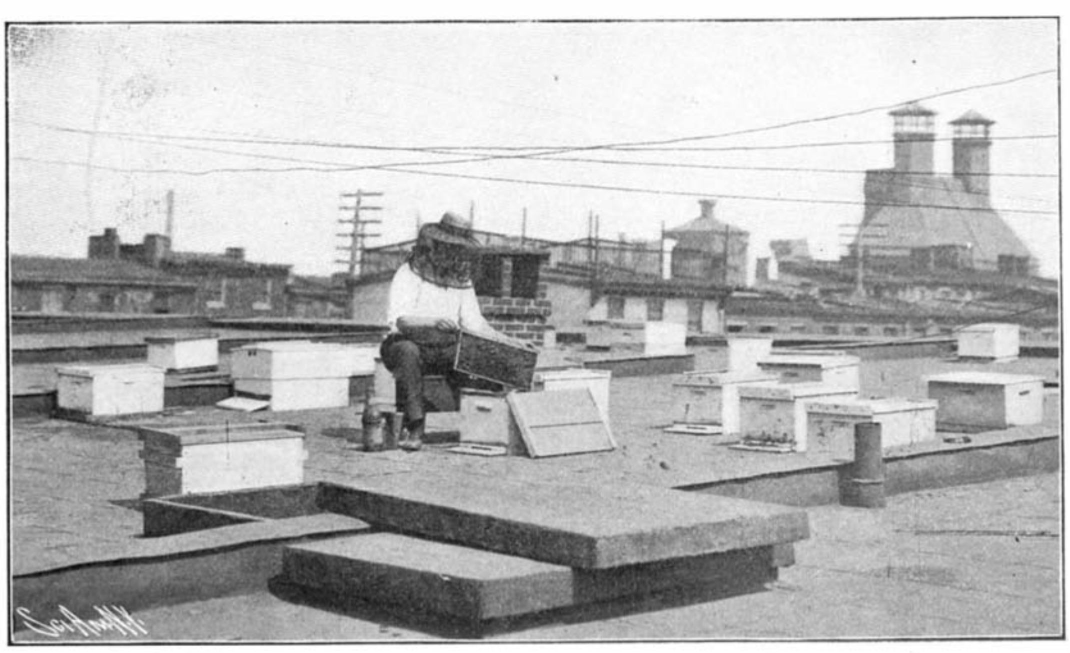
Prof. Benton considers it impracticable to obtain any great number of stings by the means suggested by the Philadelphian experimenter. To illustrate how futile it would be to undertake to monopolize the sale of bee stings or the poison therefrom, he stated that a hive or colony of bees ordinarily contained 30,000 to 60,000 insects. There are many apiaries in the United States, varying from a very small number to a large number of colonies. For instance, one in California has 1,200 colonies; one in Texas, the same number; one in Arizona, 1,100; one near Albany, N. Y., 725; one at some other point in New York State, 1,700. Taking the number of bees in a colony as 50,000, and multiplying it by 1,700, one may see the absurdity of attempting to monopolize the business.

A Quick Downward Jerk Precipitates the Bees on the Roof.



A Pennsylvania Apiary.

Removing a Bee That Has Stung the Bee-Keeper.



A Bee Colony on the Roof of a House

BEE CULTURE FOR MEDICINAL PURPOSES.

Radio-Active Minerals.

S. M. Losanitsch, in examining a number of minerals from Servia, found that the minerals containing mercury from the districts of Avala and Bara showed strongly-marked radio-active properties. After continuing his examination upon minerals from different countries, he found only those coming from Idria (Austria) to be radio-active. The author is of the opinion that the active portion of these minerals is formed of an element which is different from radium, which he designates as radio-mercury. It has a smaller active power than radium, and unlike the latter is easily volatilized, seeing that after heating the mineral it fails to show any more radio-activity. A new mineral has recently been discovered in Ceylon among the specimens which were examined by the Mineral Survey together with technical section of the Imperial Institute. At first the specimens in question were taken for monazite and uranite. Samples were sent to the Institute for analysis. The first of these was found to be thorite or silicate of thorium, and not monazite as was supposed. As to the mineral which was thought to be uranite, this was found to be a new variety and was named thorianite. It is said that the thorianite contains the highest percentage of thorium of any mineral which has yet been discovered. This may be of importance for the region, seeing that thorium is now coming into use for incandescent lighting. Besides, the new mineral is radio-active and may perhaps prove a source of radium. In this connection we may mention the recent experiments of Himstedt, relating to an emanation which he finds to come from spring water and also from petroleum. Ordinary water which has air passed through it does not act upon this air and cause it to become a conductor of electricity, but it is quite the contrary in the case of water and crude oil which is taken directly from a spring or well. Inversely, a current of radio-active air which is sent through an inactive liquid makes the latter active. It seems that there is a tendency to establish a kind of equilibrium between the liquid and the gas like that which is characteristic of gaseous solutions, and there may thus be a certain relation between the quantities of emanations contained in the liquid and the gas. This may explain why we may observe a lessening of the conductibility of the air in a room, when liquids are introduced which absorb some of the emanation. He finds that the emanation condenses between temperatures of —147 and —154 deg. C. It is not destroyed by acids or bases, nor by the electric spark.

A New Property of Radium.—Prof. Chaveau announced in a recent communication to the Parisian Académie des Sciences that radium emanations have the property of destroying the toxicity of serpent venom. Viper or cobra poison, if submitted to the action of radium, is said to lose its virulence after fifty or sixty hours of exposure.

A PETRIFIED FOREST COVERING THOUSANDS OF ACRES.

BY CHARLES ALMA BYERS.

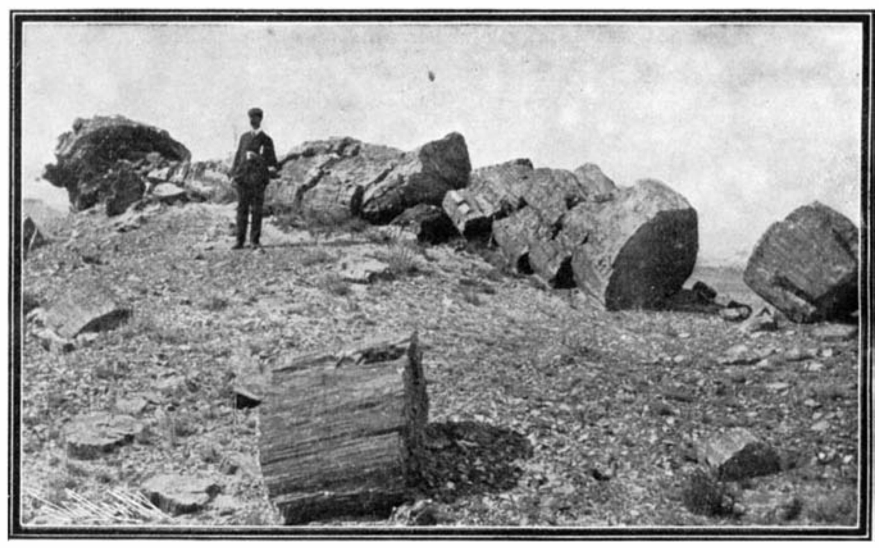
Lying in the eastern part of Arizona, scarcely outside the borders of the Painted Desert, and glistening like a field of huge, rare gems under the rays of the seldom clouded sun, is the famous Petrified Forest of the United States. It is a parched and almost barren expanse, covering several thousand acres, strewn with prostrated monuments to epochs in the history of vegetation otherwise unchronicled.

