Culverts and Bridges.

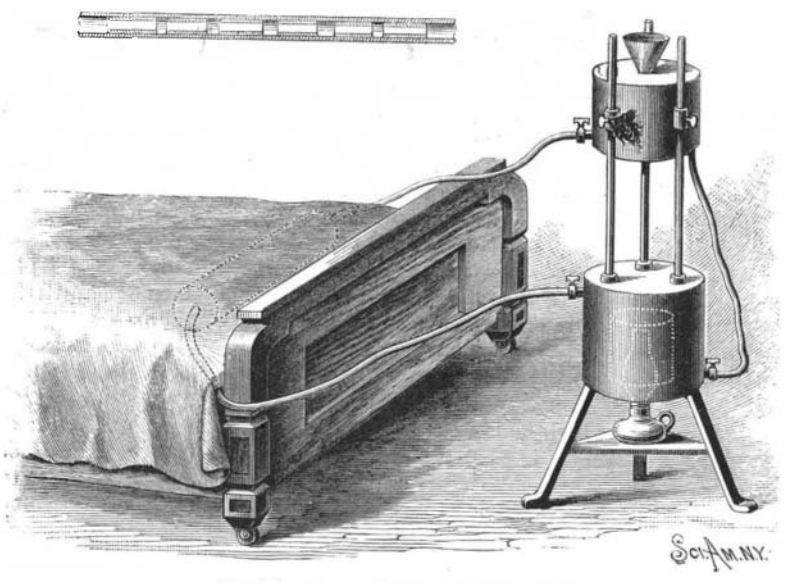
From data furnished by Mr. D. J. Whittemore, chief engineer of the Chicago. Milwaukee & St. Paul system (which had a total length of 5,688 miles on January 1, 1888), the length of open bridges on these lines was 115 91-100 miles, and of culverts covered over with embankment 39 2-10 miles. "Everything," says Mr. Whittemore, "not covered with earth, except cattle guards, be the span 10 or 400 feet, is called a bridge. Everything covered with earth is called a culvert. Wherever we are far removed from suitable quarries, we build a wooden culvert in preference to a pile bridge, if we can get six inches of filling over it. These culverts are built of roughly squared logs, and are large enough to draw an iron pipe through them of sufficient diameter to take care of the water. We do this because we believe we lessen the liability to accident, and that the culvert can be maintained, after decay has begun, much longer than a piled bridge with stringers to carry the track. Had we good quarries along our line, stone would be cheaper. Many thousands of dollars have been spent by this company in building masonry that, after 20 or 25 years, shows such signs of disintegration that we confine masonry work now only to stone that we can procure from certain quarries known to be good."

A Well of Vinegar.

A dispatch from Vincennes, Ind., says: "The mysterious vinegar well which was dug on the farm of S. W. Williams, just east of this city, has been accounted for, after much discussion by chemists and others. Some twenty years ago the farm was owned by F. M. Fay, who had an extensive orchard. The apple crop was large, and he made several hundred barrels of cider, to be converted into vinegar. While the fluid was fermenting, about one hundred barrels burst and their contents were lost. The cider sank into the ground until it reached an impervious strata of clay, where it lay until the well was dug on the same spot."

AN IMPROVED FOOT WARMER FOR BEDS.

A foot-warming apparatus designed to circulate warm water through a chamber or casing disposed at the foot of the bed, and intended to be wrapped with woolen or other cloth, is illustrated herewith, and has been patented by Mr. James A. Lewis, of St. Clairsville, Ohio. Three separate receptacles or liquid tanks are employed —a receiving tank, a heating vessel, and a foot warmer, the receiving tank resting above and supported from the heating vessel by guide clasps embracing vertical rods. From the receiving tank a hose or other suitable flexible conduit passes to the lower part of the heating vessel, from near the top of which a similar conduit passes to one end of the foot warmer, another hose connection passing from its opposite end to the supply tank, whereby a free flow and circulation is secured between the receptacles. If desired, check valves may be employed whereby the heated water will always pass in the direction from the heater to the foot warmer, etc., and be prevented from any return flow. The flexible conduits, near their connections with the foot warmer casing, have short internal re-enforcing tubular sections, as shown in the small figure, so that the pressure of the bed clothing will not prevent or retard the circulation of the heated water. The funnel-shaped outer passage into the receiving tank is closed by a removable ball valve or spherical stopper. It is designed that the lamp by which the water is heated shall have a chimney of metal or opaque material, that the room may not be lighted.

