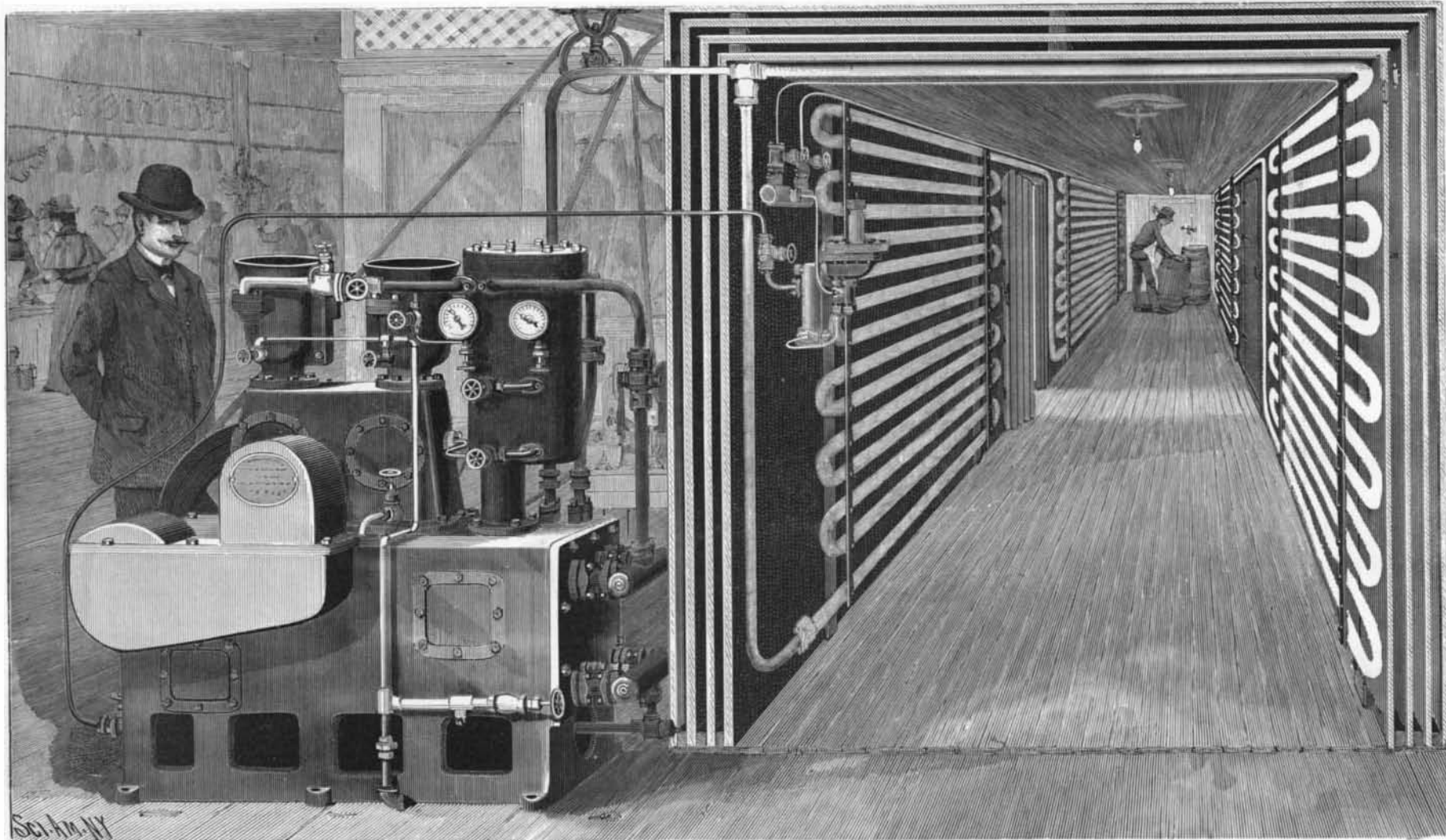


MEDIUM AND SMALL INDEPENDENT REFRIGERATING PLANTS.

It is only within the last four or five years that the makers of refrigerating machinery have turned their attention to the production of refrigerating plants

machines suitable to the requirements of a single store or dwelling were made by the makers of large machinery, and were not satisfactory. Although the laws of artificial refrigeration are unvarying, the rules governing its application will vary greatly. It is one thing

of refrigerating adopted by the Atlantic Refrigerating Company, of Springfield, Mass., who are devoted exclusively to the manufacture of medium and small sized plants of the kind above referred to. The refrigeration is accomplished by the compression, conden-



A REFRIGERATING PLANT, SHOWING REFRIGERATING MACHINE AND REGULATOR AND COILS IN REFRIGERATOR.

suitable to the needs of small users. Previous to this period, the whole attention of manufacturers was given to the construction of large machines, which are required for refrigeration on an extended scale, and while the design and equipment of large cold storage plants has been brought to a high state of perfection, and its theory and practice are well understood, the moderate user, in the person of the small manufacturer, the storekeeper, the householder or "mine host of the inn," has been left to the tender mercies of the door-to-door ice vender.