To what age these petrified logs owe their origin, and of what epoch and evolutionary processes they mutely tell, is unknown, but their antiquity is well testified to by their appearance.

The opinion, doubtless well founded, is that at some time in the misty past a large forest of stately pines grew here. Years passed, and in the course of time they were prostrated by some unknown force, probably by eruptive volcanoes, to the earth, and over them drifted snow-like layers of sand. Next over the area spread the waters of an inland sea, and all traces of the once green forest were crowded into complete oblivion. After another lapse of unreckoned time the sea vanished, and craters belched forth volcanic spume, to serve as a mantle to the ocean bed. The forest of the past slept, forgotten. In the ever-changing contour of the earth's surface, Nature is not always building. Material is indestructible and non-increasable. Consequently, to follow the periods in which the mantle over the forest was being builded, there must come a reversing time. It came. Rains fell, and as the water hurried toward lower levels, it gnawed the mass and labored constantly toward the resurrection of the pines. Erosion was at work, and after centuries it has accomplished its object over the greater portion of the area—the logs from the ancient forest are revealed to modern eyes. But how changed they are! As they reposed in their grave, the sybaritic chemistry of Nature transformed them from sappy and sapless wood into logs of stone.

"The Lonely Sentinel." Petrified Wood in Foreground.

The Petrified Bridge.



A Petrified Log Broken into Blocks.

Such is briefly the conjectured history of the Petrified Forest, which, having recently been set aside as a government reserve, is divided into an eastern and a western section, respectively containing about two thousand and three thousand acres of practically valueless land. Such has been Nature's work in the creation of the garden of monuments to ancient vegetation, which hundreds of people from all parts of the world are annually flocking to view.

Leaving the Santa Fe Railroad at either Holbrook or Adamana, the traveler engages a carriage, and starts southward toward the forest. The trip at the start is uninteresting, for there is naught to view save a limitless plain; but after riding a few miles, stray bits of petrified wood sparkling by the roadside begin to attract his attention. In a few minutes he espies larger and larger blocks. Presently there appear trunks of trees, then huge logs, some more than a hundred feet long, tumbled about in confusion, or lying just as they were bared by the action of the elements in the process of resurrection.

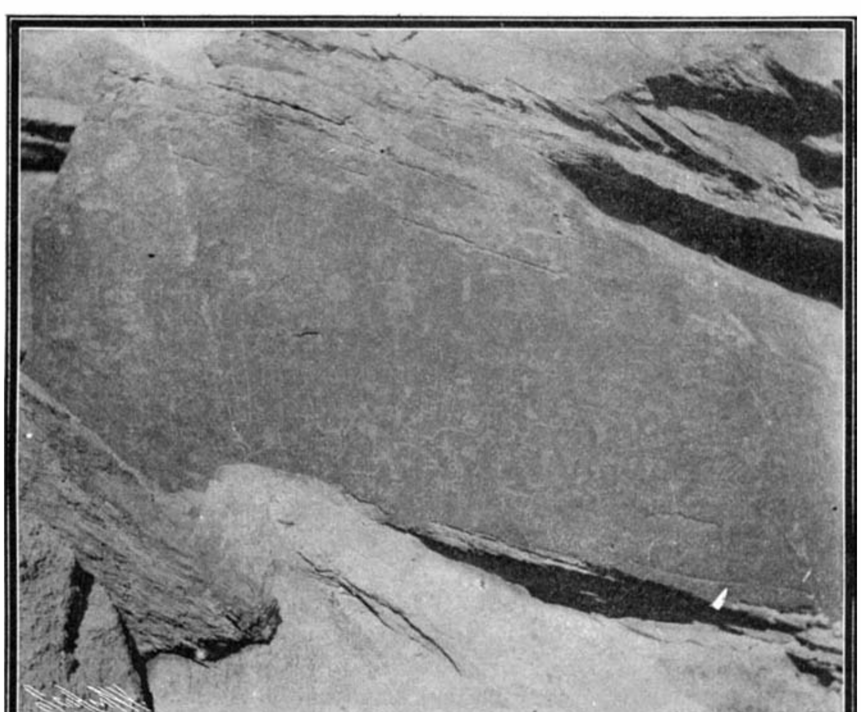
The traveler is now in the Petrified Forest. In every direction are to be seen pieces of petrified wood, ranging from the size of a toy marble to blocks and logs eight and nine feet in diameter. Some are still partly buried beneath shale, and occasionally from the side and near the top of some mesa, with which the ancient ocean bed is dotted, projects the end of a log. Here is an excellent opportunity to study the effect of erosion. The mesas, many towering sentinel-like, are composed of shale, clay, and sandstone, and down their sloping sides wind many tiny crevices. When it rains here, which is seldom now, water trickles down these crevices, and thus small particles of the mesa's substance are borne away. By pondering upon this sight, one is given a faint idea of the number of years that have passed since this thick blanket began to erode.

Stepping from the carriage and strolling about, one notices segments of logs, almost always broken by transverse fracture, representing nearly every conceivable color, and with all of its different shades. Among them are black, red, white, yellow, blue, purple, and lavender; and each piece shows some resemblance to wood, though all are as hard as adamant. There are sections that appear as if decayed, and piles of smaller pieces that look enough like chips to tempt one to try a match on them; but picking up one of these bits, he finds it almost as heavy as so much lead and as dense as a piece of flint. The mineralogist, analyzing these fragments, finds in them chalcedony, topaz, carnelian, onyx, agate, and amethyst; and if questioned, will advance the theory that each substance represented owes its existence to the state of preservation of the log at the time of its petrification, and to the stage it reached in compactness prior to being unearthed. The government, since it has declared the forest a public reserve, prohibits the removal by the visitor of any large blocks, though any one is at liberty to make a collection of smaller pieces as mementoes.

