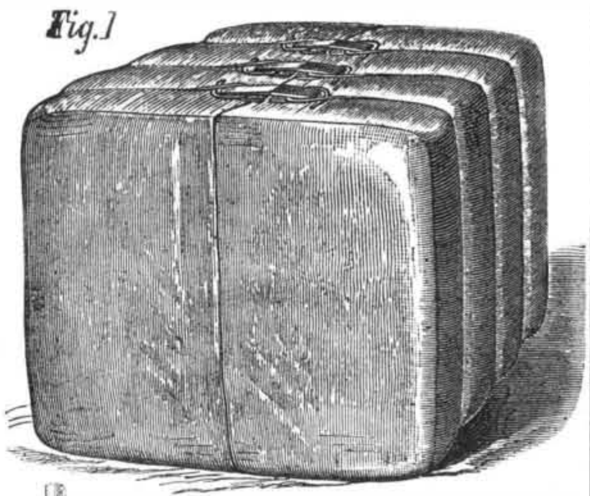
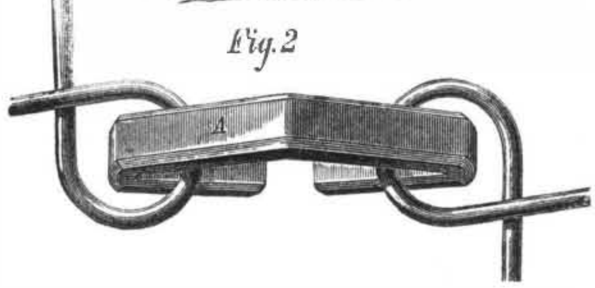
SMITH'S IMPROVED BALE TIE.

The invention illustrated herewith is a new tie designed to secure the wires used for binding hay bales. The usual mode of fastening these wires is wasteful, since about a foot on each end is employed to twist together and tuck under, so that, of the number of bands usual on each bale, fully six feet remain unutilized. Again, considerable wire is lost by cutting the bands rather than wasting the time necessary to untwist them. The present device is intended to prevent this waste, by using no more wire than is just necessary to secure the simple fastening, and, at the same time, to afford the latter of such a form as may be quickly and easily loosened





The invention consists of a double hooked piece, A, Fig. 2, having V-shaped jaws, into which the wire (size from 10 to 14) is secured. Small loops are first made on the ends of the wire, and these are slipped over the hooks while the bale is still in the press. The expansion of the bale, on its removal, draws the bands tight, and the jaw of the coupling is so constructed as to prevent the wire slipping. The ends of the wire are turned under the standing part so as to be out of the way, and are not liable to catch in transporting the bale. To unfasten the tie, it is only necessary to seize the ends of the wire with pincers and bend them back, when they will readily slip from the holes. Fig. 1 shows the bands in place on the bale.

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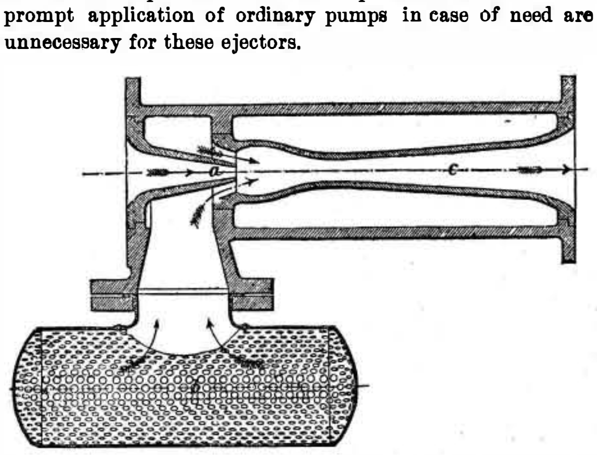
KORTING'S STEAM JET BILGE PUMP.

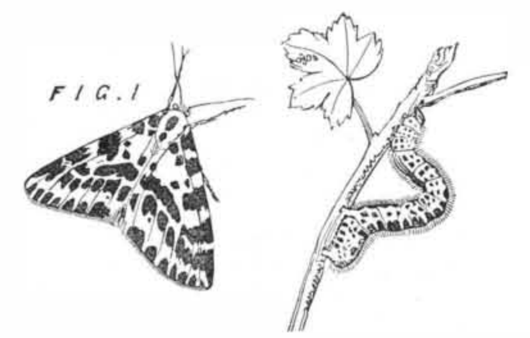
The application of an ejector to throw the water out of a ship's hold is an expensive way to attain this purpose. For the amount of steam necessary for working an ejector is found to be ten to fifteen times the amount used to do the same work by a donkey pump, or by the ordinary bilge pump in connection with the large engines. But on the other hand, it is an ascertained fact that such ejectors may be relied upon as to their never-failing surety in working, and in this respect they are most decidedly superior to most pumps in use. All those parts that oftentimes proved to be fatal to the prompt application of ordinary pumps in case of need are unnecessary for these ejectors.