The first attempts to produce small refrigerating

to refrigerate a single unit in the shape of a great room in a brewery, and quite another thing to refrigerate a number of single units represented by a score of separate refrigerating boxes, in the various flats of an apartment house; hence the earlier attempts to introduce small plants were almost invariably marked by failure. Of late years, however, the work has been taken up as a specialty by various firms, with the result that it is now possible for artificial refrigeration to be secured in small units for about the same figure as the ice is supplied by the ice companies.

The accompanying engravings illustrate the methods

sation and expansion of a highly volatile gas in a continuous cycle of operations, the compression and condensation taking place in a small and compact machine, which may be located in any convenient spot, and the expansion, with its attendant refrigeration, taking place in a coil of pipes located in the refrigerating room or "box."

The machine is of the ammonia compression type, the gas used being pure anhydrous ammonia, which is composed of 14 parts of nitrogen and 3 parts of hydrogen by weight. At ordinary temperature it is a gas, and at a temperature of about 30 degrees below



MEAT MARKET SUPPLIED WITH A COMPLETE ATLANTIC REFRIGERATING PLANT.

zero F. it liquefies at the normal pressure of the atmosphere, and, of course, at higher temperatures it liquefies at higher pressures.

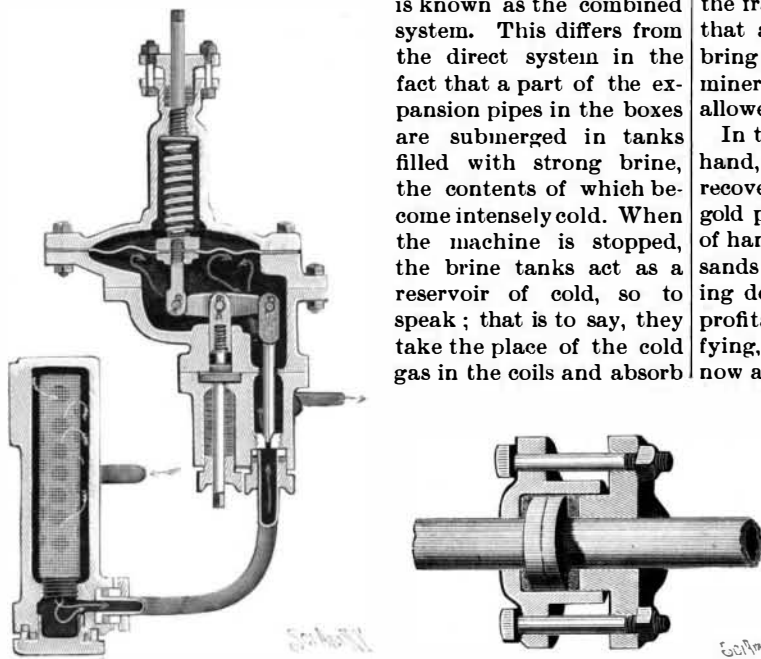
The refrigerating apparatus shown in the accompanying cut is an extremely compact and self-contained machine, all of whose working parts are inclosed, and run in a bath of oil. It is provided with a heavy fly-wheel pulley, which may be belted direct to an electric motor or any suitable power shaft. At one end of the pulley shaft is a wrist plate which by means of a connecting rod and a rocker arm operates a rocker beam. Attached to the ends of the rocker beam are the piston rods of the two compressing cylinders, which are placed in the vertical position to avoid the uneven wear which would occur if the cylinders were placed horizontally.

The compressors are single acting and work with the smallest practicable clearance between the cylinder head and the piston. Particular attention has been paid to the design of the suction and discharge valves, which are provided with offsets on the stem which permit the passage of the gas but prevent the valve falling into the cylinder should any breakage occur. The discharge pipe from the compressor cylinders is led into a high and low pressure oil trap, located behind the cylinders, which is divided by a diaphragm into two separate receptacles. The compressed gas, at 150 pounds pressure, more or less, depending on the temperature of the condensing water, enters the high pressure half of the trap, where any oil which may have been carried over is deposited, and collects in a receptacle at the bottom. From the trap the gas is led down to a condensing coil located in the "condenser base" of the machine. This is simply a tank in which the coil is cooled by a constant circulation of cold water. Here the gas is condensed and passes down to another tank beneath it, known as the liquid receiver. The liquid ammonia is now ready for use in the refrigerating box.