In another section of the forest the visitor finds the famous natural bridge; a huge, petrified tree trunk spanning a cañon-like ravine fifty feet wide—a bridge of agate and jasper overhanging the only clump of living trees within the forest's borders. Each end of the log is embedded in shale and sandstone, leaving one hundred feet of it either wholly or partly exposed. How much of its length still remains completely buried is unknown, but each year the action of the elements brings more into view. So far, time has graciously spared the integrity of this natural curiosity, but in the last few years the log has begun to show signs of yielding to the natural inclination of petrified trees, and in several places transverse cracks appear. Fearing that the bridge would tumble to destruction, the government has recently had two stone abutments erected under it, making of it a bridge of three spans. This no doubt will preserve it for at least several years yet.

While there is a similarity between the different divisions of the forest, a drive to all portions of it will be found interesting, despite the driver's assertions to the contrary. During a recent visit to the forest, I insisted on acting as my own guide, and as a result several places hitherto unexplored were visited. At one of these almost secluded spots I found a deposit of petrified sage-brush roots—indisputable evidence that the chemicals which had worked such wonders on the pine logs were equally as powerful in effect on other fibrous substance.

Here is also study for the ethnologist. Scattered about over the area covered by the Petrified Forest are the remains of a prehistoric race of people—the fast-disappearing remains of that race of people known as Aztecs, that once inhabited Mexico and the southwestern part of the United States. There are crumbling walls of ancient habitations, broken bits of curiously painted pottery, and on the large rocks of a nearby cliff strange and as yet uninterpreted hieroglyphics. Drifting sand has nearly buried the old walls, but for the opportunity of studying this ancient masonry many of them have recently been resurrected. Between these old remains and the not far distant dwellings of the Pueblo Indians of to-day there is noticed a striking similarity, and the belief, now seldom disputed, is that the latter are the descendants of the Aztecs. That such is a correct belief in the matter of genealogy is evidenced also by a similarity in the pottery and the arrowheads found here. Instead of flint, however, petrified wood is used for these arrow-points, and it evidently made good ones.



Uninterpreted Hieroglyphics Near the Petrified Forest.

A PETRIFIED FOREST COVERING THOUSANDS OF ACRES.

The Western Pacific Railroad is said to be fully financed. Construction will begin without delay, and the Boca and Loyalton Railroad has been purchased.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TROLLEY.—L. LEUBNBERGER, Van Ness, N. Y. The invention relates to a trolley intended for use on electrical railway cars; and it comprises the arrangement on the pole of a pivoted harp carrying at one end the main roller and at the other end or end portion two guide-rollers, which are arranged to move toward and from each other and to carry the wire between them and which are held in active position by a spring.

SIGNAL APPARATUS.—C. B. GUNN, Collinwood, Ohio. In the present invention the improvement relates to a device for indicating low pressure in a fluid-pressure system—as, for example, an air-brake line for a railway-train—and for giving signals from the cars of the train to the locomotive. Although capable of other uses these are the principal objects for which the invention is designed.

Of Interest to Farmers.

STANCHION-OPENING DEVICE.—E. O. BERGH, Beloit, Wis. The inventor provides an effective construction whereby one or all of the stanchions may be simultaneously opened, but wherein the stanchions are independently closed. He provides means for automatically throwing a stanchion when unlocked to an open position, the open stanchion at that time being carried out of the influence of its locking device until purposely brought to a closed position, thus preventing the stall from being accidentally closed before the cow has left it.

TOOL FOR BUDDING.—H. C. WHITE, Valdosta, Ga. There is provision in this invention for a tool or implement which is easily manipulated and arranged to enable the operator to correctly gage and engirdle the tree, twig, limb, or branch to detach the bark portion carrying the bud without injury to the chit or eye of the bud and to allow of viewing the bud during the girdling operation.

BAND-CUTTER AND FEEDER FOR THRESHING-MACHINES.—H. T. MCCORMICK and S. E. MCCORMICK, Winchester, Ky. The Messrs. McCormick have made an invention in the nature of a novel band-cutter and feeder for threshing-machines designed to receive the bundles of grain on wing-shaped tables projecting laterally on each side of the throat of the threshing-cylinder and to feed these bundles under cutters which sever the bands that bind the bundles and then discharge the several bundles into a chute through which they are fed to the threshing-cylinder.

Of General Interest.

BOTTLE-WASHING BRUSH.—C. K. VOLCKENING, New York, N. Y. In this instance the invention relates to improvements in brushes employed in bottle-washing machines and in which the brush proper consists of rubber; and the object of the invention is to provide a novel and simple means for expanding the brush so as to engage all parts of a bottle interior and thoroughly clean the same.

PROCESS OF TREATING PRODUCTS CONTAINING VANADIUM, MOLYBDENUM, TITANIUM, AND TUNGSTEN.—H. L. HERRENSCHMIDT, Le Genest, Mayenne, France. In this patent the invention pertains to a process of treating ores or products containing vanadium for the purpose of obtaining vanadic acid or the vanadate of any metal, as well as alloys of vanadium with certain metals—such as nickel, iron, copper, etc.—in definite proportions. The process is equally applicable for the treatment of ores or products containing molybdenum, titanium, or tungsten.

APPARATUS FOR FORMING CEMENT TANKS.—J. T. DONAHOO, Edgar, Neb. This patent covers an improved from of a tank-forming apparatus previously patented by Mr. Donahoo. It comprises a fixed sectional cylindrical wall and an inner wall concentric with the first and arranged to move with a central mast mounted to turn. In connection with these an additional device for shaping the bottom portion of the tank is employed, said shaper being secured to the mast near the bottom, and means are provided for rotating the mast and with it the inner wall and bottom shaper.

WRENCH.—L. G. EGGER, Buffalo, Iowa. In the present patent the invention has reference to improvements in wrenches of the type having a sliding jaw, an object being the provision of a wrench of this character that will be simple in construction and so constructed that the movable jaw may be quickly adjusted.

FLOATING CURRENT-WHEEL.—P. M. WARREN, Nyssa, Ore. Mr. Warren's invention pertains to that class of wheels known as "floating current-wheels," in which the wheel floats on the surface of a running stream of water and is anchored to some stationary object, so that the current passing under the floating wheel will rotate the same and through a connection with the axial shaft will furnish power for any desired purpose.

PEN-WIPER.—R. ADDISON, New York, N. Y. The principal object of the inventor is to provide a convenient device in which the wiping-surface may be readily renewed. The wiper may be cheaply manufactured and its base inserted under a desk-pad, ink-well, or any object to maintain it securely in an upright position and convenient for the user. It may be secured to the desk by means of tacks passing through openings in the base. It is not necessary to employ both hands when cleaning a pen.

