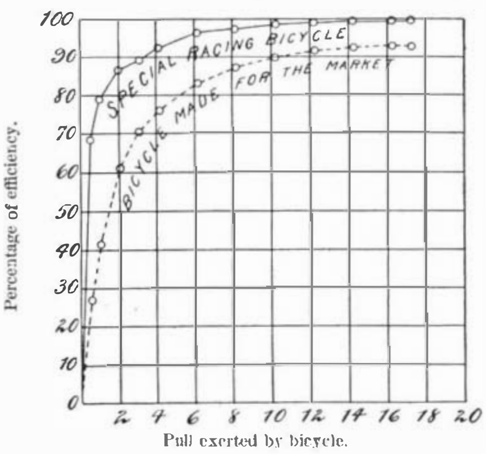
A MILE IN LESS THAN A MINUTE ON A BICYCLE.

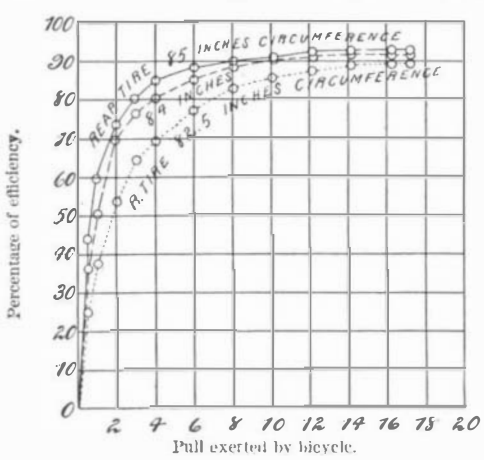
As our readers are aware, it is not the custom of the SCIENTIFIC AMERICAN to lend its columns to the announcement or discussion of feats of speed or endurance, and it is only when such performances have a distinctly scientific bearing that an exception is made. The remarkable ride recently accomplished by the bicyclist C. W. Murphy, however, who covered a mile in $57\frac{4}{5}$ seconds, has such an important bearing upon the question of air resistance, while the distance and time were surveyed and recorded by such unimpeachable authorities, that the facts are well worthy of being carefully recorded, both for their scientific value, and as data for future reference.

The Long Island Railroad, at the request of Mr. H. B. Fullerton, who is the special agent of the road and holds the position of vice-consul of the League of American Wheelmen, arranged to give Murphy an opportunity to ride a mile, paced by a locomotive, on a five-mile stretch of local track which is used only on special occasions for the transfer of trains between the two main branches of their system. Murphy, who is a well-known cyclist, has for many years been anxious to prove that if fast enough pace could be secured, a mile could be ridden within 60 seconds. His remarkable and, as the event proved, successful attempt was arranged by the railroad company as one of the attractive features of the State meet of the League of American Wheelmen, which took place a few miles further up the road, at Patchogue, Long Island, the railroad company running special trains to the scene of the trial course.

The accompanying plan and profile furnished us by the chief engineer of the railroad show the location and grades of the course. The measured mile was laid off on a straight and approximately level stretch of road about $2\frac{1}{4}$ miles in length. Three-quarters of a mile was allowed on which to get up speed and half a mile on which to slow up. The bicycle track was supported on 2 by 4-inch ties, which were cut to exact length and laid on the inner flanges of the rails. Upon these were laid five 1 by 10-inch planks, which were dressed on both edges and the upper side, and laid close together, the abutting ends being arranged to break joint on the ties. The railroad track and roadbed were of the light construction used 20 to 25 years ago, consisting of 56 pound rail laid on 6 by 8-inch ties, upon a sand and gravel ballast. The Long Island main lines are laid with 80 and 90-pound steel; but the infrequent use of the track on which the trial took place, and the slow speed at which the few trains that use it are switched from one main line to the other, does not necessitate any heavier construction. The bicycle track, of course, extended the whole $2\frac{1}{4}$ miles of the course. The mile was measured with an engineer's steel tape under the personal supervision of Mr. P. D. Ford, the chief engineer of the Long Island system, and was personally remeasured just before the race by Mr. James E. Sullivan, secretary of the Amateur Athletic Union, who acted as the referee of the trial.