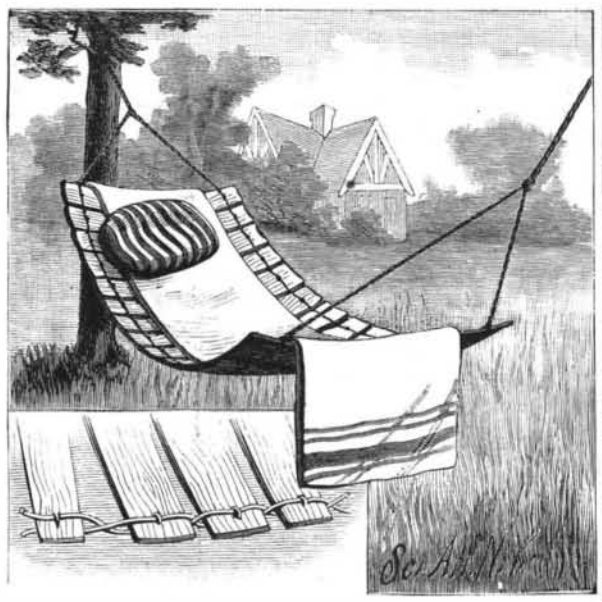


LEWIS' FOOT WARMER FOR BEDS.

Fabric and Fibre mentions an electric picking motion for looms, which is to do away with all the present mechanism called a picking motion. Should this prove true, and there is no reason why it should not, it will cause a revolution, and greatly simplify the loom.

A BARREL STAVE HAMMOCK.

We illustrate in the cut a simple method of constructing a hammock. But little explanation is required, as, owing to the simplicity, the illustration explains itself. The material used includes a number of barrel staves and some rope. The latter should be about one-half inch in diameter. It should be doubled and loosely twisted. Then a second doubling without twisting leaves it in condition for the introduction of the staves.



A BARREL STAVE HAMMOCK.

These are taken from ordinary flour barrels. Two such barrels give material for a good sized hammock. Near each end of each one of the staves a hole about one-quarter inch in diameter is bored. The ends of the staves are then inserted, as shown, in the lays of rope, between the two pieces on each side. The object of the loose twisting is to provide places for the introduction of the ends of the staves. Care must be taken to have enough twists to receive all the staves, and not to have the twisting too tight.

If preferred, the ropes may be twisted as the staves are introduced. This gives a more certain method of securing the desired mean between tight and loose twisting.

To prevent the staves from slipping out, each one is tied in place. A short piece of string is wound at each end of the stave around both ropes, passing through the hole already mentioned, and is then tied. The ends of the suspension ropes are now secured and tied or spliced into loops, and the hammock is complete.

The staves may be used of their original width, or may be split. Probably the most generally satisfactory method is not to split them. The weak point in the construction is the liability of the staves to bend and pull out of place. This, of course, is more liable to happen with split ones, which are of but one-half the normal strength.

When such a hammock is provided with a heavy rug and pillow, it surpasses in comfort the ordinary type. It can be made in a half hour, and we believe that the half hour will generally be considered well spent by the maker. Various other methods of securing the staves may suggest themselves, but the above is given as a simple and effective form.

Lightning Rods.

Some useful particulars are given in Professor Oliver J. Lodge's lectures on the "Protection of Buildings from Lightning," delivered at the Society of Arts. Referring to the tape and rod forms of conductors, it is pointed out that Faraday maintained that sectional area was the one thing necessary, and that shape was wholly indifferent; on the other hand, Sir W. Snow Harris considered that tube conductors were just as good as solid rods, and that flattened ribbon was better still. Faraday was thinking of nothing but conduction for steady currents, Harris was guided by experience. The lecturer thinks that Harris was right, and to prove this point he gives results of experiments made upon two conductors of copper of the same weight, but one in the form of wire, the other in the form of a ribbon, by which it is shown that the flattened form of conductor has the advantage over a mere round section for carrying off a charge, and with least liability to side-flash. As to the deflagration of the conductor, Mr. Preece has found that ribbon and wire are equally easy to be destroyed by a flash. Experiments have also shown that straight conductors have a tendency to side-flash, however thick they may be. No conductor, Professor Lodge says, is able to prevent it altogether, unless it is zigzagged to and fro, in which case it is found to have practically no self-induction, and side spark is nearly stopped.