Hardware.

WRENCH.—J. MUNRO, New York, N. Y. The invention pertains to wrenches having a fixed and a movable jaw; and its aim is to provide a new and improved wrench arranged to permit quick, convenient, and minute adjustment of the movable jaw relative to the fixed jaw and to provide a long range of movement for the movable jaw to allow engaging large and small articles with firm gripping power.

Household Utilities.

PULLEY CLOTHES-LINE.—J. ROBERTS, New York, N. Y. The purpose of the invention is to provide a pulley-line and support therefor, the line being so arranged as to extend from a post, for example, to opposite sides of a window or other opening, the said line being practically in four strands, two outer strands in parallel order and two inner strands which converge at their meeting ends or where they are connected with a transverse member, all of the said strands being adapted to freely pass through suitable blocks or sheaves, each strand moving simultaneously with the others.

WATER-CLOSET BOWL.—M. D. HELFRICH, Evansville, Ind. Particularly the siphon-jet style of bowls is improved by this invention. In operation the jet will be so discharged as to avoid any splashing, and the inventor is able to construct a jet-pipe of sufficient size to reseal the closet-bowl, and thereby do away with the costly, noisy, and otherwise objectionable resealing mechanism in the tank, and at the same time avoid any exposure of the jet-pipe at the sides of the bowl.

CLEANING APPARATUS.—H. L. DORT, New York, N. Y. The aim in this invention is to provide a cleaning apparatus arranged to readily loosen dust in a carpet or other article, to suck the dust up and discharge it at a convenient place outside the room, and to permit using the apparatus on the carpet or other article without disturbing the position the article has while in regular use—as, for example, a carpet fastened to or a rug lying on a floor.

ALARM DEVICE.—T. N. DERBY, Roundlake, N. Y. One purpose of the inventor is to provide an economic alarm device adapted for attachment to the knob or door spindle of a door, whereby when the spindle is turned an alarm will be immediately sounded, and which is also adapted for use in connection with window-sashes and the like, one device being utilized for both the lower and upper sash.

Machines and Mechanical Devices.

MAGAZINE COIN-CONTROLLED MECHANISM.—H. MEYER, New York, N. Y. Mr. Meyer's object is to provide a mechanism for use on self-playing musical instruments, vending-machines, and other coin-controlled mechanisms and devices arranged to allow a person to place a number of coins into the coin-chute for the coins to successively start the machine and keep it going until the coins in the chute are exhausted.

LABELING-MACHINE.—F. C. FISHER and P. PERDIUE, Muncie, Ind. One object of the inventors is to automatically feed the article to be labeled across a suitable gum-applying device, whereby it receives a strip of gum at the portion where the ends of the label come, and thereupon to pass the gummed article into engagement with a label that will be thereby caused to be wrapped around the article, with the ends of the label lying at the gummed portion.

Prime Movers and Their Accessories.

BOILER-CLEANER.—T. J. PASCOE, Norway, Mich. The intention of the improvement is to provide a boiler-cleaner which is simple and durable in construction, readily applied to any kind of a water-tube boiler, and more especially designed for boring out the scale in the tubes to render the tubes perfectly clean in a comparatively short time.

DRY-PIPE HEAD.—H. G. CORYELL and J. E. STEPHENS, Marietta, Ga. The invention pertains to improvements in heads and valve mechanism for dry pipes in locomotives for controlling the passage of steam to the locomotive steam-chest, an object being to provide in a head a valve designed to be operated from the outside of the locomotive so that the steam may be quickly cut off from either one of the steam-chests should breakage or other accident occur to one of the chests. The valve is so arranged that it will be self-adjusting to its seats.

Railways and Their Accessories.

TRIPLE VALVE.—J. B. PURDY, Hilo, Hawaii. In this case the invention relates to a triple valve for fluid-air-brake systems, by means of which the auxiliary reservoir may be recharged almost instantly with the restoration of the normal train-line pressure, thus allowing any number of brake applications to be made in rapid succession and without the delay which ordinarily takes place owing to the time required to recharge the auxiliary reservoir in the brake systems as now applied.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. **Please state the name of the patentee, title of the invention, and date of this paper.**

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 6813.—For manufacturers of machinery for working brass.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 6814.—For manufacturers of cash registers for tradesmen.

For logging engines. J.S. Mundy, Newark, N. J.

Inquiry No. 6815.—Wanted, a mill with chilled burrs to grind iron or soft steel thread cuttings or small chips.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 6816.—For manufacturers of "peat" pressing and drying machinery.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 6817.—For manufacturers of small iron buildings, such as are used for dwellings; also dog and chicken houses.

Commercially pure nickel tube, manufactured by The Standard Welding Co., Cleveland, O.

Inquiry No. 6818.—For manufacturers of spring motors.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 6819.—For manufacturers of nickel-copper alloys.

Braze Cast Iron. See our advertisement in this paper. The A. & J. Mfg. Co., 9 S. Canal St., Chicago.

Inquiry No. 6820.—For manufacturers of tantalum wire.

I sell patents. To buy them on anything, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 6821.—For manufacturers of artificial camphor.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 6822.—For manufacturers of shoe-pegs made of wood.

Gut strings for Lawn Tennis, Musical Instruments, and other purposes made by P. F. Turner, 46th Street and Packers Avenue, Chicago, Ill.

Inquiry No. 6823.—For manufacturers of forcing and draining pumps.

We manufacture iron and steel forgings, from twenty pounds to twenty-five tons. Crank shafts of all varieties. Erie Forge Company, Erie, Pa.

Inquiry No. 6824.—For manufacturers of dumb waiters for houses.

Sheet metal, any kind, cut, formed any shape. Die-making, wire forming, embossing, lettering, stamping, punching. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 6825.—For manufacturers of any kind of amusement devices operated by dropping a coin in a slot.

WANTED.—An engineer experienced in the design, construction and use of gasoline motors for automobiles. "Address Pope Manufacturing Company, Hartford, Conn."

Inquiry No. 6826.—For the manufacture of rubber top (for mouth piece), which is inserted in top of a tobacco sack, called "Squeeze it."

WANTED.—Colonial silverware. Any one wishing to sell any authentic silver made in this country during the eighteenth century, please communicate with C. A. M., Box 773, New York.

Inquiry No. 6827.—Wanted, small drive punches suitable for making felt and pasteboard wads from ¼ to 1 inch in diameter by 32.

You can rent a well equipped private laboratory by day, week or month from Electrical Testing Laboratories. 548 East 80th Street, New York. Absolute privacy. Ask for terms and facilities.

