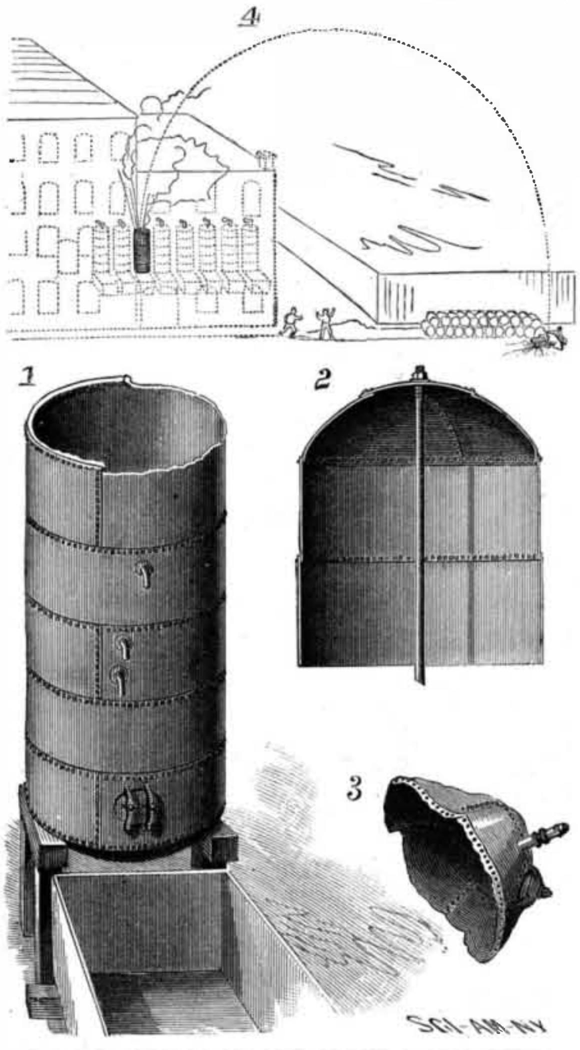
EXPLOSION OF A LARD BOILER.

A somewhat curious accident occurred on the 14th of January, at Messrs. James Morrison & Co.'s pork packing establishment, situated on the corner of Bank and Riddle Streets, Cincinnati, Ohio.

There is at the rear of the main building a lard rendering house in which are eight rendering tanks (see Fig. 1). The night man noticed a flame of fire at tank No. 3 (shown in shaded lines), and immediately had an alarm turned in, but before the engines arrived the fire had spread to such an extent as to completely envelop the tank. As the tanks are subject to steam pressure, the pressure in this one was raised above the usual point, causing it to explode with a loud report, the domed top being projected through the roof and floors, and falling about 100 yards away, on some barrels of grease, crushing one of them in its descent (see Fig. 4).



A LARD BOILER DURING, BEFORE, AND AFTER EXPLOSION.

These tanks are 6 feet in diameter and 14 feet high, and are made of about five-sixteenths inch iron, single riveted; the heads are domed outward, and are stayed by one long 1¼ inch bolt passing from head to head, secured by nuts; they are supplied with steam from a pipe passing along the line of tanks, having a regulating valve at each, and are each provided with a safety valve set at about 40 pounds per square inch.

Under ordinary circumstances these tanks are strong enough perhaps, but it is necessary to provide for all contingencies, especially when we consider that the men in immediate charge of such apparatus are not first class machinists, although they are fully competent for their work of attending to this process; it may therefore be worth while to consider how the construction of these tanks may be improved.

By reference to the cut, Fig. 2 and Fig. 3, and as stated above, the heads are domed outward and stayed as described by a bolt; the objection to this plan is that the fluctuations of pressure cause a constant buckling at the flange where the head joins the shell, which the stay does not wholly prevent, and in time the head will crack at the flange, or the shell will crack near the point of junction.

Suppose the heads were domed inward and the stay added, and perhaps radial stiffeners fastened on to heads; they would be so stiff that buckling could not take place.

The necessity for some such plan as above can be seen, when it is noticed that the heads are further weakened by each having two large man lids in them.

Although the fire burnt the beams and floors only, this tank had much fire round it; but suppose all or any of the other tanks had exploded, how many lives might have been sacrificed! As it was, only one man was injured by a falling beam, and no one killed.

A. R. P.

EXPERIMENTS WITH THE SIPHON.