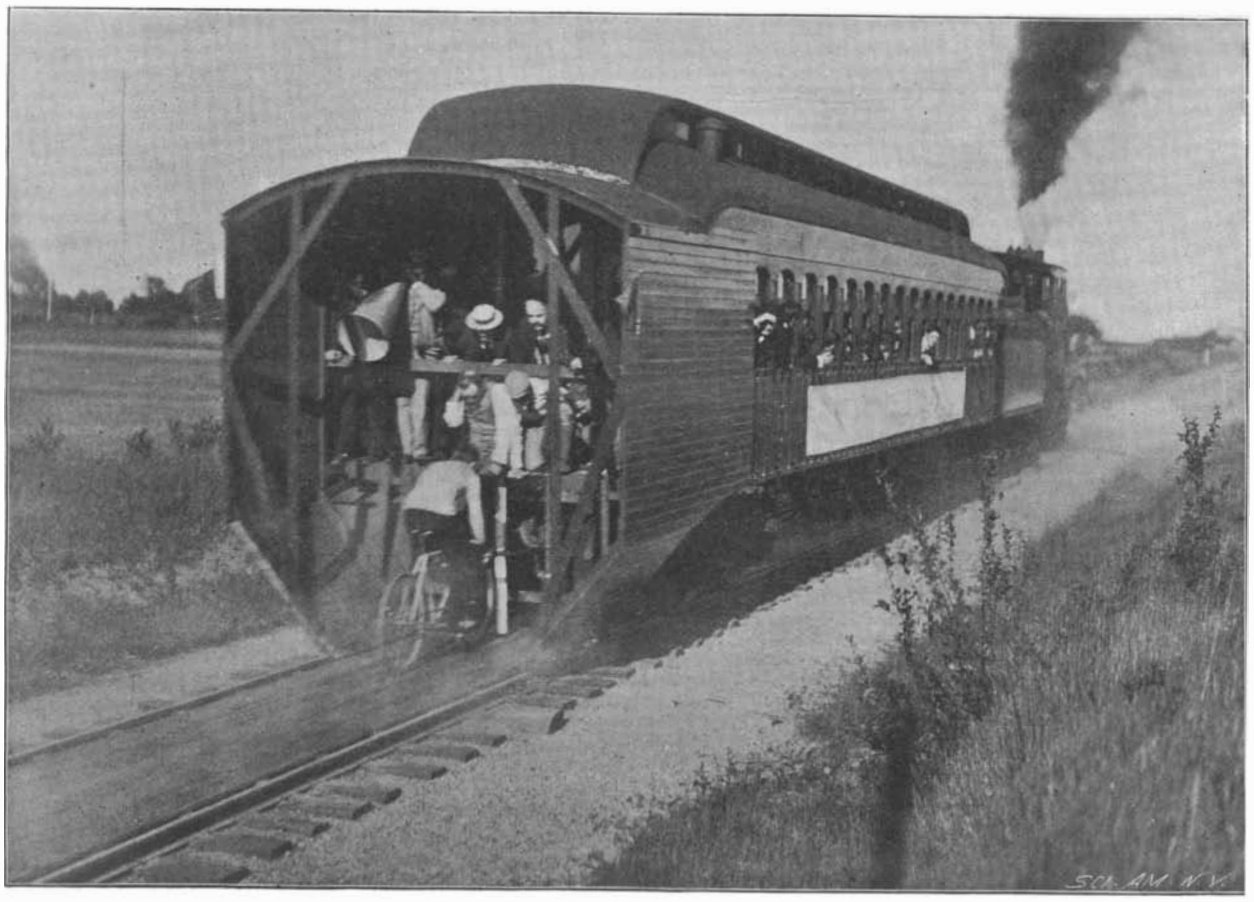


TEST OF COMMON AND RACING BICYCLES.