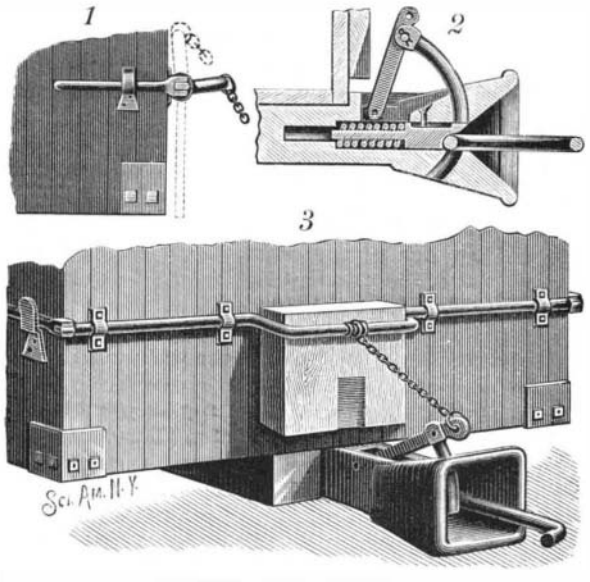
It must also be remembered that a rod of iron carries off a discharge better than a rod of copper. The discharge probably penetrates iron deeper than it does copper. Its inferior conductivity is considered even an advantage in rendering the flash slower and less dangerous. When galvanized, it can be made almost as durable as copper, and its liability to get magnetized is no objection. Prof. Lodge thinks the use of copper for lightning conductors is doomed. The lectures are full of interest for the architect. The liability of objects to be struck is shown to depend upon certain conditions—for example, whether the flash occurs from an already charged surface which has strained the air close to bursting point, or whether the flash is produced by a rush of electricity into a previously uncharged conductor too hastily for it to prepare any chosen path. These are considered, and the results of experiments given.

To Build a Chimney.

To build a chimney that will draw forever and not fill up with soot, you must build it large enough—sixteen inches square; use good brick, and clay instead of lime up to the comb; plaster it inside with clay mixed with salt; for chimney tops use the very best of brick, wet them and lay them in cement mortar. The chimney should not be built tight to beams and rafters; there is where the cracks in your chimneys come, and where most of the fires originate, as the chimney sometimes gets red hot. A chimney built from cellar up is better and less dangerous than one hung on the wall. Don't get your stovepipe hole too close to the ceiling—eighteen inches from it.

AN IMPROVED CAR COUPLING.

A coupling designed to be operated without requiring trainmen to go between the cars, and which permits of cars provided with it being also coupled with those having the ordinary link and pin drawhead, has been patented by Mr. Francis L. McNab, and is illustrated herewith. At the back end of the link socket of the drawhead is a shoulder limiting the inward movement of the link, and behind this socket is a longitudinal recess, prolonged inward by a bore, receiving a trip block and its stem, the latter surrounded by a spiral spring, as shown in Fig. 2. The forward end of the trip block is rabbeted out transversely at its lower part to provide a recess to receive the inner end of the coupling link, which thus rests beneath a tongue or lip of the block, and is held up at its outer end prior to coupling to another car, the lip also serving as a support to the curved coupling pin. The latter is pivotally connected to a pivoted drop bar, whose outer end is connected by a chain to the central cranked part of a shaft journaled across the end of the car body and provided at its outer end with crank arms, hinged to the ends of the shaft, so that when the shaft is turned to lower the coupling pin to couple two cars, the arms may be placed in latch hook supports fixed to the car body, and when lifted or disengaged from the latches the arms will swing down at the side, as shown in dotted lines in Fig. 1, the weight of the pendent arms then being sufficient to hold the coupling up to prevent coupling while shunting the cars, etc.



McNAB'S CAR COUPLING.

For further particulars with reference to this invention address the inventor, or Mr. James Playfair, Sturgeon Bay, Ontario, Canada.

THE Rosedale, an iron ocean-going steamer, has been the first to make the passage between London and Chicago, proceeding up the St. Lawrence and through the ship canal to the lakes. Though a certain amount of her cargo had to be removed to permit her to pass through the St. Lawrence Canal, yet the vessel was still drawing 14 feet on her arrival at Chicago.