In the annexed engraving a section of Körting's steam jet bilge pump is shown, the arrangement being so very simple that it hardly requires any explanation. The steam coming from the boiler enters through a nozzle, *a*, and forces the bilge water, after having passed the suction filter, *b*, through the diverging tube, *c*, whence it is discharged into the sea by means of a pipe through an opening in the ship's side. The arrows indicate the directions of steam and water.

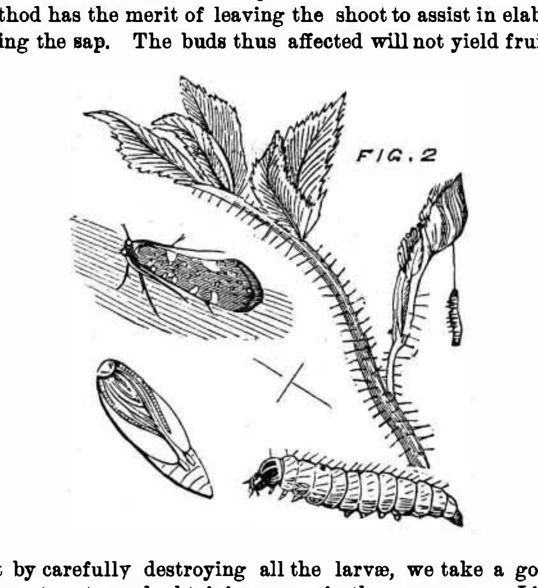
The Currant and Raspberry Moths.

A correspondent of the *English Mechanic* writes as follows: " A destructive pest among the fruit bushes is the *abraxis grossulariata*, known under the name of the gooseberry caterpillar, the magpie, or the currant moth. This moth and its caterpillar are shown in Fig. 1, and will, doubtless, be easily recognized when it is mentioned that the wings are whitish with black markings, and a few yellow blotches or stripes here and there; the caterpillar is yellow and black. The larvæ of this moth spin the leaves together in the autumn and winter, in position ready to devour the leaves as soon as they appear in spring. The remedy for this is to remove all the dead leaves from the bush in winter and burn them, or else dig, close handy, a hole at least two feet deep, into which you may rake the fallen leaves, and then remove



from underneath the bush about two inches of the top soil, putting it on the leaves in the hole, and then filling up with the soil previously removed. Tan and decayed manure, with a dusting of lime, may then be put under the bush, and the result will be found satisfactory, in freedom from early attacks of the pest, and a good crop of fruit. If, however, the bush should become infested with larvæ hatched from eggs deposited by the moth which has arrived at the perfect stage on some neighbor's domain, the best remedy is a dusting with powder of white hellebore, which is easily laid on and under the leaves by means of a muslin bag. Like most of the other garden pirates, this insect can be exterminated, as far as one's garden is concerned, by a little energy at the proper time.

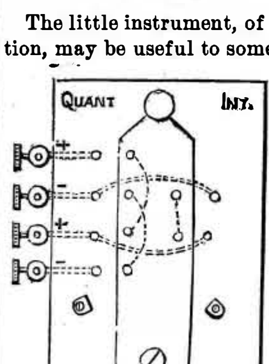
Another insect, *lampronia capitella*, also attacks currants. This moth is the raspberry grub, and is shown in various stages in Fig. 2. It is a pretty little moth, and its larva is unmistakable, being a bright red. If, on examining the young buds or shoots of the raspberry canes, we find a larva of *l. rubiella* on slitting open a bud or shoot, it will be tolerably correct to conclude that all the buds which appear to be in a similar condition are occupied by one of these destructive little pests. It will be sufficient if a sharp pinch is administered to the bud between finger and thumb, because that method has the merit of leaving the shoot to assist in elaborating the sap. The buds thus affected will not yield fruit:



but by carefully destroying all the larvæ, we take a good many steps towards obtaining a crop in the next season. Like the rose fly and the sesia on the currants, it is impossible to detect the presence of the enemy till the mischief has been done—the egg being placed in position during the preceding autumn, its presence becoming manifest only by the effects. A very good way of forestalling these and similar pests is to top dress the ground in early autumn with soot, and to dust that pungent substance freely about the fruit quarters, over leaves and everything. It is unsightly and unpleasant, but it seems to keep off a host of insects, and it is valuable as manure."

JOINING UP CELLS OF BATTERIES.

The little instrument, of which the following is a description, may be useful to some of our amateur electricians. It is a switch for joining-up cells for quantity or intensity by one movement. The engraving shows one for two cells, but it could be made for any limited number.