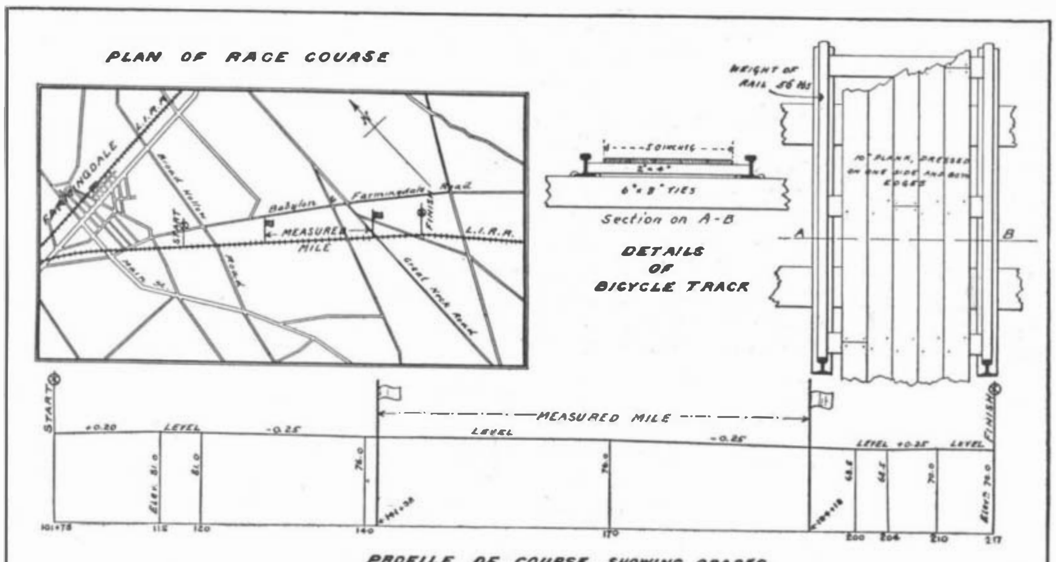
TEST OF EFFECT OF PARTIALLY DEFLATED TIRE.

The pacing outfit consisted of an engine and one passenger car, at the rear of which had been constructed a wind shield of the kind shown in the accompanying illustrations. And just here, before we describe the construction of the shield, it will be as well to state that at one time, in the preliminary preparations, it began to be a question as to whether the locomotive itself could, on so short a track, develop and hold a speed of a mile a minute. To start from rest and get up to a speed of a mile a minute in three-quarters of a mile is no easy task, even when the load consists of only one car, especially when, as in this particular instance, the first 1,500 feet of the track is on an up grade of $10\frac{1}{2}$ feet to the mile. Altogether six trials were made with three different engines. The first three were made with No. 34, one of the older engines, with 17 by 24-inch cylinders, and the results were not encouraging. The first run over the mile was made in 68 seconds, the second in 67, and the third in 62 seconds, while the steam fell from 140 to 80 and 90 pounds. Another 17 by 24 engine was tried, with the result that the steam fell from 140 to 100 pounds, the time of the trials being 68 seconds for the first and 65 seconds for second run. On the last named trial Murphy was behind the shield and held the pace very comfortably. It was then decided to use a more powerful engine with larger boiler capacity, and No. 74, with 18 by 24-inch cylinders, was given a trial. This is an 8-wheel engine of the American type, with 68-inch drivers and large firebox and heating surface. The weight on each pair of drivers is 35,000 pounds, and the total weight of engine and tender 91 tons. On the first trial No. 74 covered the mile in 56 seconds, the steam falling from 180 to 170 pounds, and Sam Booth, the engineer, was satisfied that he could take the bicyclist over the course at the speed requested, which was 58 or 59 seconds, or just within the minute.