Inquiry No. 6828.—For manufacturers of wooden gears for clocks.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, wood fiber machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 6829.—For manufacturers making commode seats of wood fiber.

Space with power, heat, light and machinery, if desired, in a large New England manufacturing concern, having more room than is necessary for their business. Address Box No. 407, Providence, R. I.

Inquiry No. 6830.—For manufacturers of sheet aluminum.

WANTED.—First-class wood-working machine hand. Must be able to read blue prints, and lay out work.

Address, by letter only,
F.M.L., Room 29, No. 38 Park Row, N. Y.

Inquiry No. 6831.—For manufacturers of calcined magnesite which has been calcined in an electric furnace.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 6832.—For manufacturers of pill-making machines.

WANTED.—A first-class Machine Shop Foreman; a man who is capable of producing work at the lowest possible cost. Must be a man of ideas and capable of hiring and handling men. Reliability first consideration. Steady position with opportunity to advance. Factory at Waterloo, Iowa. Address Manufacturer, Box 773, New York.

Inquiry No. 6833.—For manufacturers of machines to make very fine powders of roots, drugs, seeds with swifts.

The SCIENTIFIC AMERICAN SUPPLEMENT has published a practical series of nine illustrated articles on experimental electro-chemistry by N. Monroe Hopkins. The SUPPLEMENT numbers in which these articles are to be found are 1509, 1511, 1513, 1515, 1517, 1519, 1521, 1523 1525. Each SUPPLEMENT costs ten cents by mail. Munn & Co., 361 Broadway, New York.

Inquiry No. 6834.—For manufacturers of machines to make lozenges, tablets, etc.

Splendid opening for a high-grade mechanical engineer, who has had a broad experience in managing machine shops, the manufacture of machinery, engines and metal specialties. Applicants must be in prime of life and now employed. Preference will be given to applicants who have had modern scientific training in mechanical schools of high standing. Unqualified references will be exacted. All communications received will be regarded as strictly confidential. Address
Mechanical Engineer, Box 773, New York.

Inquiry No. 6835.—For manufacturers of machines to make various sized envelopes.

WANTED.—The patents or sole agency for Britain and France, of new machines and articles used in the Brewing and Allied Trades. Highest references given and required. State best terms with full particulars to "Wideawake," care of Streets Agency, 30 Cornhill, London, England.

Inquiry No. 6836.—For manufacturers of card-board cartons for various sizes of phials.

TECHNICAL GRADUATE.—Five years' experience handling men, contracting and draughting general machinery and electrical work. Will change for permanent position where definite opportunity for promotion exists. Best reference. Age 25 years. Bayard S. Stewart, 1530 N. 20th Street, Philadelphia, Pa.

Inquiry No. 6837.—For manufacturers of machinery for a creamery.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(9629) C. M. H. asks: Could you give me simple method for treating cloth or paper for making barometer, the kind that changes color—pink for rain, blue for fair? A. A formula which recently appeared for the so-called color barometer is as follows: Cobalt chloride, 30 parts; sodium chloride, 15 parts; calcium chloride, 4.5 parts; gum arabic, 7.5 parts; water, 45 parts. Soak cloth in this solution and dry. The solution absorbs moisture from the air, and so changes color. The cobalt chloride is the substance which changes color by moisture. The cloth is not a barometer in any proper sense, but a hygrometer, since it shows the presence of moisture in the air, and not the pressure of the air.

(9630) W. H. asks: Kindly inform the writer the correct way to express 1905 in Roman numerals, as I saw it recently written MDCCCCV., and remarked that it should be written MCMV. I was told that either way was right. I thought not. This date is for a proposed building, and will be criticised if wrong. A. There are two ways of writing many numbers in the Roman notation, one by addition, the other by subtraction. Both are very ancient. Inscriptions upon milestones dating a hundred years before Christ give the subtractive mode of writing, such as IV. four, IX. nine, and so forth. The additive method was, however, much more usual, four I.'s four, VIIII. nine, and so forth. The subtractive mode of denoting numbers was always rare as compared with the additive method of writing them. MCMV. and MDCCCCV. are equally correct for the date 1905, but the longer way was the more common way of expressing the number.

(9631) A. A. G. says: Will you please answer in your notes and queries column the following? The subject under consideration is this: During last summer I constructed a dwelling house, known as a brick-veneer structure. To place the flue for the furnace I was compelled to place it toward the southwest of the building, and project it out from the veneer wall, its entire length of thirty feet, so you see it is exposed to the wind its full height. The smoke opening in the flue is 8 x 12 inches and well plastered on the inside. The furnace is connected to the flue with 14 feet of 8-inch iron pipe. The fuel used is wood, and the furnace has been in operation the past winter only. Now the trouble is this: Creosote began coming to the surface of the brick at the top of the flue, and has extended half way down to bottom, and spreading to the brick-veneer wall, that is attached to the chimney. The surface of the brick look as if they were soaked in water. What is the cause? What will stop it? Will the creosote destroy the stability of the brick and mortar? A. It is almost impossible for us to suggest the cause of your trouble from the description that you give. If the combustion of your wood in the furnace were absolutely complete, you would have no trouble from creosote. We do not believe that the creosote will injure the strength or stability of the brick or mortar.

NEW BOOKS, ETC.

ALTERNATING CURRENT MACHINERY. By William Esty, S.B., M.A. Chicago: American School of Correspondence, 1905. 8vo.; pp. 432.

The prevailing impression among men who have obtained their electrical knowledge from practice, that one must be a college graduate to be able to understand a book on alternating currents, is in most cases not far from the truth. Very few books on this important subject use simple mathematical proofs. Calculus is largely used except in such books as make it a special point to avoid this advanced subject. But these books can hardly claim to be any simpler mathematically, because the algebraic and trigonometric problems introduced are usually of the most involved character. Mr. Esty in the present work has carried the simplification a long step further by avoiding mathematics as far as possible, and where impossible, using such simple reasoning as will be clear to anyone acquainted only with the rudiments of algebra, geometry, and trigonometry. The special aim of the book is to explain first the physical theory, second the application, behavior, and operation, and third the structural details of the various apparatus. The usual tests and the calculations based on them are also explained. The volume has been prepared particularly for use by the American School of Correspondence, and, therefore, contains many examples which help to fix the matter in the student's mind.

ELECTRICAL INSTRUMENTS AND TESTING. By Norman H. Schneider. New York: Spon & Chamberlain, 1905. 12mo.; pp. 199. Price, $1.

This book describes in simple language the apparatus and formulas used in tests in the daily work of the engine room, power house, or technical school. The galvanometers, voltmeters, ammeters, rheostats, Wheatstone bridge, potentiometer, portable testing sets, etc., are described in very simple language, and the simplest formulas for their use are given. The book also has a number of tables giving the resistance of copper wire, and the increase of resistance with temperature, the natural tangents of angles, voltmeter readings and resistance tests, etc.