The boxes may be one or more, close together or widely separated, and of any size (within the capacity of the machine) or shape desired. One of our illustrations shows the interior of a refrigerator such as might be used in a meat market, large grocery, or in any establishment where it is desirable to refrigerate a considerable amount of material in bulk. The liquid ammonia is led by a small pipe from the machine to the refrigerator, where it passes through a very ingenious automatic expansion valve which controls the flow and adjusts itself to any pressure at which it may be set. The regulation is effected by means of a flexible diaphragm controlled by the pressure of the gas, which acts on a needle valve at the mouth of the liquid ammonia supply pipe. The moment the liquid enters the regulator, which is set for a pressure of fifteen pounds to the square inch, more or less, according to the

the compressor is shut down it will automatically shut off the supply of gas to the coils. After the gas has traversed the coils it is led back to the refrigerating machine and passed through a coil in the condenser and then led into the low pressure receptacle of the "trap." From the trap it is again drawn into the compressors and sent on its course through the pipes.

The method above described is known as the direct expansion system. The Atlantic Refrigerating Company also make use of what is known as the combined system. This differs from the direct system in the fact that a part of the expansion pipes in the boxes are submerged in tanks filled with strong brine, the contents of which become intensely cold. When the machine is stopped, the brine tanks act as a reservoir of cold, so to speak; that is to say, they take the place of the cold gas in the coils and absorb



SECTION THROUGH REGULATOR, AND COUPLING.

the heat from the refrigerator box, maintaining the low temperature until the machine is again started. The company also makes use of the brine system, which differs from those already described in the fact that the ammonia pipes are not placed in the rooms or boxes to be cooled, but in a brine tank (located usually in the basement of the building), and the cooled brine is circulated through another set of pipes placed in the rooms or boxes.

The uses to which these compact and self-running machines can be put are many and various. The accompanying illustration shows a six ton plant, installed in a city meat market. At the far end is seen the large refrigerator box divided into a large beef room, a room for general storage and a freezing room, the temperature of which may be reduced to zero. At one side of the room is another box containing four large corned-beef tanks and tubs of high-class salted meats, and a further and entirely novel application is shown in the construction of the horseshoe shaped counter. This is nothing more or less than a continuous refrigerator box with a plate glass top, in which are shelves upon which plates of cut meats, chops,

light and steam heat, in the rent. Such an arrangement would insure the abolition of the ice box with all its attendant inconveniences, a relief which would be greatly appreciated by the average householder.

DREDGING FOR GOLD.

Gold mining operations in the country lying west of the Rocky Mountains are just now being carried on by two very different systems. In the frozen North the pioneer is searching for the rich placer deposits where the fragments of gold are so large and so thickly strewn that a single season's work with the miner's pan may bring a fortune. In his feverish haste to grow rich the miner pays no attention to the finer gold, which is allowed to run to waste in the tailings.

