event of an accident, the cup can be replaced at a very small cost.

In the two small cuts we show a peculiar feature of construction of the saddle. By turning a screw at the end, any slack in the leather covering can be taken up at once. The other view shows how by turning a screw the position of the saddle can be instantly changed on the bar, as well as the tilt of the saddle arranged to suit the rider.

The Lovell Diamond cycles have been in the market for several years. All the parts are thoroughly tested before entering into the machine and extreme care is taken in the fitting. The John P. Lovell Arms Co., of Boston, make a large variety of Diamond cycles suited for ladies and children as well as gentlemen, and will be pleased to mail their new catalogue on application.

### A Peculiar Fire.

In the *Ladies' Home Journal* for January is an account of a fire from gasoline that originated in a rather peculiar manner. A lady was cleaning a Brussels carpet with gasoline. She had cleaned about one-third of the carpet when she noticed one spot that looked a little dull and which must have a little more rubbing. She says, "I gave one quick, hard rub, the cloth in my hand ignited. There was a sort of a puff, and the flames went creeping all over the carpet I had cleaned." The explanation suggested was that the friction ignited the gasoline, but no suggestion is made as to whether that was caused by raising the temperature to a high degree, as might ordinarily happen by friction or whether it was otherwise.

Professor G. D. Shepardson, of the University of Minnesota, writing to *Science* in respect to the above, says: Some of my experience in the cold, dry climate of Minnesota has suggested a very plausible explanation for this accident, which seems surprising that such accidents are not more frequent. Our sleeping room has an ingrain carpet, from which we get marked electrical experiences. On a cold morning one can hardly take a step without being strongly electrified. By shuffling across the carpet, taking only two steps, I have many times drawn a spark one-eighth of an inch long. By taking a dozen shuffling steps and touching the water faucet I have several times drawn a spark nearly one-half of an inch long. Indeed it is so common and so excessive that it is quite uncomfortable. I have several times thought seriously of getting up some arrangement for gradually dissipating the charge on one's body, so that we can avoid the unpleasant shock when using the water. It should be stated that this high degree of electrification is not an everyday experience, but it is very common when the thermometer in the room goes below 50 or 40 degrees Fah.

A similar experience is very common here when one is putting on a fur overcoat or one simply with a fur collar. The simple rubbing of the fur in putting on the coat will so electrify it that one gets a prickly sensation from the charge from the collar when it is turned up against one's neck. Quite frequently simply picking up a flannel undergarment will so electrify it that one hears a decided crackling. These experiences are very common here in Minnesota with the dry atmosphere, and are quite surprising to one accustomed to the more moist climate of New York of the seacoast.

This experience suggests at once that the gasoline in the case above noted was ignited by an electric spark caused by rubbing the carpet.

### An Unusual Foundry Experience.

A singular accident occurred recently in the foundry of the A. L. Swett Iron Works, Medina, N. Y., which seemed very mysterious.

Mr. Albert L. Swett, the proprietor of the works named, has a communication in the *American Machinist* relative to the matter.

We were melting a fifteen ton heat in a newly lined cupola, says Mr. Swett, and soon after the blast went on a number of our men were affected by gas. Out of about fifty employed in the room, seventeen were so overcome that it required prompt medical aid to restore them. They seemed to become paralyzed to a certain extent, and unable to help themselves. Some of them seemed to suffer intense agony, while others seemed more in a paralyzed condition. And from the statement of the doctors who handled the cases, it seemed to paralyze the lungs to such an extent that it was necessary to work rapidly in order to restore the action of the blood through the system. In about two hours or more, with the assistance of four physicians and what other help we could get, all were restored sufficiently to be taken to their homes, and the most severe cases were kept away from their work only four to five days.

As to what caused the gas to affect so many at this time is unaccountable. From actual experience of over twenty-five years in the business, I have never seen nor heard of anything like it before, and in conversation with old moulders they claim they never had. The moulding shop had been idle for two days. All ventilators were closed, and the gas, after putting on the blast, seemed to settle to the earth instead of going to the chimney. It was not our custom to open the ventilators until the room was warmed somewhat from the melted iron; doubtless the gas was all retained in the room.

### What Constitutes Good Vulcanized India Rubber?

An investigation has recently been conducted by Lieut. L. Vladimiroff, at the St. Petersburg Technical Institute, with a view to establishing rules or tests whereby the quality of vulcanized India rubber may be efficiently judged. It is a notorious fact that no method of chemical analysis gives reliable results for this substance. Hence the tests applied were chiefly of a physical nature. From a lengthy series of experiments the following conclusions were deduced, namely:

1. India rubber should not give the least sign of superficial cracking when bent to an angle of 180° after five hours of exposure in a closed air bath to a temperature of 125° Centigrade. The test pieces should be 6 centimeters thick.

2. Rubber that does not contain more than half its weight of metallic oxides should stretch to five times its length without breaking.

3. Caoutchouc, free from all foreign matter except the sulphur used in vulcanizing it, should stretch at least seven times its length before rupture.

4. The extension measured immediately after rupture has taken place should not exceed 12 per cent of the original length of the test piece of rubber. The test piece should be from 3 to 12 millimeters long, 3 centimeters wide, and not more than 6 millimeters thick.

5. Softness may be determined by measuring the percentage of ash formed on incineration; it may form the basis for deciding between different grades of rubber for certain purposes.