THE POTATO. By Samuel Fraser, Assistant Agronomist, Cornell University. New York: Orange Judd Company, 1905. 12mo.; pp. 200. Price, 75 cents.

This book is a manual for the potato grower. While the practical side of potato culture has been emphasized, much scientific information of value has also been included. The author has drawn a large amount of information from the American Agricultural Experiment Station Reports of the past fifteen years, and also from data obtained from Europe. The author himself has had a wide experience in potato culture, both commercially and experimentally in Great Britain and America. Among the subjects discussed are Soils; Rotation of Crops; Manuring and Fertilizing; Consideration of Seeds; Varieties; Planting; Management of the Growing Crop; Obstructions to Growth and Development; Sprays and Spraying; Harvesting; Storing; Production, Transportation, and Markets, and the Chemical Composition and Food Value. The book is illustrated with over fifty cuts, and there is no doubt that it will be found extremely valuable to the potato grower.

INDEX OF INVENTIONS

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AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

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Brake beam, E. Posson 788,556
Brake head, F. Sargent 788,850
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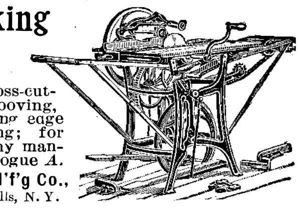

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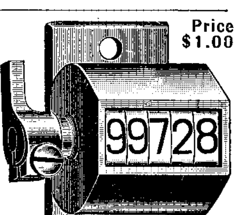

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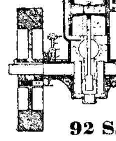

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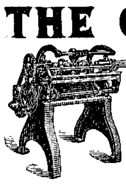

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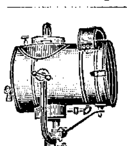

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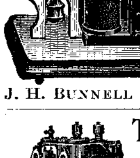

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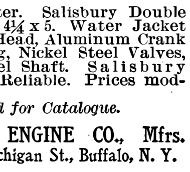

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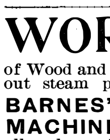

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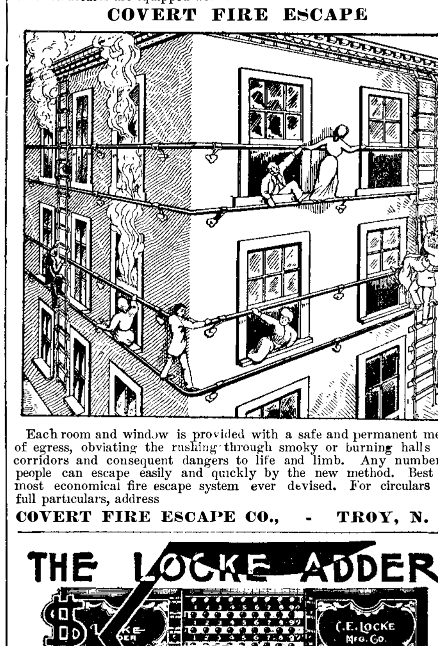

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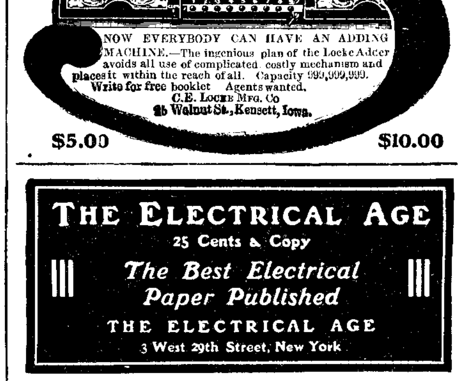

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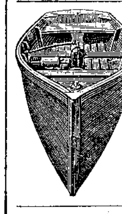

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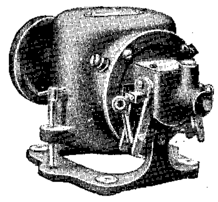

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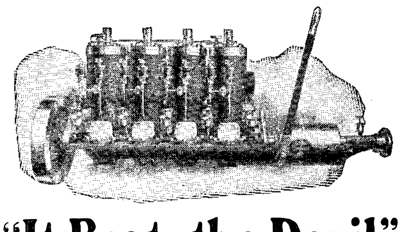

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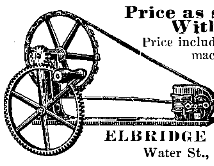

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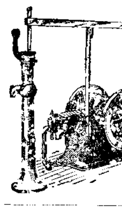

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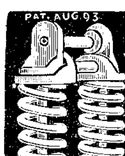

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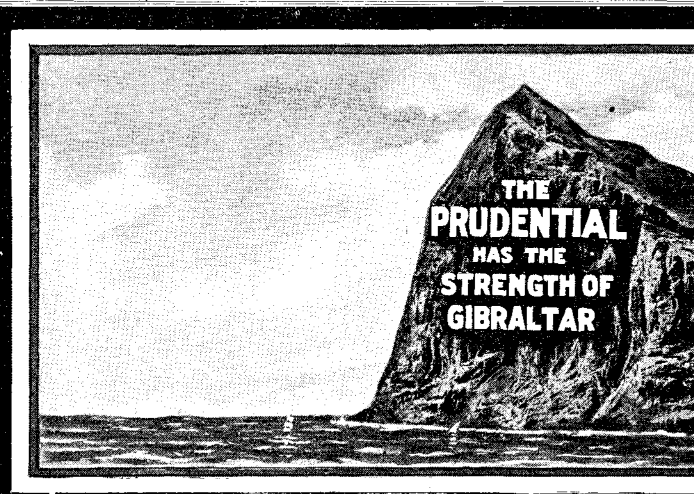

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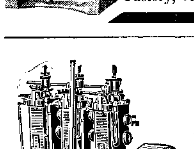

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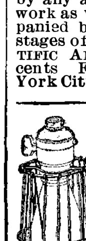

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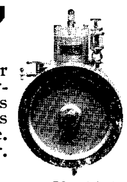

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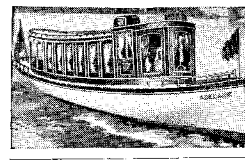

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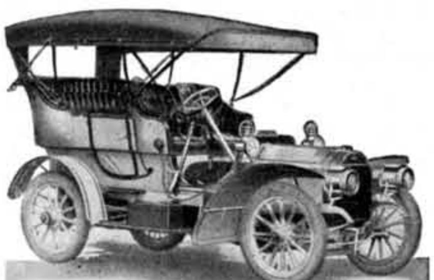