Yellow Fever in Florida.

The United States Marine Hospital Bureau is informed that, about the middle of June, yellow fever reappeared at Plant City, Fla., and there was one death therefrom, June 22. Another case in the vicinity, four miles and a half from Plant City, died on the 26th. There have been several mild cases in the village, which contains less than 300 inhabitants, but for the present trains will not stop at Plant City, and it is understood that mails will be delivered at Cork post office, five miles west of Plant City. In the meantime, by the direction of the Governor, the most active measures are being taken by the president of the county board of health, Dr. J. P. Wall. The board have promulgated the following regulations concerning the epidemic:

"The board of health of Hillsborough County adopts and promulgates the following rules to prevent the spread of yellow fever at and from Plant City:

"1. Railroads passing through or into Plant City are prohibited from carrying passengers and baggage to or from Plant City, or from delivering or taking on freight, or transferring freight from the cars of one road to cars of another road at or near Plant City, except the delivery of the necessary supplies for the people living in the place. Said railroads are also prohibited from delivering or taking on the United States mail at Plant City.

"2. All employes of the railroads living at or near Plant City must be acclimated to yellow fever by a previous attack of the disease, and such employes should be enjoined to keep away from the sick, if any, and aloof from all places suspected, of being infected with yellow fever poison.

"3. These rules are substituted for rule 2 of the rules adopted and promulgated April 24, 1888."

The president of the county board of health states that:

"In explanation of the foregoing stringent rules, it is necessary to say that the board of health of Hillsborough County believes Plant City to be infected with the poison or germs of yellow fever, and inasmuch as expensive efforts to disinfect the place and stamp out the disease have failed, it is due to the public safety and welfare of the State to isolate the place and have it shunned as an infected place until such time as the board of health may deem it safe for people to go there. It is deemed absolutely necessary to suspend all business and cut off all communication with Plant City to prevent the risk of a widespread epidemic of yellow fever this summer. It is true that there is not much sickness there, and happily the large majority of the residents in the place are acclimated by a previous attack of the disease, but by visiting the place or commingling much with the people who still reside in Plant City, there is unquestionably great risk of spreading the disease. The summer is here, and the time for temporizing measures has passed. It is probable that Plant City will remain infected for some time, if not for the whole season, and hence the necessity for these stringent measures."

The Markings on Mars.

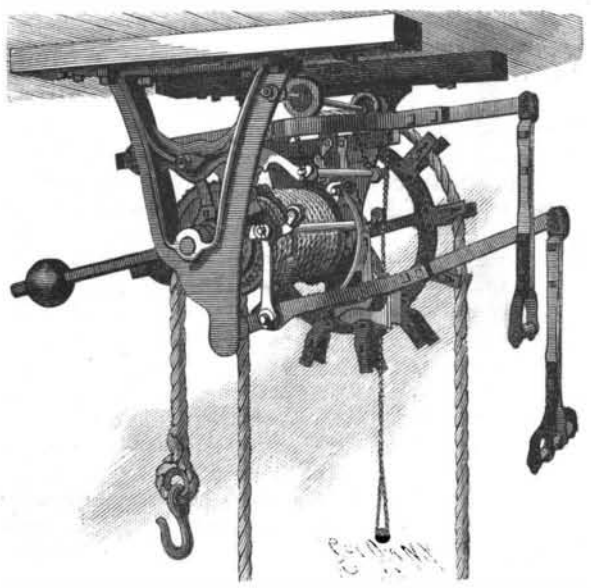
The observations of M. Perrotin at Nice, and M. Terby at Louvain, and, in England, of Mr. Denning at Bristol, have confirmed the presence on the planet of most of the "canals," or narrow dark lines, which were discovered by M. Schiaparelli in 1877, and at subsequent oppositions. M. Perrotin has also been able to detect, in several cases, the gemination or doubling of the canals, and M. Terby has observed the same phenomenon in one or two cases, but with much greater difficulty than in the opposition of 1881-82. But some curious changes of appearance have been noted. An entire district (Schiaparelli's *Lybia*) has been merged in the adjoining "sea," *i. e.*, its color has changed from the reddish hue of the Martial "continents" to the somber tint of the "seas." The district in question is larger than France. To the north of this district a new canal has become visible, and again another new canal has appeared to traverse the white north polar cap, or, according to M. Terby, to divide the true polar cap from a white spot of similar appearance a little to the south of it. With the exception of these changes, the principal markings, both light and dark, are those which former oppositions have rendered familiar.