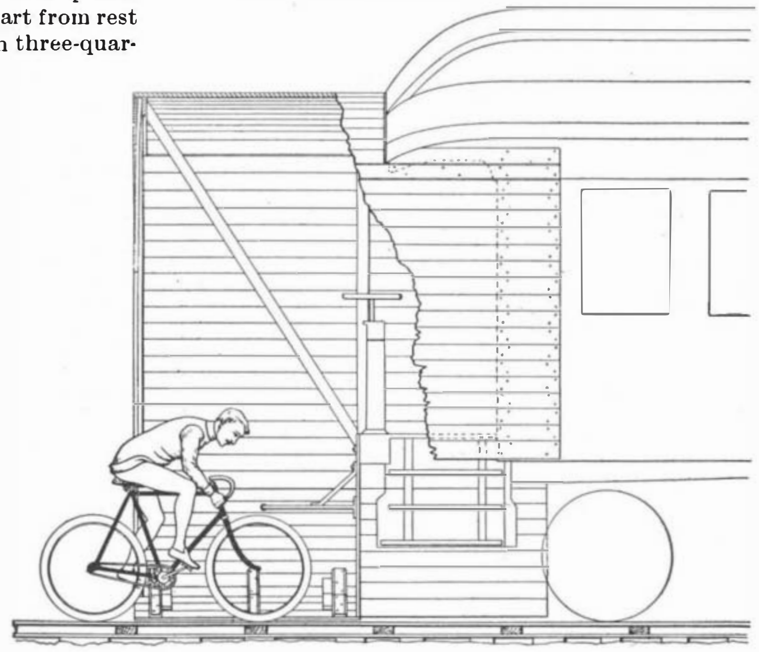


SNAPSHOT OF C. W. MURPHY DURING HIS RIDE OF ONE MILE IN 57 4-5 SECONDS.

The shield was built of 1 by 3-inch tongued and grooved sheathing, laid over a light framework of 2 by 4 scantling. It was built flush with the sides and roof of the car and extended for a distance of 5 feet beyond the rear of the platform. Below the level of the floor of the car platform its sides sloped inwardly until its bottom edges were between the rails and the board track. Projecting forward below the car platform and extending down to within an inch of the track was a plow-shaped projection which served to deflect the wind, dust, etc., to each side of the shield. The latter was thus perfectly closed at the front, top, and sides, the only entrance for air being by way of the one inch of clearance between the shield and the track. To enable the rider to keep the middle of the track a vertical strip of wood 3 inches in width and painted white was nailed to the rear of the car platform. To prevent his wheel from touching the rear of the shield a fender of 1-inch round iron projected rearwardly $2\frac{1}{2}$ feet at a height which would allow the front wheel of the bicycle to pass beneath it,



PLAN AND PROFILE OF COURSE AND DETAILS OF TRACK.



DETAILS OF WIND SHIELD.

but would cause the head of the machine to bring up against the bar, which was covered with rubber to lessen the shock.

The beginning and the end of the mile were each marked by large flags, one green and one red, and the quarters were marked by white flags, placed on the right hand side of the track. The timers, five in number, were all men who are well-known judges and timers in the various athletic gatherings in the East. They were stationed at the last five open windows of the car, and can be plainly seen in the snapshot photograph of the ride which is herewith reproduced. They carried split-seconds stop-watches, and each quarter was taken by two timers to avoid error. In the only case where they differed, the referee accepted the slower time.

The rider, who is twenty-eight years old and weighs 154 pounds, was mounted on a Tribune racing wheel, which weighed 20½ pounds, had 6½-inch cranks, and was geared to 120. For the trial ride, made in 65 seconds, he had used a 112 gear. On the car were Messrs. W. F. Potter, the general superintendent of the railroad; P. D. Ford, the chief engineer; J. H. Cummin, superintendent of bridges and buildings; H. B. Fullerton, who had charge of the trial, together with representatives of the press, and several engineers, who were interested in the scientific side of the experiment. In pulling the engine up to a mile-a-minute speed, the engineer, with one hand on the throttle and the other on the sand-lever, gave the cylinders all the steam they could use without slipping the drivers, the throttle being pulled gradually open to one-half with a ¾ cut-off. The acceleration was wonderfully rapid, and the first quarter of the mile was made in exactly 15 seconds, the last three-quarters being covered in 14⅗, 14⅗, and 14 seconds, or 57⅕ seconds for the mile. The average speed for the mile was 62·28 miles per hour, and for the last quarter the speed was 64·29 miles per hour.