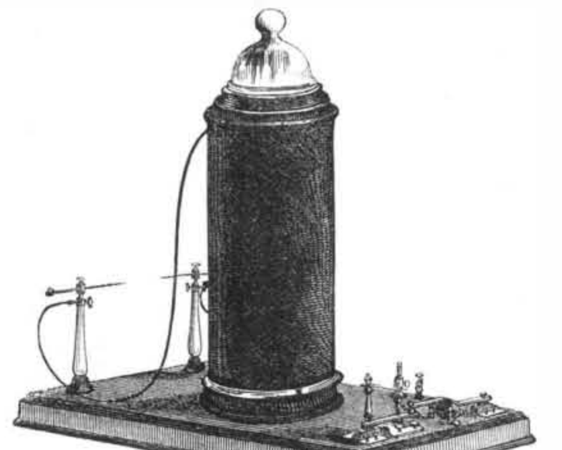
To the four binding screws are attached the wires from the cells, the line wires being fastened to the outer screws. The connections on the switch are marked in single dotted lines: the double lines represent those under the wooden slab on which the switch turns. When it is moved to the right, it joins the cells for intensity, and *vice versâ*. The small circles are brass knobs (tipped with platinum, if preferred). The rest explains itself. It may be of use on the lecture table.—*A. Trotter.*

PICRIC ACID dyes leather a good yellow without any mordant; it must be used in very dilute solution and not warmer than 70° Fah. Anilin blue modifies this color to a fine green.

THE ELECTROSTATIC OR INDUCTION COIL.

It has been proved by experiments that the quantity of electricity traversing the secondary wire of an induction coil is the same whether the current is produced by the closing or by the opening of the primary circuit. The difference between the two currents, in respect to their electromotive force, is, however, very marked, that of the opening current being far greater than that of the closing one, although, as above stated, the actual quantity of electricity is the same in both cases. The reason of this is that, when the primary or battery circuit is closed, it is opposed by the extra or self-induced current, and hence the former requires a certain length of time to attain its full force. When, however, the primary circuit is broken, the extra current is in the same direction, and therefore does not delay the action to the same extent as in the first instance. The primary current disappears almost instantaneously, or at all events in much less time than is required for it to attain its full strength. The duration of the induced or secondary current corresponds with the time occupied in the charging or discharging of the primary wire by the battery current. As the same quantity of electricity is produced in the secondary wire in each case, it is obvious that it must necessarily pass through the circuit in a shorter time at the breaking than at the closing of the primary circuit, and thus its potential or electro-motive force must be correspondingly greater.

Fig. 1.



The most striking example of this action is afforded by th electro-magnetic induction coils of Ritchie, Ruhmkorff, Ladd, and others, which are now made to produce the most powerful electrostatic effects, far surpassing those of the frictional electric machine.

The discovery of the electrostatic properties of the induced or secondary current was made by Professor C. G. Page, of Salem, Mass., who (in 1836) published the first account of an induction apparatus, consisting of a primary coil with a secondary coil wound upon it, of many times its own length. Professor Page was also the originator of the automatic circuit breaker, and of the devices for rendering the same adjustable. Ruhmkorff, of Paris, constructed in 1851 the coils which bear his name. By careful insulation of the secondary wire, he succeeded in producing sparks of nearly one inch in length, capable of charging a Leyden jar with great rapidity. Ritchie, of Boston, in 1857, vastly improved the induction coil, and in successive instruments obtained sparks of 6, 10½, and 12½ inches. The cause of the superiority in Ritchie's coils is due chiefly to an improved method of winding the fine wire coil, by which it has been found possible to use with success a wire of several hundred thousand feet in length, while the limit in the instruments as constructed by Ruhmkorff was about ten thousand feet. Fig. 1 shows the external appearance of one of Ritchie's medium sized coils, giving a spark of nine or ten inches in length.

The chief parts of this apparatus are the primary and secondary coils, an interrupter to the primary circuit, and the condenser. In the instrument shown in Fig. 1, about 68,000 feet of silk-covered wire, 0 012 of an inch in diameter, is wound upon the exterior coil. The primary or inducing coil consists of about two hundred feet of copper wire, one seventh of an inch in diameter (No. 9), the ends of which terminate in binding screws upon the base. A heavy glass bell, seen at the top of the coil, insulates the primary from the secondary circuit, its foot being turned outwards by a flange as wide as the thickness of the coil. The induction coil, for more perfect insulation, is also encased in thick gutta percha. The ends of this coil are carried by gutta-percha-covered conductors to the two glass insulating stands, seen at the rear of the instrument, where they end in sliding rods, pointed with platinum at one end, and having balls of brass at the other. The interrupter devised by Mr. Ritchie consists of a toothed wheel, which raises a spring hammer, the blows of which fall upon an anvil, breaking contact between two heavy pieces of platinum. The European induction coils are usually provided with an automatic circuit breaker, but comparative trials have shown that there is an advantage in varying the rapidity of the interruptions, according to the class of effects to be produced, and that a certain time is requisite, for the complete charge and discharge of the soft iron wires which form the core, longer than the automatic circuit breaker allows.

The object of the condenser is to destroy by induction the greater part of the force of the extra current, which would otherwise materially diminish the power of the apparatus. In the instrument shown in the figures, the condenser consists of 144 square feet of tin foil, divided into three sections (two of 50 and one of 40 feet), carefully insulated by triple folds of oiled silk and placed within the base of the instru-