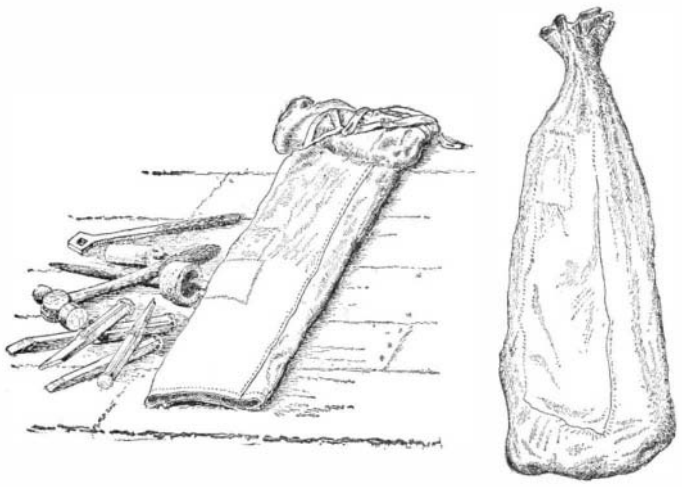
as follows: Unscrew the hot-water connection on top of the boiler, and insert a street cross; if this cannot be obtained, two street tees will answer the purpose. Then replace the hot-water connection in this cross, as before. From one of the side outlets of this cross run a pipe line to the furnace, and from the other to the gas heater. It is well to start and finish the lines with a union, as it is then an easy matter to disconnect them in case the kitchen boiler gives out, or any repairs are needed. The line from the boiler is run from top of same into the furnace, thence down through the fire pot and grate, in such a manner that it does not interfere with the proper working of the latter. Thence through the side of the ash-pit, and up to the bottom of the kitchen boiler. It is now evident that as the water in the heating pipe inside the furnace is heated, it rises, and fills the top of the boiler, forcing the cold water out at the bottom.



HOW TO CONVERT A PAIR OF OVERALLS INTO A TOOL BAG.

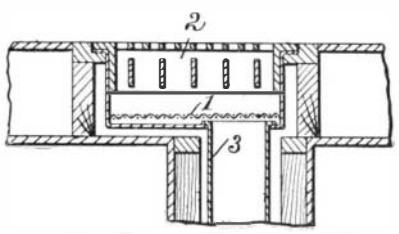
Fig. 2 shows a cross section of the heating pipe, inside the furnace. It consists of a short piece (say 2 inches) of extra heavy black pipe, threaded at each end to receive reducing caps, which connect with the pipe line. Inside this pipe is another, 1½ inches in diameter, which leaves only a small space for the water to circulate in; that is to say, the water is spread out in a very thin sheet, which very easily heats. Three small sections on top and bottom of this pipe, about ⅛ inch wide, are turned outward, so as to fit the inside diameter of the outside pipe, and thereby keep it central. Outside the furnace is placed a faucet or stop-cock, so that the sediment may be drawn off, which should be done at least once a week.

Fig. 3 shows the other arrangement of a heating pipe inside a sectional boiler. In the back of the boiler, over the fire line, drill two holes, about 3 inches above each other, into which insert the pipes, about 2 inches in diameter, reaching nearly across the entire fire space. Connect the same with a return ell, or make it up with ordinary pipe fittings. At the outside of the boiler, reduce these pipes to the regular size used for the pipe line, which is usually ¾ inch in diameter. Attach a faucet to the lower one, and connect it to the bottom, and the higher one to the top of the kitchen boiler. Care should be taken, in running the hot-water pipe from the boiler, not to trap it, that is to say, not to let it drop on the horizontal run, but rather give it as much of a rise as possible. If the run from the furnace to the boiler is very long, the hot-water pipe may be covered with asbestos or the like. A stopcock may be put in either or both lines, so that the water can be shut off, in case of repair. The gas heater is connected at the top and bottom to the top and bottom respectively of the boiler.

A SCREEN FOR THE REGISTER.

BY J. A. BROPHY.