Professor G. M. Clayberg, teacher of physics in the West Division High School, Chicago, sends us the following:

Some very instructive experiments may be performed in the following manner:

Take a piece of ordinary glass tubing about 5 mm. in internal diameter and one meter long. Fifteen centimeters from one end bend it to an angle of 100°, and five centimeters farther to an angle of 90°. Draw out the other end to a point, and grind off the point so as to leave a hole about one millimeter in diameter. Twelve centimeters from this end bend it twice at right angles in the same plane as the bend at the other end. Grind off the large end obliquely. When finished, the siphon will be as in the illustration.

Place the large end in a vessel of water in which a little aniline red has been dissolved, and support the apparatus high enough so that the whole siphon can be seen by all the class. Start the water, and of course it will run. Lift the siphon so that the opening of the large end is partly out of the liquid, and you will have the beautiful appearance of a succession of spaces filled alternately with the colored liquid and with air. The length of these spaces can easily be regulated by raising or lowering the siphon a very little. Again lift the siphon entirely out of the liquid until fifteen or twenty centimeters of air have entered, and then lower it into the liquid again. The long bubble of air will pass slowly down the long vertical part of the tube and then up the short and pointed arm until it reaches the small opening, when it will rush out with great velocity. The rapid escape of the air gives the liquid behind it great velocity, and when it reaches the small opening at the end of the tube it is suddenly checked, producing considerable pressure—pressure enough to throw a few drops of the liquid ten or fifteen feet high, easily seen when the drops strike the ceiling of the class room.

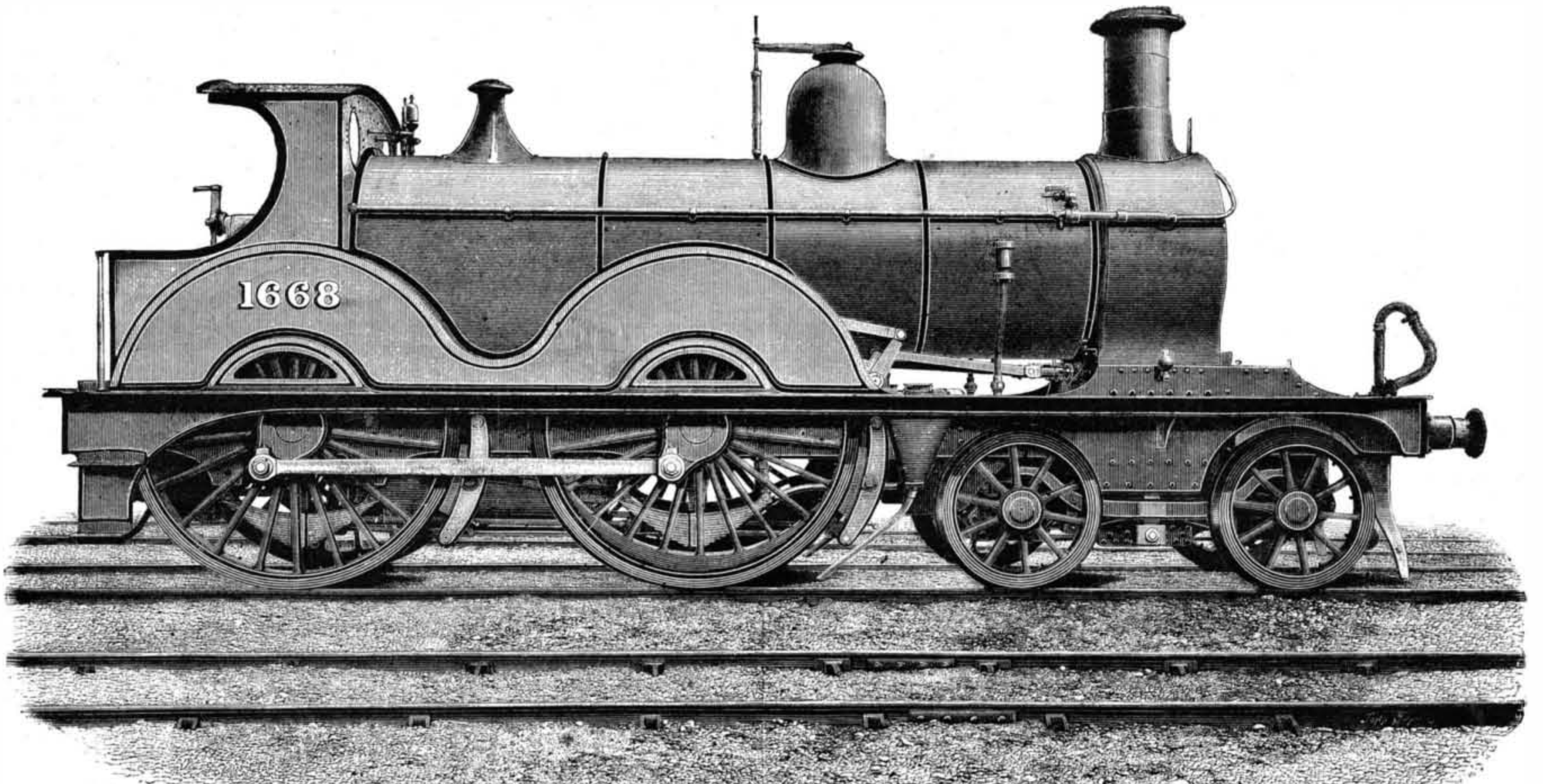
EXPERIMENTS WITH THE SIPHON.