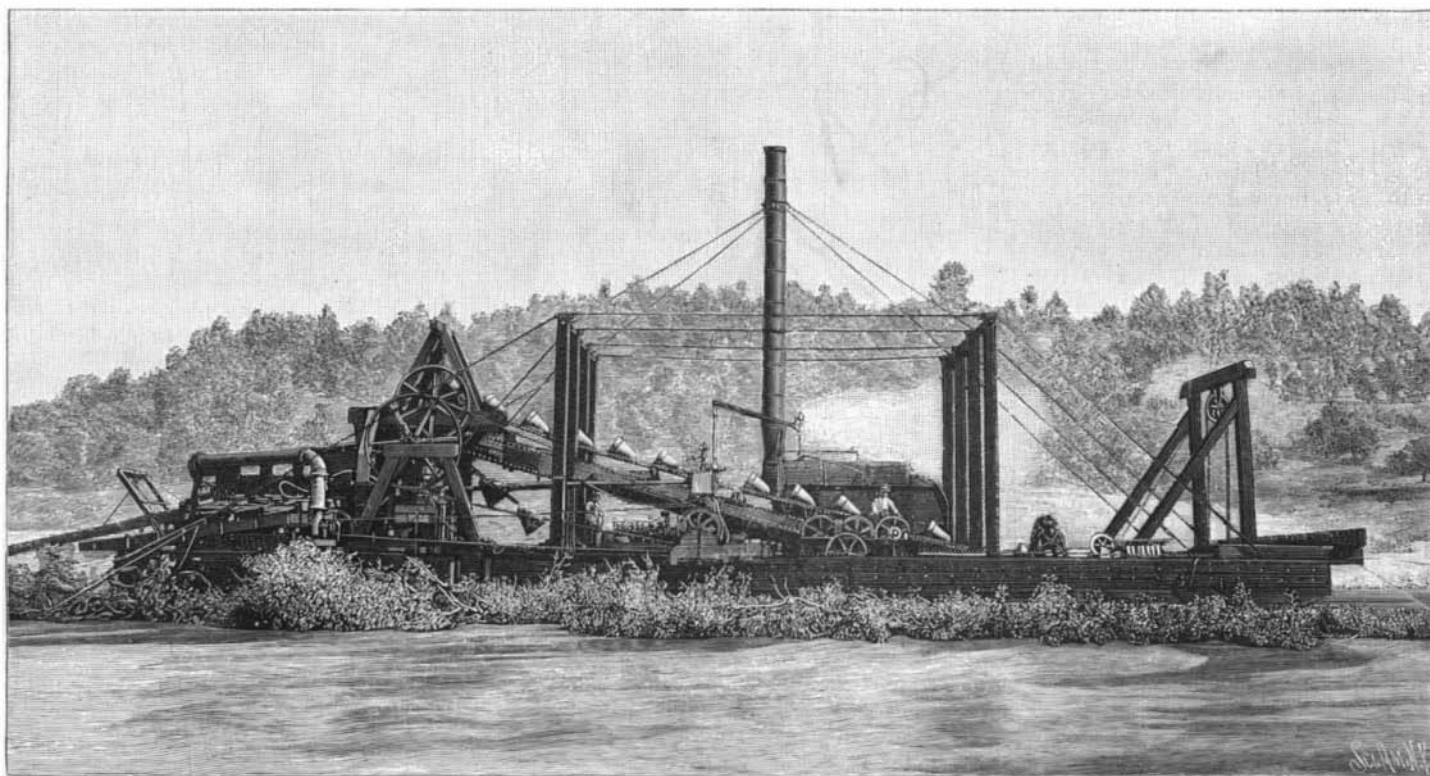
In the historic gold fields of California, on the other hand, mining men are giving increased attention to the recovery of gold from placer deposits, where the yield of gold per ton is very low. Improved machinery, capable of handling the auriferous material at the rate of thousands of tons per day, is being employed on gold bearing deposits which hitherto it has been considered unprofitable to work. The results have been very gratifying, and many discarded or neglected districts will now acquire a positive value.

The accompanying cut represents the Risdon Improved River Gold Dredge, as designed by R. H. Postlethwaite, consulting engineer, of San Francisco, California, patents for which are held by the Risdon Iron and Locomotive Works, of that city.

These dredges are the result of a process of evolution and many years of experiments by the designer and others in New Zealand, now recognized as the leading gold dredging country of the world, from which country Mr. Postlethwaite arrived in April last for the purpose of introducing and operating his dredger in this country.

One of these dredgers is now operating on the Yuba River, in California, and is lifting and washing over 93 cubic yards of gravel per hour from a depth of 45 feet, and extracting and saving the gold therefrom, some of which is so fine that it cannot be seen by the naked eye, at a cost of 3 cents per yard. The dredger consists of two long pontoons, each 96 feet long by 9 feet beam. These are connected at the stern by a small pontoon 17 feet long and 5 feet wide, the bow being connected by a heavy overhung beam. This practically makes one boat 96 feet long and 23 feet in width, with a well hole 5 feet wide running through the center for some 75 feet.

The dredger is fitted with a power winch with six drums, all being under the control of one man. Four of these drums carry lines running from the four corners of the dredger, the other end of the lines being affixed to "dead men" or backers on the beach. The fifth drum carries the head line. With these five lines the dredger can be made to rapidly take up any position necessary, one man handling her with the greatest ease and nicety and with no loss of time. The sixth



RIVER GOLD DREDGE ON THE YUBA RIVER—CAPACITY, 2,000 CUBIC YARDS PER DAY.

amount of refrigeration required, it volatilizes, and in so doing produces extreme cold which absorbs the heat from the surrounding atmosphere. At this lowered temperature the gas then passes into coils of pipe which are arranged on the walls or ceilings of the refrigerator. When the expansion valve has been set at the proper tension, it will admit just sufficient ammonia to insure the refrigerator being maintained at whatever temperature is required. Moreover, when

steaks, etc., may be placed and inspected by the buyers. Another form of installation which is likely to meet with extended application is the refrigeration of apartment buildings.

Plans are being prepared for the equipment of a large six story apartment building with some thirty domestic refrigerators—one to each suite of rooms—all of which will be operated by a single machine in the basement. The refrigeration will be included, like the

winch barrel carries the ladder line, raising or lowering the ladder as required. A ladder 67 feet long, built up as a heavy lattice girder, is hung at the stern end by a bar fixed across a heavy wooden framing. The lower end of the ladder carries a five-sided tumbler and is suspended by blocks and tackle to a cross beam. By means of a wire rope and blocks the winch can raise or lower the bottom end as required. The top tumbler is carried by the timber framing some 3 feet above the top end