A simple and very effective means for preventing articles dropped on the floor from falling down the hot-air pipes is shown in the accompanying illustration. Cut a piece of wire mosquito netting, 1, the size of the floor opening. By lifting out the floor register, 2, the netting can be placed over the opening in the hot air pipe, 3, as shown. Better still, bend a piece of stiff wire to the shape of floor opening, and after turning the edges of netting over this frame, sew the netting to the frame with fine wire. Galvanized wire netting is preferable to the painted netting. The writer has been able by this method to reclaim several articles of value that had dropped into a floor register.



A SCREEN FOR THE REGISTER.

THE BOILER MAKER'S TOOL BAG.

BY A. F. BISHOP.

When the boiler maker gets a rush order for repairing a boiler he gets busy. Quickly converting his overalls into a tool bag, he drops in half a dozen chisels, expander, hammer, etc., and then he is ready for action. In making the bag he places the overalls full length on the floor, folds one leg up and lays it on the seat of the overalls, then rolls the two very tightly together, criss-crosses the suspenders and ties them on the part which appears in illustration. He then puts his hand inside the leg left full length and grasps the roll and turns the whole thing inside out. This completes the bag which is ready to receive the tools, which, of course, come against the outside of the overalls, leaving the side that comes next to his garments as clean as ever.

COATING ROOFS WHITE TO REPEL HEAT RAYS.

BY A. J. JARMAN.

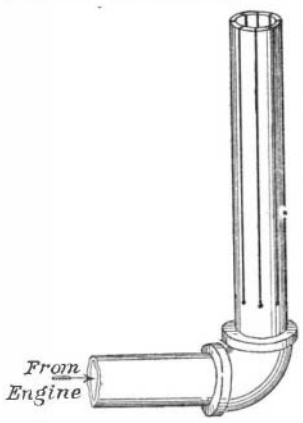
The almost general practice of painting the metal covering of the roofs of houses with the red or chocolate-colored oxide of iron, is one of the causes of the insufferably high temperature of top rooms or attics during the summer months. Although good as a covering for metal, this paint because of its color absorbs the heat rays and conducts the heat to the interior. The roof-covering material is not always metal. If tar paper or tar felt and gravel have been used, no kind of white paint will retain its color upon them. If the covering is zinc, this metal is apt to prevent the adherence of paint, particularly when new. Although white paint made with oil and driers can be used upon a roof previously covered with chocolate-colored paint, another material must be used for a tar and gravel roof. To secure a thoroughly adhesive coating upon new zinc, brush over the metal the following mixture: Sulphate of copper two ounces, chloride of copper two ounces, salammoniac two ounces, water one gallon. When the salts have become dissolved, add two ounces of spirit of salt (common hydrochloric acid). Allow this to dry upon the zinc for about twenty-four hours, when it will be found that any kind of oil paint will adhere perfectly to the zinc.

For a tar roof, use a freshly-made mixture of lime wash, moderately thick and hot. Two coats of this will adhere firmly to the tar, and retain its white color, as well as becoming very hard and resisting rain without washing off. If the lime mixture has become cold, the hardening property will be lost. In that case, to every pailful add a double handful of common salt. Stir in well until dissolved. This will revive the hardening quality. The interior of the rooms with roofs painted or lime-washed as above, will be found from ten to twelve degrees lower in temperature.

A MUFFLER FOR GAS ENGINES.

BY ALFRED P. MORGAN.

The handy man who has a gasoline engine in his shop and which exhausts outside into the atmosphere may silence that disturber of the peace somewhat in the manner shown in the accompanying illustration. It removes the sharp penetrating quality of the noise without causing any back pressure. The end of the exhaust pipe, which must be vertical in order to prevent clattering of the segments, is split into eight parts by means of longitudinal cuts made with a hack-saw. The cuts should extend for three or four feet in the pipe.



SLOTTED EXHAUST PIPE SERVES AS A MUFFLER.

TO PREVENT COAL GAS.

BY L. G. HANDY.