Resorcin in Diarrhœa.

A case of severe diarrhœa controlled by the administration of resorcin is reported by Mr. G. E. J. Greene (*Lancet*, June 23, p. 1277). The patient was a boy seven years of age, and there was a history of gastric trouble and tormina on the first and second days, for which catechu, opium, chloroform, and chalk had been prescribed without benefit. A ten grain dose of resorcin in half an ounce of water every hour was then ordered, and after the fifth dose the motions were reduced in number, and from having been very offensive were rendered odorless. The dose was afterward raised to fifteen grains every third or fourth hour, and in three days the diarrhœa was completely controlled. No disagreeable after-effects were noticed.

AN IMPROVED HOISTING MACHINE.

A hoist in which an endless rope is employed for operating the hoisting wheel, and the latter is so constructed that the rope will be prevented from slipping, and will also take a hold upon the wheel to assist in hoisting, is illustrated herewith, and has been patented by Mr. Fridrich H. A. Peters, of No. 372 Bronson St., Detroit, Mich. The hoisting wheel has forked arms cast on or secured to its rim, these forks being provided with sliding blocks or jaws, each block having a projection adapted to slide in a slot in the arm of the

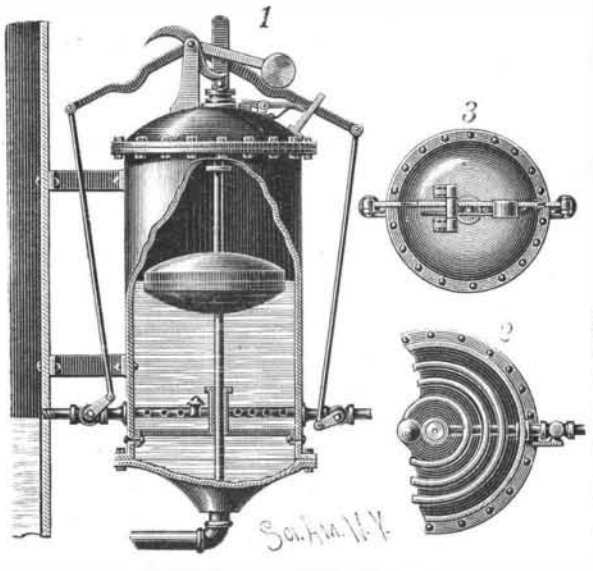


PETERS' HOISTING MACHINE.

fork, and be secured in place by a screw-held plate overlapping the slot. The length of the slot is such as to permit the blocks to slide from the base of the forks to their extremities, and in operation the blocks in the forks at the top of the wheel rest at the bottom of the forks, while at the bottom of the wheel they are at the outer ends of the arms of the forks, the hoisting rope being gradually wedged in between the blocks or jaws in traveling toward the top of the wheel, and as gradually released therefrom in its descent on the other side, the rope being thus automatically clutched and released. The machine is provided with a check cord and pawl and ratchet, for use when it is desired to release the hand hold on the hoisting rope while raising a heavy weight.

AN IMPROVED BOILER FEEDER.

A boiler feeder designed to provide for the automatic maintenance of the water in the boiler at a certain predetermined and required level is illustrated herewith, and has been patented by Mr. John E. Winder, of No. 120 Plum Street, Cincinnati, Ohio. It is made to withstand a steam pressure equal to that of the boiler. Upon a rod mounted vertically therein, and extending out through a stuffing box, is arranged a float, to move up and down upon the rod, between an upper and lower collar. Upon the top of the feeder, as shown in Figs. 1 and 3, is mounted a short shaft, supporting a double-armed lever, the extremities of the arms being connected by rods to crank arms car-



WINDER'S BOILER FEEDER.