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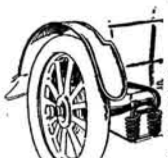

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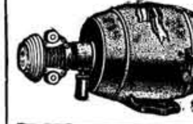

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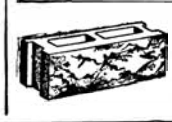

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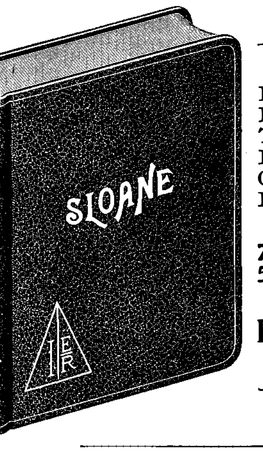

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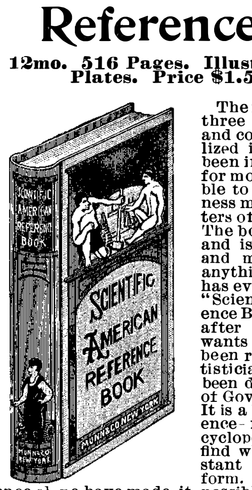

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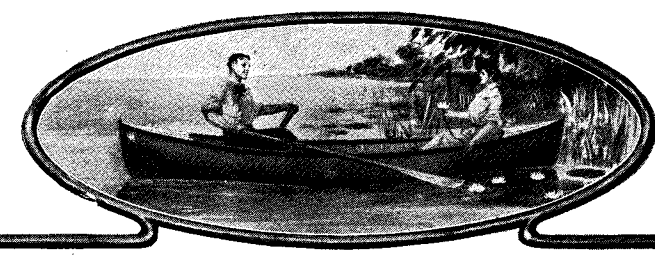

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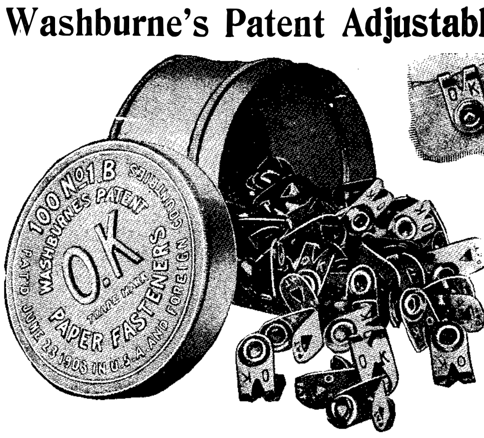

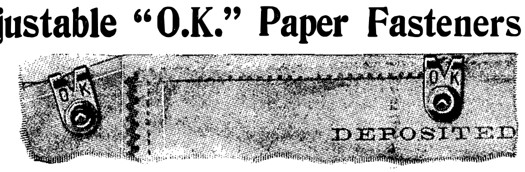

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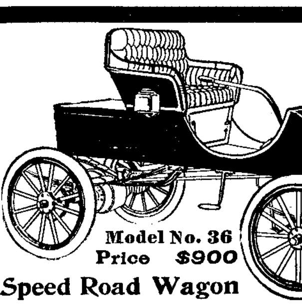

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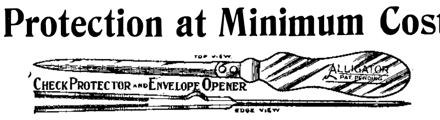

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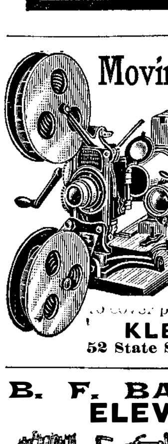

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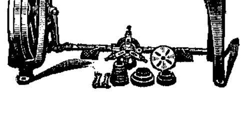

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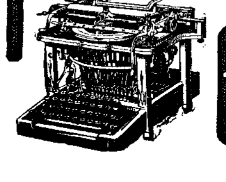

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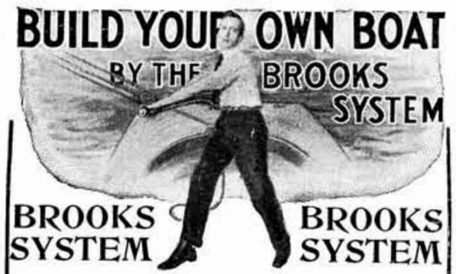

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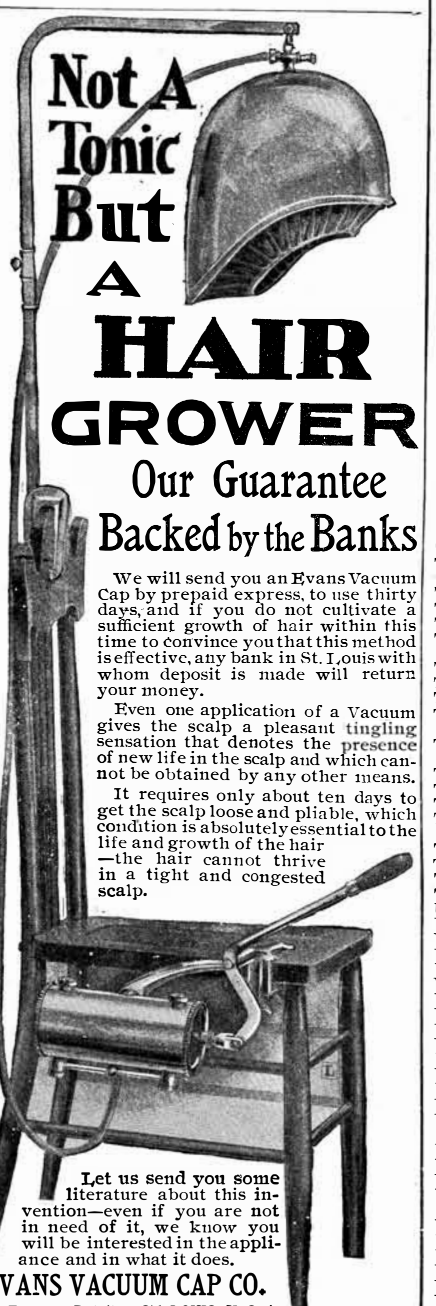

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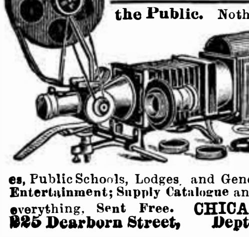