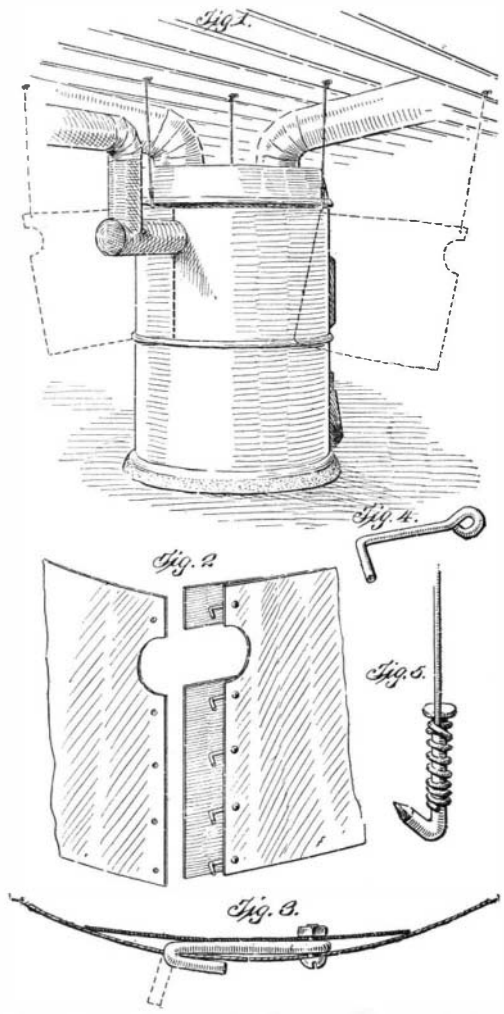
The extremely objectionable presence of coal gas in a furnace-heated house is really a simple thing to prevent. It is due, of course, to leaks in the air ducts through which the gas generated in the furnace enters and mixes with the fresh air that passes to the rooms above. To gain access to the interior of the furnace so as to stop the leaks may appear to be a task quite beyond the average amateur's capabilities, but the accompanying drawings show how the writer succeeded in doing the trick in a simple way.

The top of the furnace, carrying the heating pipes, rested upon a cast iron ring and it was a simple matter to raise the whole thing bodily by the arrangement shown. Three strong hooks were made out of large nails and under the head of each a piece of stout wire was fastened. The hooks were slipped under the iron ring. The ring was raised and the wires wound upon heavy nails driven into the beams overhead.

A 1-inch lift was sufficient and did not interfere with the heating pipes in any way, but relieved all weight from the main band of the furnace and left it free to be laid open. This was done with a pair of tinner's shears. The band was simply slit at the back where the heavy dotted line appears on Fig. 1. The two ends were spread apart and temporarily supported by wires to the rafters. The entire interior of the air box was now accessible.

Several open cracks were found. Through these the gases of combustion had passed freely into the fresh-air compartment and thence to the rooms above. A can of asbestos cement was obtained from a hardware dealer. All surplus rust was scraped off from around the cracks with an old knife and the cement was applied freely. Care was taken to squeeze enough into the cracks to insure a good hold. All cracks were treated in this way and the important part of the job was finished.

To reconnect the ends of the band five small holes were punched an inch from each of the two edges and exactly opposite each other. From a piece of heavy iron wire five hooks were bent to the form shown in Fig. 4. These hooks each measured 2 inches from the center of the eye to the bend. A strip of galvanized sheet iron about 8 inches wide was punched with holes to correspond to those in one end of the band. Small bolts, about ⅝ inch long, were used to bind all firmly together. The free ends of the hooks were now passed through the holes in the opposite end of the band and bent down. The strip of sheet metal on the inside formed an effective seal, as clearly shown by the section, Fig. 3.



METHOD OF REPAIRING A LEAK IN THE AIR DRUM OF A FURNACE.

The band being closed, the top was now lowered, and the furnace was ready for use. The whole job consumed slightly over three hours.

The cement may need to be removed next year, and, to facilitate this task of the future, the hooks were conveniently looped up into the rafters. The back may be readily reopened by bending up the ends of the hooks, and to repeat the work should not take more than an hour.

Since this job was completed, my fire has been made three times without the slightest trace of smoke or gas in the house.

In the Revue de Métallurgie, Le Châtelier advocates autogenous welding for the repairing of marine boilers. Referring to the important work that has been done, especially in Germany, in the welding of fire-boxes to boilers by the aid of water gas, he expresses the conviction that the same work could be done better by the autogenous process. A large French shipbuilding company is employing the process in order to dispense with riveted joints in the parts of boilers that are exposed to fire heat, and in one case, it is stated, the bracket supporting the grate of a boiler has been replaced by a fitting welded to the metal of the grate and of the fire-box.