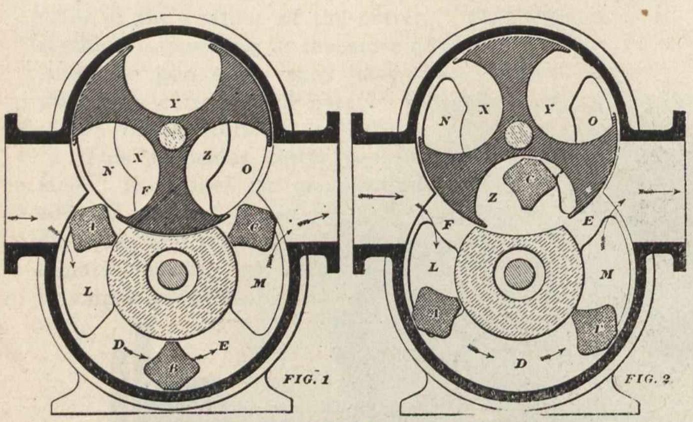
is at least one-eight inch in small blowers and in large sizes, one-half to three-quarter inches.

The idler, or drum, revolving in the smaller part of the casing, which in the vertical type is above the impeller, is symmetrical, and has a periphery nearly a complete circle. It consists of three hollow vanes or blades cast in one piece with the shaft, which is of cast iron, very rigid, and of ample strength to transmit the little power necessary for rotation. The idler, revolving with large clearance, is turned at the same speed as the impeller by means of two spur gears running in oil and incased for protection against dirt and accident.



Action of Rotors: Stages 1 and 2.

The impeller, mounted on the driving shaft, is made up of three diamond shaped bars or blades and a central web which is keyed to the steel shaft. Being symmetrical it is perfectly balanced at all speeds. As it revolves, three separate pockets are formed in the annular space between the shell and a core extended lengthwise of the lower part of the casing. In reality the core is in two parts, each cast in one piece with the end plates, the space between them allowing the web to revolve.

The cast-iron shell or casing consisting of two hollow cylinders partially intersecting, is accurately bored and amply strong and rigid to withstand the strains due to handling, setting on foundation and operating at high pressures. The ends of the casing are finished to receive the four cover plates in which are cast chambers or passages for lessening the noise and increasing the efficiency of the machine, as is explained under "operation." On either side of the housing are openings for the intake and the discharge of the air, flanged and tapped for standard gas-pipe fittings; the small sizes have openings at the sides, and the large blowers openings at the top and bottom. In every respect the casing and rotors are symmetrical, permitting the blower to run in either direction.

Except in blowers of large size, the lower half of each journal box is cast in one piece with the cover plate, insuring rigidity, simplicity and correct alignment. The boxes, except those for very small blowers, are of the ring-oiling type, lined with Sturtevant white metal, hammered in.

When it is desired to maintain absolutely constant pressure, the blower is provided with a relief valve, or automatic governor. For transferring gases and air at high pressure, stuffingboxes are provided for the shafts, and a drain in the bottom removes tar and other distilled liquids.

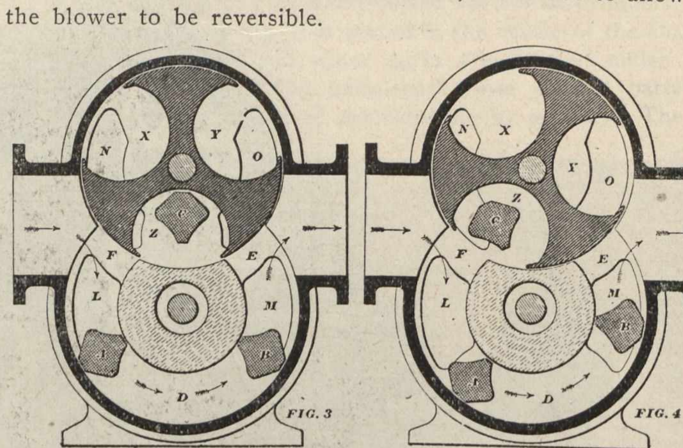
Operation.

Air at atmospheric pressure entering the blower at the intake is successively imprisoned in the three pockets formed by the three blades of the revolving impeller, and discharged at any desired pressure up to 10 pounds per square inch. The volume of free air delivered varies directly with the number of revolutions; the pressure varies with the resistance met in the delivery pipe. The principle upon which the blower operates is clearly shown by the accompanying diagram which is a sectional view of the rotors and casing. In the explanation it is assumed that the blower is running at a speed to produce average pressure, and that this pressure exists in the discharge outlet.

While the rotating members were in the positions shown in Fig. 1, air entered freely and completely filled the chambers *X* and *D*, while pockets *E* and *Z* were discharging air to the delivery pipe. From the previous movement of the rotors, the pressure in *Y*, filled with air carried over by the revolving idler, had been increased slightly by air flowing through the leakage passage *N* as will be explained later. The space between blades *A* and *C*, just above the concave portion of the core, was practically filled by the wing of the idler, and consequently while in this position it took no part in the action.

While revolving from the position in Fig. 1 to that shown in Fig. 2, air in pocket *D* has been carried along, and the communication between chamber *D* and the inlet has been cut off. Space *Z* is filled with compressed air, which further movement will carry toward the suction end where it will flow back to the inlet and in escaping cause noise. But this noise and loss is prevented by the leakage chamber *O* which allows the pressure to be transmitted to the air in space *Y* thereby increasing its density just before it is discharged. Continuing, the rotors reach a position, Fig. 3, so that the air is now entering the pocket *F*, the air in *D* is being carried around between the blades *A* and *B* in the annular space, and *E* is discharging. Above the impeller the remaining pressure in *Z* is being transmitted to the air in *X* by means of the leakage passage *N* provided for the purpose, thereby making its pressure a little greater than atmospheric. The air in space *Y* under slight pressure from previous leakage is imprisoned, and being carried around by the idler.

When the last position completing the cycle is reached, pocket *F* will be filling, the pressure in chamber *Z* will have been reduced to atmospheric by leakage, space *Y* will discharge and a little compressed air from the delivery pipe will flow back through leakage passage *M* and increase the pressure in D which will result in a quieter discharge when further movement brings *B* into the discharge passage. The purpose and advantage of the leakage chambers is now apparent; they make it possible to recover the pressure tending to escape from the impeller pockets and by making the increase in pressure gradual cause the blower to run with less noise. Leakage passage *L* has little effect when the blower runs in the direction shown here; it is made to allow the blower to be reversible.



Action of Rotors: Stages 3 and 4.

The three blades of the impeller, set at equal distances around the periphery, cause three admissions of air at each revolution. Upon leaving the last position, Fig. 4, the rotors quickly reach a position in which the conditions are exactly the same as those shown in Fig. 1, the operation continuing as explained.

In selecting a blower for the foundry, it is customary to rate the volume of air according to the maximum amount of iron which the cupola can melt. The capacity of the cupola being known, the size of the blower may be found from the fourth column of the accompanying table. If the maximum output is not known the diameter of the cupola be-