6. The vulcanized rubber should not harden under the influence of cold temperature.

These conclusions are to serve in the establishment of rules governing the introduction of vulcanized rubber in the Russian navy.—*The Electrician.*

### A LABOR-SAVING SCREW DRIVER.

The "Howard-Allard" spiral, clutch, triple bit screw driver has recently been offered to the trade in new designs, though retaining all the original valuable features of the old Allard. This tool is especially adapted for light and rapid work, and is invaluable for mechanics having large quantities of small screws to drive. There is no turning of the hand and twisting of the wrist to drive a screw, which is effected by simply pushing the handle. The tool may be used as a spiral, ratchet, or ordinary screw driver. If it is found that a screw cannot be driven to its place by use of the spiral, it is readily done by using it as a ratchet or ordinary screw driver. It is provided with three bits nicely finished, of different sizes, to enable the operator to select one to fit any size screw he may wish to use. These bits can be instantly interchanged and secured in the chuck or clutch provided for the purpose. The knurled nut of the clutch is made of steel, and the socket of steel, as is also the spindle, which is provided with four spiral grooves, which are cut deep and have square sides, and which nicely fit corresponding grooves in the extra long nut through which it passes into the handle. This gives it nearly four times the bearing surface to wear usually found in this class of tools, which have fewer spiral grooves and shorter nuts. The handle is made of thoroughly seasoned hard wood, nicely finished. The whole tool is not only attractive, but also very strong and durable.

This implement is manufactured solely for the Alford & Berkele Co., 77 Chambers Street, New York City.

### King Steam.

According to *Wieck's Illustrirte Gewerbeblatt*, the steam power at the disposal of the civilized nations was, in 1888, as follows:

| | Horse powers. | Horse powers per 100 inhabitants. |
|---|---|---|
| Great Britain | 8,200,000 | 25 |
| France | 4,520,000 | 11 |
| German Empire | 6,200,000 | 13 |
| Russia | 2,240,000 | 3 |
| Austria | 2,150,000 | 5 |
| Italy | 830,000 | 3 |
| Spain | 740,000 | 4 |
| Portugal | 80,000 | 2 |
| Sweden | 300,000 | 7 |
| Norway | 180,000 | 9 |
| Denmark | 150,000 | 8 |
| Holland | 340 000 | 8 |
| Belgium | 810,000 | 14 |
| Switzerland | 290,000 | 10 |
| Other European countries | 600,000 | 6 |
| United States of N. A. | 14,400,000 | 24 |
| Colonies | 7,120,000 | — |

According to the above table there were, in 1888, a total of 50,015,000 horse powers at the disposal of the civilized nations. The steam horse power is considered equal to three animal horse powers, and the latter to seven man powers. Hence every round million of horse powers represents not less than a thousand millions of man powers. Now, if we suppose a horse power to work, on an average, as long as a man, 1,000 millions of "man powers" are equal to 1,000 million men.

However, the civilized nations have only during the last few decennials come into the possession of these thousand millions auxiliary workmen. Although the steam engine was invented in the last century, there were, in 1840, only 1,650,000 steam horse powers in the same territory which now has over 50 millions at its disposal. Even in 1860 there were not more than 9,380,000 steam horse powers.

Now, as regards the distribution of the steam horse powers over the different countries, Great Britain leads with 25 horse powers per every 100 inhabitants, but is closely followed by the United States, with 24 horse powers per every 100 inhabitants. Next of importance, as industrial countries, are Belgium and Germany, then France and Switzerland, which are followed by the Scandinavian countries and Holland. By way of Austria are reached the countries of inferior industrial importance, of which Spain is the most prominent, while Italy ranks with Russia. However, it would be wrong to think of the greater portion of the above mentioned horse powers as being used for actually "industrial" purposes. Of the 50 millions steam horse power, only 10 millions belong to "stationary" steam engines, the remainder being divided between railroads (32 millions) and steamboats (8 millions). Hence, of the 1,000 millions auxiliary workmen who, in the form of steam engines, to-day perform service for us, not less than 800 millions are especially employed in the carrying of passengers and goods, and only 200 millions remain for industrial and agricultural purposes. It is estimated that, in 1888, the railroads of the world transported 1,430 millions tons, while 146,400,000 tons were carried by vessels, including both steam and sailing vessels. Among the articles transported by sea, coal, with 26·2 per cent, occupies the first place. Next follows wood, with 17·3 per cent; then grain, with 9·3 per cent. All other articles are of comparatively smaller importance, iron forming only 3·2 per cent of the entire transport; fabrics for clothing, 2·1 per cent; sugar, 1·8 per cent; and cotton, 1 per cent.

### Radiation Through Vacua.

The experiments of Professor Dewar upon the effect of high vacua on the radiation of heat, undertaken in the course of his researches with liquid oxygen, lead to some interesting considerations that may cause us to modify entirely our conception of radiation of the sun's heat. It has been usually taken that the long heat waves, as well the short light waves, came direct by radiation from the sun, and that consequently an enormous amount of energy was continually being dissipated. But Professor Dewar's experiment tends to show that an absolute vacuum is entirely impervious to low waves of heat radiation. Interstellar space, therefore, though transparent to light radiation, does not presumably convey heat radiation at all, and the heat waves manifest in the atmosphere are created there. We see in this the necessity for remodeling our theories upon the time required to cool the earth down; for, if space is impervious to heat radiation—as is Professor Dewar's vacuum—we need not fear cooling on this account. The interstellar space has lost one of its properties, and at a stroke, by a simple experiment, a huge proportion of the supposed available energy of the solar system disappears.

TUNNELING THE SIMPLON.—Work on the new Simplon tunnel has been commenced. When completed it will be the longest tunnel in the world. It will extend from Brieg, in Switzerland, to Isella, in Italy, and its total length will be 12½ miles. It is expected that from eight to nine years will be occupied in the construction of the tunnel.