This sudden arrest of the velocity of the flowing liquid illustrates the principle of action of the hydraulic ram.

FOUR-COUPLED BOGIE ENGINE, MIDLAND RAILWAY.

We illustrate one of several new engines of a very powerful character, put to work within a few months on the Midland Railway, England. They have been designed by Mr. Samuel Johnson, locomotive superintendent of the Midland Railway, and were built under his supervision at the Derby works of the company. The cylinders are 19 inches in diameter, and the valves are placed on top, there being no room between them, and are worked by Joy's valve gear, which is now being very largely employed for locomotives.

These engines are employed in working the express traffic between London and Nottingham, the fastest traffic in the world, the average speed being, says the *Engineer*, 53·5 miles an hour, with loads of nine to ten coaches. The consumption is only 27 pounds to 29 pounds per mile, of common Derbyshire coal. The heaviest gradients are 1 in 119 for 3½ miles, and about 5 miles of other gradients of 1 in 162 to 1 in 177. These engines also work the Leeds and Derby mail with sixteen to eighteen coaches; speed, 45 miles an hour, with



FOUR-COUPLED EXPRESS LOCOMOTIVE, MIDLAND RAILWAY, ENG.

a bank of 5½ miles of 1 in 100 on the line between Sheffield and Dronfield.

The principal dimensions are as follows:

PARTICULARS OF BOGIE EXPRESS PASSENGER ENGINE, JOY'S MOTION.

	ft.	in.
Cylinders—		
Diameter of cylinders	1	7
Stroke	2	2
Length of ports	1	1½
Width of steam ports	0	1⅝
Width of exhaust ports	0	4
Distance apart of cylinders center to center	2	0
Lap of slide valve	0	1⅛
Lead of slide valve	0	3/16
Motion—		
Diam. of piston rod (steel)	0	2¾
Length of slide blocks	0	10
Length of connecting rod between centers	6	2¾
Wheels and Axles—		
Diameter of driving wheel on tread	7	0
Diameter of trailing wheel on tread	7	0
Diameter of bogie wheels on tread	3	6
Distance from center of bogie to driving	10	0
Distance between centers of bearings	3	7
Tires—		
Thickness of all tires on tread	0	2¾
Width of all tires	0	5½
Frames—		
Distance apart at leading end	3	11¾
Ditto at trailing end	4	1½
Thickness of frames (iron)	0	1
Boiler—		
Center of boiler from rail	7	4
Length of barrel	10	6
Diameter of ring next to firebox	4	3
Thickness of plates (iron)	0	½
Thickness of smoke-box tube plate	0	¾
Lap of plates	0	2½
Pitch of rivets	0	1⅞
Diameter of rivets	0	13/16
Thickness of butt strips, outside	0	½
Distance from center of driving to trailing	8	6
Distance from driving to front of firebox	1	8½
Distance from center of bogie to front buffer plate	5	3
Distance from trailing to back buffer plate	4	4
Wheel base of bogie	6	0
Crank Axle (Iron)—		
Diameter at wheel seat	0	8½
Diameter at bearings	0	7½
Diameter at center	0	7½
Distance between centers of bearings	3	10
Length of wheel seat	0	6⅝
Length of bearings	0	9
Trailing Axle (Steel)—		
Diameter at wheel seat	0	8½
Diameter at bearings	0	7½
Diameter at center	0	7¼
Length of bearings	0	9
Diameter of outside coupling pins	0	3½
Length of ditto	0	3½
Throw of ditto	0	12
Bogie Axles (Iron)—		
Diameter at wheel seat	0	6½
Diameter at bearings	0	5¾
Diameter at center	0	5¾
Length at wheel seat	0	6
Length at bearing	0	9
Thickness of butt strips, inside	0	7/16
Width of butt strips	0	7½
Firebox Shell—		
Length outside	5	11
Width outside at center line of boiler	4	4
Ditto at bottom	4	½
Thickness of front plates	0	9/16
Thickness of back plates	0	½
Thickness of side plates	0	½
Distance apart of copper stays	0	4
Diameter of copper stays	0	⅞
Inside Firebox—		
Length at bottom, inside	5	3
Width at bottom, inside	3	4½
Top of box to inside of shell	1	3
Depth of box inside, front	5	11½
Depth of box inside, back	5	4½
Tubes (Copper)—		
175 diam.	0	1¾
30 "	0	1½
Total No. of tubes 205		
Thickness, 11 and 13 B.w.g.		
Diameter of exhaust nozzle	0	4⅝
Height from top of top row of tubes	0	½
Height of chimney from rail	13	1½