ried by the stems of valves, one of which is in the supply pipe and the other in the pipe through which the water passes from the feeder to the boiler, the arrangement being such that when one valve is open the other will be closed. The valve in the pipe leading to the boiler is represented as closed, when, the other valve being open, the water in the feeder will continue to rise, lifting the float against the upper collar on the vertical rod. This rod has a stud bearing against the lower section of an S-shaped arm, connected to a weighted lever carried by the short shaft on top of the feeder, and the vertical movement of the rod by the float carries the arm and its weighted lever upward till the latter passes the center, when the weighted lever will drop upon the other side of the double-armed lever, closing the valve in the water supply pipe and opening the one in the pipe leading from the feeder to the boiler. A spring-pressed vent plug is provided on top of the feeder, for the escape of air from the entering water, and there is a settling chamber at the bottom, tapped by a blow-off, for the removal of impurities. To heat the water in the feeder, prior to its introduction to the boiler, a coil pipe is arranged in connection with the feed pipe, as shown in Fig. 2, the inner end of the pipe being bent upward and surmounted by a cap or housing, the steam thus diffused tending to precipitate any lime in the water. After the feeder has been filled, and the water in the boiler has reached a level lower than the feed pipe, the valves being reversed, steam passes through into the feeder, equalizing the pressure in the feeder and boiler, and putting a supply of hot water into the boiler. When the water in the feeder is lowered till the float rests upon the lower collar of the vertical rod, the other section of the S-shaped lever will be moved to throw the weighted lever upon the other side of the double-armed lever, thus closing the valve leading from the feeder to the boiler and opening that in the water supply pipe.

On the Diameter of the Fixed Stars.

As there appears to be no method known of obtaining the diameter of the fixed stars, the way is open for my suggestion, which I submit for the opinion of practical astronomers. I think I am right in theory, but the difficulties in the way of its accomplishment may be too great. The rays of light which come to us from the fixed stars must be regarded as parallel. The stars have no apparent diameter in consequence of their remoteness. Therefore angular measurement is not possible. We can imagine the existence in space surrounding every star, countless bundles or cylinders of parallel rays of light. Our aim in attempting to measure the diameter of a star must be to find the thickness of one of these bundles or cylinders, which found will obviously correspond with the diameter of the star.

The way I would suggest to do this is to utilize the motion of the earth in its orbit round the sun. A long tube or telescope must be pointed in the direction of the star whose diameter we want to measure, and must be kept parallel by suitable mechanism with its first position. I suppose it would have to be kept in this position for some weeks or months, according to the size of the star, which will very likely be something within the diameter of the earth's orbit, judging from the size of our own sun. If this can be absolutely accurately accomplished, then, when the earth arrives at one certain point in its orbit, the star will leave the field of vision. The point in the earth's orbit where observation commenced, and the direction in relation to some fixed line from earth to sun, must be noted, also the point where the star leaves the field of vision. Then the distance between the parallel lines from the star passing through these two points will be the diameter of the star.—*Capella, English Mechanic.*

Photographing the Sun.

Mr. J. C. O'Loan, of Liverpool, writes: While experimenting with a ray of sunlight in a darkened room, I had my attention directed to pinhole pictures, and am of the opinion that startling results can be obtained in photographs of the sun or moon in this way. In a room darkened by blocking up windows with thick paper, make a small hole in the paper with a "darning needle," so as to admit a ray of direct sunlight. Hold a piece of white paper in the path of the ray, 12 in. from the hole, you will have an image of the sun 1/8 in. in diameter, at 4 ft. an image of 1/2 in., and at the distance of 8 ft. from hole a 1 in. image, and so on. The size of opening used as lens does not alter the size of image at any given distance, but only its sharpness and brightness. Say the opening is 1-16 in., and gives a sharp picture at 4 ft., by enlarging the opening to one-eighth the size of the image at 4 ft. would be still the same, but unsharp, so that the screen or plate must be removed to twice the distance to obtain equal sharpness. In a room 100 ft. long, a 12 in. picture of the sun could be had, and of the moon one very much larger. A series of pipes 100 yards long for camera would give a 3 foot photograph of the sun. In fact, there is no limit to size of image but the length of camera. Perhaps some one who has more time and space at their disposal than I have may take the subject up.

A CORRESPONDENT of the *Army and Navy Journal* asks: "What is the longest piece of ordnance that has ever been successfully fired?" and receives the following answer: "If you include in the term ordnance everything that carries a projectile, we should answer fourteen miles. This is the straight tube conveying natural gas from Murrayville to Pittsburg. To clear this tube out, a projectile known as the 'gum ball' was inserted in the end at the gas well, closely fitting the interior. The gas was then turned on full force and the gum ball fired through its full length, coming out at the further end in a few minutes."