Murphy kept inside the shield and within a few inches of the iron fender bar until he entered the first quarter, when it was noticed that he kept falling a foot or two back and then running up and striking the head of his wheel against the bar. He finally fell back about fifteen feet, and rode for the rest of the mile entirely outside the shell and just ahead of a perfect maelstrom of dust which whirled and eddied behind the shield. Then, as the mile flag was passed, he sprinted forward and closed up until he struck the fender, when he commenced to climb aboard the car, assisted by those on the platform, the wheel, which was held by the toe-clips, being dragged up with him.

This was certainly the first time that anyone overtook and boarded a train going at a speed of over sixty-four miles an hour.

In the trial ride of a week before, it was arranged for the rider to back-pedal when the mile flag was passed, the engineer at the same time making a final spurt to run clear, thereby allowing the resistance of the air to assist the rider in slowing up. This was done; but, as should have been foreseen, the violent eddies in the air nearly threw Murphy from his wheel, and it was, no doubt, the determination to stay within the shield on the second attempt that prevented a fatal accident.

We are informed by the rider that at no time during the ride was he working up to his full power. All went well until he entered the first quarter, when a violent vertical vibration set up in the track, "as though the boards were rapping the bottom of my wheel." At the same time, although he was riding "in perfectly still or dead air," the effort necessary to drive the wheel varied, the effect being as though he were riding over an undulating instead of a level track. Thinking that the track might be less "lively" further back from the train, he dropped back 15 feet, and here, though a slight wind resistance was felt at his sides, making harder pedaling necessary, the vibration was not nearly so marked. There is no doubt that the vibration and undulating sensation were due to the natural elasticity of a light track under the rapid passage of a 91-ton engine. The rebound of the rail joints after the passage of the train would produce a rapping effect on the plank track, and the "wave-action" of the whole track at such a high speed would easily have a retarding or accelerating effect on anything so light as a bicycle, according as the wave moved to the front or the rear of the rider.

In view of the fact that Murphy assures us he was not riding up to his full power, the question arises as to how fast a bicycle could travel if the proper pace were supplied. Probably on a rock-ballasted track, laid with 100-pound steel, where the vibrations would be greatly reduced, one of the younger racing men who are accustomed to paced riding, or Murphy himself, could cover the mile in 50 or even 45 seconds. Of the three kinds of resistance to bicycle propulsion, the internal friction and the rolling friction, as is shown by the accompanying diagrams of tests carried out by R. H. Fernald, M.E., of the Civil Engineers' Club of Cleveland, O., are very slight in a carefully constructed racing-wheel, with the tires inflated to the full limit; and in the recent trial the most serious resistance, that of the atmosphere, was entirely wanting. Hence, it is possible that Murphy is right when he says that on a perfectly quiet track a bicyclist can follow any pace the locomotive can set for him. It is more a question of rapidity of pedaling, and a cool head, than of strength and endurance. Although he was using a 120 gear, equivalent, as we showed in the special bicycle number of the SCIENTIFIC AMERICAN of May 13, to a 10-foot driving wheel covering over 31 feet at each revolution of the pedals, the rider was spinning his feet at the rate of 2·91 revolutions a second or 175 revolutions a minute.

Without disparaging in any degree the persistence and pluck of the bicyclist, the most interesting feature of the ride is the impressive object-lesson it affords as to the serious nature of atmospheric resistance on moving bodies, a question which is discussed at some length in our editorial columns.

Curio Factories.