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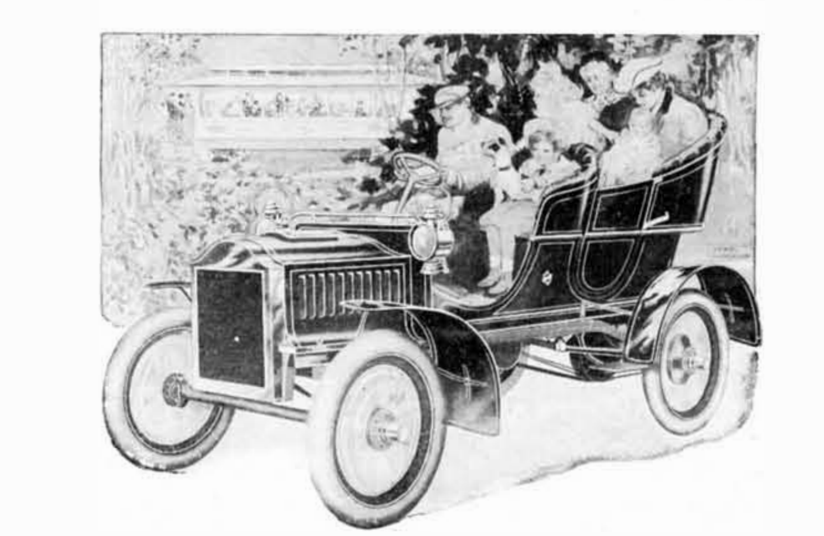

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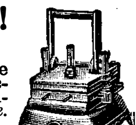

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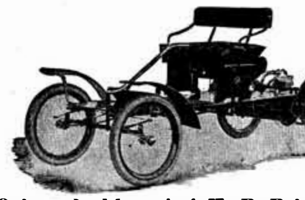
TITLE	AUTHOR	TITLE	AUTHOR
FAGAN (1st Prize)	Rowland Thomas	Georgia	John Luther Long
MANY WATERS (2d Prize)	Mrs. Margaret Deland	A Woman Laughs Last	Gordon Wilson
IN THE PROMISED LAND (3d Prize)	Raymond M. Alden	Fisherman's Luck	Jeannette Lee
Rasselas in the Vegetable Kingdom	Mrs. H. L. Pangborn	Our Buzzitski	W. S. Dunbar
The Golden Egg	Ellen Duvall	Children of Eden	Elmore Elliott Peake
The Best Man	Edith Wharton	The Meddler	Robert McDonald
Paradise Ranch	Gouverneur Morris	The Daughter of the Factory	Washington Gladden
The Golden Age of Poincarré	Stanhope Sams	Paths of Flame	Alvah Milton Kerr
The Dissembler	Mabel Herbert Urner	The Letter Written and the Letter Sent	Mabel Herbert Urner
The Haunted Bell	Herminie Templeton	Across the Boundary	Henry Wysham
Chains of Darkness	Edith Labaree Lewis	The Other Kind of Greatness	Ella Higginson
The Two-Gun Man	Stewart Edward White	The Casting Out of Adoniram Goforth	Alice MacGowan
A New Light	M. S. Kelly	Of the Honor of the Dorans	Jas. Gardner Sanderson
The Rhyme to Porringer	James Branch Cabell	But as Yesterday	George Hibbard
The Village Child	Jeannette Lee	My Father's Brother	John Farewell Moors
Mr. Chadwick's Trial Balance	Thomas Jackson	A Woodland Heritage	Alta Brunt Sembower
The Dragon-Painter	Mary McNeil Fenollosa	Billy Boy	John Luther Long
The Unearned Increment	Frederick Trevor Hill	Sailormen	Stephen French Whitman
Strone's Southerner	Charles Warren	The Fog Maiden	Cloudesley Johns
A Study in Values	Emma Kaufman	The Spring by the Water Tank	George L. Teeple
A Belated Conscience	Florence Converse	Politics and Little Pigtails	Viola Roseboro
Cecilia	Theodosia Garrison	A Frost-Nipped Romance	Alta Brunt Sembower
Lottridge	Ray Stannard Baker	On the Roof of the World	Arthur S. Pier
The System of Haddon-Brown	David Lloyd	"Daown in Missouri"	Marianne Gauss
Chance	L. C. Hopkins	The Donaghue Luck	Kate Jordan
The Valley of Sunshine and Shadow	Rowland Thomas	Arms and the Woman	Rex E. Beach
The Chief, the Child, and Mickey Sweeney	Lincoln Steffens	The Goddess of the Car	Katharine A. Whiting
Keepers of the Gate	Dr. W. Lowndes Peple	Forsaken Mountain	Samuel Hopkins Adams
The Telegram	Robert L. Beecher	The Middle Ground	Edwin Balmer
The Strategy of Shorty	Rex E. Beach	How Snorts Climbed Sourdough	Alfred E. Dickey
The Atavism of Abimelech	Frank N. Stratton	Elizabeth	Charlotte Lee Barrows
M'Liss's Child	Ella Higginson	On the Face of the Waters	Jeannette Lee
Victory	Helen Palmer	God's Way	Stella Walthall Belcher
		Saddle and Croup in Turkey Hollow	F. L. Stealey
		The Talisman	Van Tassel Sutphen

Details of the NEW Collier's Short Story Prize Competition will be sent upon request



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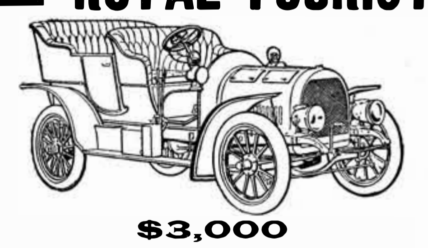

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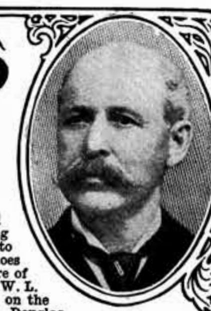

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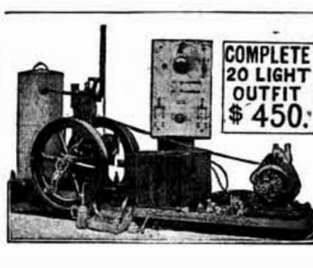

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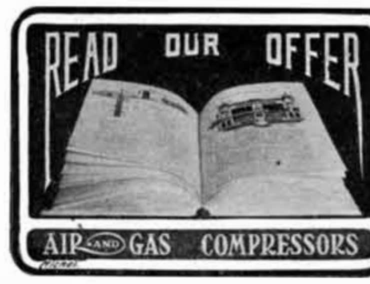

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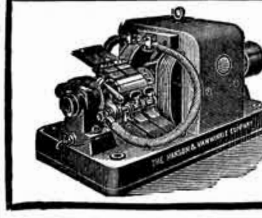

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