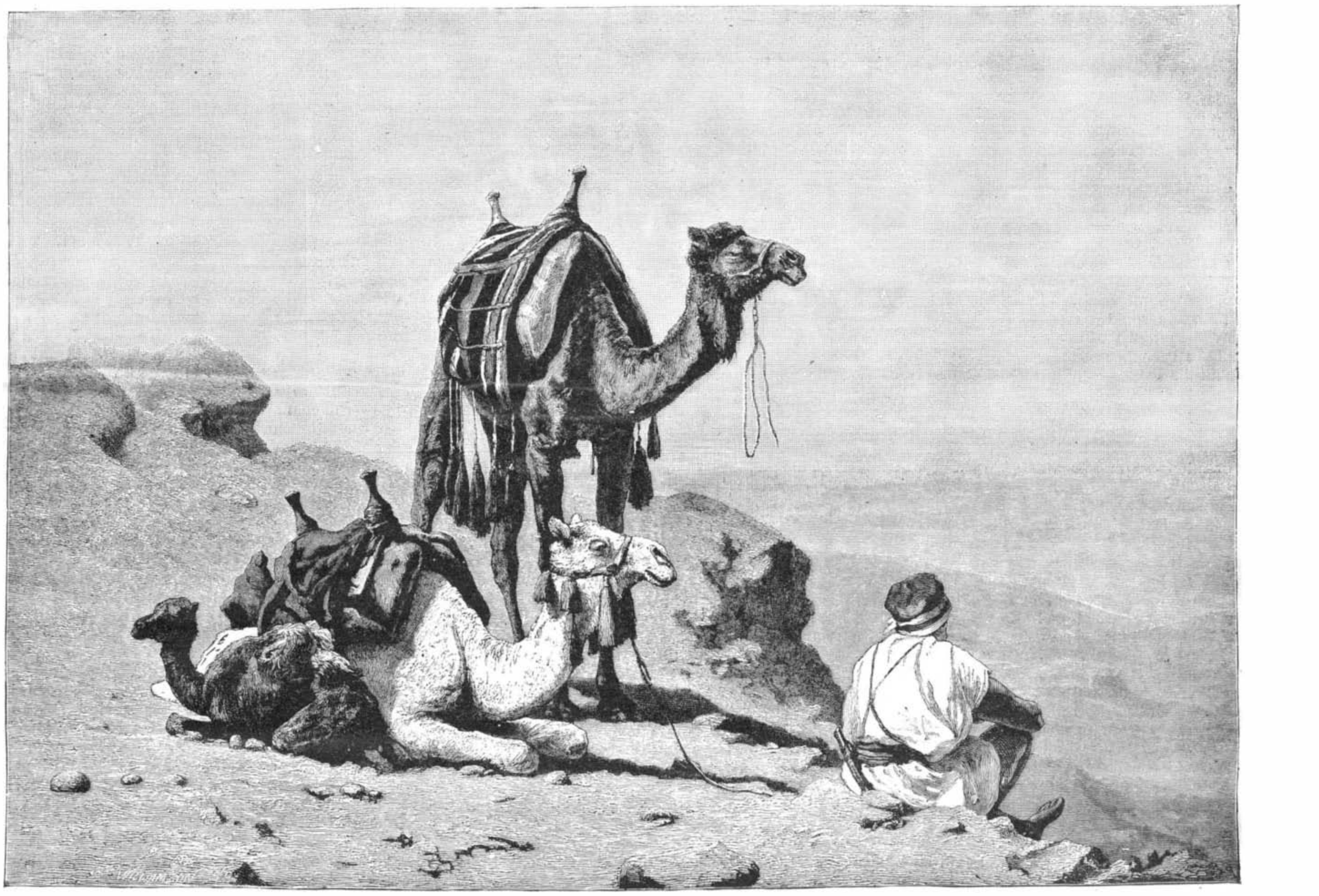
Heating Surface—	sq. ft.
Tubes	1011·459
Firebox	110·163
Total	1121·622
Area of grate	17½