A well-known curio expert states that there are factories in Europe for the manufacture of all kinds of works of art that are likely to attract the collector. Modern articles of china are stamped with old marks so cleverly that even experts have been deceived. Arms and armor are treated with acids which eat away the metal, thus producing the same effect as the ravages of time. Carved ivories are stained with oils to make them yellow, and are subjected to heat to make them crack. Pieces of furniture have holes drilled to represent the worm holes, and so on, until there will in time be very little in the way of curios which are in themselves really curious. Paris is one of the strongholds of this class of forgers, while in Hungary there is a factory where Dresden china is imitated in a fair manner. There is, however, one safe way, and that is to buy through reputable dealers. Forgeries in all works of art very rarely get into the dealers' hands. As a rule they are sent to auction rooms.

Many amateurs have an idea that they may pick up a priceless work of art or curio for a mere song. That is the chance for the forgers. They know all this and work accordingly, and thus the amateur is deceived. The spurious curio makers haunt out-of-the-way auction rooms, where amateurs look in with the idea that nobody but themselves can know of the room in question. The sale takes place, and they come away with a gem, so they think, and are perfectly happy until undeceived. There has, curiously enough, in this connection, lately been discovered a disease which eats away bronze and gives it a sign of antiquity. All objects of antiquity fabricated from metallic copper and its important alloy, made by adding tin in certain proportions, are liable to be attacked by this destructive corroding affection. Skilled artists of these false antiquities are known to inoculate their reproductions with spots of bronze disease.—Pottery Gazette.

Telephones of the World.

I give below, says Edward D. Winslow, United States Consul-General at Stockholm, writing to the Department of State, statistics in regard to the telephones in use in the different countries of the world, which have been carefully prepared by the statistical department of this government:

Countries.	Number of Instruments in Use.	Distance Covered, Miles.
Sweden (1897)	56,500	74,568
Norway (1897)	20,678	33,481
Denmark (1895)	10,500	9,321
Great Britain and Ireland (1894)	69,645	83,401
Holland	8,000	4,971
Belgium (1895)	9,227	16,235
Germany (1896)	151,101	147,093
Austria (1896)	21,616	46,375
Hungary (1896)	10,293	17,940
Switzerland (1897)	28,846	47,594
France (1894)	27,736	63,230
Italy (1896)	11,991	13,049
Spain	11,038	14,282
Russia	18,495	40,391
Japan	3,232	5,262
Philippines	452	592
Algiers	335	224
Tunis	200	281
United States (1896)	772,627	825,711
Cuba	1,818	1,181
Canada (1898)	33,500	44,020
Mexico (1896)	9,000	11,807
Uruguay (1896)	3,269	8,117
Total, including 9 countries not mentioned	1,288,163	1,509,499

A Vermiform Appendix Containing a Minute Piece of Bone.

Dr. Charles Phelps reported this case before the Society of Alumni of Bellevue Hospital. He stated, says The New York Medical Journal, that the attack had begun eight days before, but the patient had not come under his observation until three days before the operation. A small abscess had been found and evacuated. A perfectly smooth mass, feeling like a kidney, had been brought into the wound, and had been found to contain the appendix. Within this appendix was a minute piece of bone. The irritation produced by this foreign body had resulted in the production of this mass of inflammatory exudate. Some surgeons, he said, maintained that they had never found a foreign body in their cases of appendicitis; he had found them quite frequently, but this was the most minute one that he had met with.

Dr. Robert T. Morris said that usually the things which were called grape seeds, etc., proved, on searching microscopical and chemical examination, to be ordinary concretions of insoluble salts, mixed, in most cases, with more or less fæcal matter. For this reason one should be careful in determining this point. He had found a piece of apple core in one appendix, and it was the only foreign body that he had discovered in his cases. In one of Dr. Wyeth's cases he had seen some lemon seeds.

Miscellaneous Notes and Receipts.

Alloy White Metal Candlesticks.—Great cheapness of the metal being usually a chief condition, such compositions should be chosen in which zinc plays a chief part, e. g., zinc, 85 parts; tin, 1½ part; antimony, 3 parts; and copper, 10 to 12 parts. An addition of lead renders the alloy more easily fusible and enhances the pliancy, but prevents the formation of fine edges in the molds. Too large an admixture of copper gives the metal a yellow color. An addition of tin, even in a larger proportion than given above, is of advantage for the composition. Nickel, aluminum and bismuth are also used in large or small quantities, for the production of white metals, and frequently arsenic is added.—Dampf.

Clearing-Vat Bottoms of Bronze.—Instead of copper, Brewmaster Rüffer recommends the use of bronze as a material for the perforated bottoms in the clearing vats. As a matter of fact various essential advantages can be quoted in favor of bronze.

It is obvious that a clearing bottom will do the work so much quicker and increase the yield according to the number of holes in it. In a bronze bottom 6,700 holes per square foot may be cut, which number it is hoped to increase to 10,000, while a copper bottom can only receive 4,500 holes per square foot at most. The copper bottoms present another drawback in that they are readily scratched and bent, because copper is comparatively soft. Besides, copper oxidizes quickly, and is readily attacked by acids, for which reason it must be frequently subjected to a careful and thorough cleaning.

All these evils are precluded with the use of bronze bottoms. The metal is hard, resistive, oxidizes little and is easily kept clean and bright, features enough to give bronze bottoms the preference.—Wochenschrift für Brauerei.

Composition for Preserving Furniture.—By V. H. Soxhlet. Take small pieces of wax, white or yellow, and add oil of turpentine until the solution has the consistency of a thick paste. Of this mixture lay a piece as large as a bean upon a piece of cloth and rub it out as much as possible on the piece of furniture. Then wipe with a woolen rag.

By this process the gloss is restored to walnut furniture, to marble, to varnished metal, etc. But if this composition is to be used on articles which have a red color, the oil of turpentine must be colored before adding the wax, by soaking some alkanet in it, until the oil turns a deep violet. If the gloss is to be restored to mahogany, the oil must be dyed only slightly, because this wood has a tendency to become brown in time; bird cherry wood, however, bleaches in the course of time, hence for this the oil must be strongly colored.

It is well to use of this mixture only a piece of the size of a bean at a time. If more is taken, it is necessary to rub a longer time. Hence, it is better to put on a second thin layer and to repeat the operation several times. This requires more time, but is less tiring and gives a better gloss. After rubbing with the woolen rag, it is well to finish rubbing with an old linen one.—Neueste Erfindungen und Erfahrungen.

Preparation of Oil Copal Varnish.—By V. H. Soxhlet. This is prepared by melting coarsely crushed copal, 240 grammes; purified oil of turpentine, 260 grammes; readily drying linseed oil varnish, 360 grammes. The copal is placed in a glazed earthen pot of sufficient size and well moistened with oil of turpentine. The pot is then closed with a lid, placed on glowing coal and left there about ¼ hour until the copal is melted. When melting commences, stir with an iron rod until the copal has dissolved completely. Now add boiling hot linseed oil varnish, slowly and with constant stirring, the coal fire being increased, so as to cause the mixture to bubble up a few more times, whereupon the pot is removed from the fire to cool off, and the warmed oil of turpentine kept in readiness is added.

The varnish produced in this manner is sifted through oakum, into a dry, previously warmed vessel. Before applying the varnish, the wooden articles are coated with weak glue water (size) or with linseed oil varnish, and when the ground has dried perfectly the varnish is put on uniformly with a good brush. As a rule, one coat of this varnish suffices, but if a second one becomes necessary, it should only be applied when the first one is completely dry. Later on the dry varnish is smoothed and rubbed down. The fusing of the copal may also be carried out in a glass flask surrounded with wire work. Hang the flask over a gas flame and keep it in constant motion until the copal has melted. —Neueste Erfindungen und Erfahrungen.