	tons.	cwt.	qr.
Engine Empty—			
Bogie	13	14	2
Driving	13	12	2
Trailing	12	4	1
Total	39	11	1
Engine in Working Order—			
Bogie	14	16	3
Driving	15	0	3
Trailing	12	18	3
Total	42	16	1
Tender Empty—			
Leading	6	10	0
Middle	6	6	2
Trailing	6	0	2
Total	18	17	0
Tender in Working Order—			
Leading	10	17	3
Middle	12	5	1
Trailing	12	0	0
Total	35	3	0

	lb.
Adhesion	12,544
Tractive power at 100 lb. mean pressure	11,173

THE EGYPTIAN CAMEL SERVICE.

Those who have an idea that the desert regions of Upper Egypt and the Soudan are simply a dead level, a sort of ocean of sand, have greatly mistaken the actual physical configuration of the country. The artist in the accompanying illustration, for which we are indebted to the London *Graphic*, has sought to give us a view of the desert as it really is, the rocks and hills alternating with sandy plains to make a country rugged of aspect, where the absence of water precludes all vegetation, and the naked, glaring surface seems to almost equally forbid animal life. And this is the character of the country for hundreds of miles along both banks of the Nile, up to the great central African plateau. Long before the First Cataract is reached, at Assouan, five hundred miles above Cairo, these sterile wastes approach quite up to the river banks, and all travel over them is fraught with great labor and hardship.



A REST IN THE DESERT.—FROM A PICTURE BY C. RUD. HUBER.

The difficulty of sending soldiers through such a region was the most serious matter which presented itself to the British Government in organizing its expedition for the relief of Khartoum, and the idea of utilizing the service of camels therefor was promptly adopted by General Lord Wolseley. In the SCIENTIFIC AMERICAN of December 20 we gave an illustration and description of the equipment of this unique cavalry service, without whose aid it would hardly have been possible for the divisions of Gen. Earle and Gen. Stewart to have made their forced marches from Korti across the desert, the former toward Berber and the latter to the Nile near Shendy. In these marches and the subsequent retreat even the endurance of the camel has been severely tried, as it is quite a different thing to take a modern army over the Nubian or the Libyan desert from what it is for an Arab caravan to traverse these dreary wastes. The English soldiers have now become familiar with the characteristics of their uncouth steeds, but it is said that the closer acquaintance has not increased their estimation of his character, and he is declared to be a sulky and troublesome beast, whose use is a most disagreeable necessity.

Rhigolene.—A Local Anæsthetic.

The use of cocaine as a local anæsthetic has directed attention to the value of petroleum naphtha for similar purposes. The name rhigolene was given by Dr. H. J. Bigelow, of Boston, to a light inflammable liquid obtained by the repeated distillation of petroleum. It is probable that it is not a definite chemical compound, but it is said to be one of the most volatile bodies in existence. By using it in the form of a spray with a common atomizer, it produces a degree of cold sufficient to freeze any tissue with which it may come in contact. Dr. W. Chapman Jarvis, of New York, finds that its action is more decided than that of cocaine, although of shorter duration. Skin and mucous membranes may be divided deeply and freely without fear of pain or hæmorrhage. Its effects pass off quickly, so that the operator has to act with promptness. It is a good plan to employ it in conjunction with cocaine. When not in use, it should be kept on ice or in a cool room, tightly corked. In a warm place it would probably burst the bottle or blow out the cork. It has been accused of possessing explosive properties, but probably it is safe if not brought in contact with an open flame. It should not be used for cases which require artificial light. Very little is known about it as yet, although its properties were cursorily investigated some years ago.

Casehardening Axles.

Here, says the *Carriage Monthly*, is a brief description of the process of steel-converting axle spindles. The axles are first forged and then machined or finished in the lathe. The threaded portion is then incased in a ball of fire clay. The axles are next stood (points down) in metal boxes; the space between the axles is then filled with animal carbon, usually calcined "bone dust," to a point one inch or more above the collar. A fire is then made about the metal boxes, and kept up until the carbon ignites and penetrates the iron, the whole being at a red heat. When thoroughly charged with the carbon, and while red hot, the axles are removed and placed in the cooling vat, the water of which is most usually charged with salt, and sometimes with prussiate of potash. When cold, the spindles are straightened and riveted to the boxes, and the spindle and the inside of the box polished.