

MECHANICAL DRAFT.



STURTEVANT.

# MECHANICAL DRAFT

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## A PRACTICAL TREATISE

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## CHAPTER XII.

### THE STURTEVANT FANS FOR MECHANICAL DRAFT.

It has been made evident in the preceding chapters that the essential feature of mechanical draft is a fan blower or exhaustor. It has been shown that the blowing engine and the positive rotary blast blower are not adaptable, that the steam or compressed-air jet is not economical, and that the disc or propeller form of fan wheel is not suitable for the purpose. The peripheral discharge type of fan therefore stands as the only form which it is desirable to employ for the production of draft. It is the purpose of this chapter to illustrate and describe this type of fan in all of its principal forms as built by this house. It is, however, manifestly impossible to present all of the multitudinous shapes in which these fans are constructed to suit the ever-varying requirements of different plants.

Prominent among the advantages of mechanical draft as displayed in the preceding chapter is that of adaptability, as is most clearly evidenced in this and the succeeding chapter. The steel-plate construction employed in all fans but those of smaller size lends itself most readily to perfect adaptation to the conditions existing in any specific case. The fan may, if absolutely necessary, be small and be operated at high speed, or, as should otherwise be the case, it may be large and run slowly. It may be constructed of steel plate in all sizes, and of cast iron in the different types of the smaller sizes. In the former material it may take almost any shape within the range of possible requirements, while either cast-iron or steel-plate fans are regularly constructed to discharge either horizontally at the top or bottom, or directly upward or downward. The pulley or engine, according as one or the other is employed, may be placed upon either side of the fan; while the engine may, to suit circumstances, be single or double, open or enclosed, with its cylinders above or below the shaft, or may be horizontal and of any required size. Or if desired a direct-connected electric motor may take the place of the engine in all but the largest sizes. The most important of these various arrangements are presented in the succeeding illustrations, while in Chapter XIII. are shown specific applications, in many of which the particular conditions demanded the construction and introduction of the particular forms of fans which there appear.



**Steel Pressure Blower.** — The type of fan presented in Fig. 15 is, as its name indicates, a pressure blower rather than a volume blower. That is, the wheel is of such dimensions as to make it possible to deliver a comparatively small amount of air under high pressure. This is the requirement in the case of cupola furnaces and forges for which this type was originally designed. Substantially the same requirement exists in the case of some of the under-feed mechanical stokers, where a very deep bed of fuel is maintained and considerable pressure is necessary to overcome its resistances, although the actual volume of air required is not great. Under similar conditions it is useful in connection with crematories, garbage destructors and the like. These fans are capable of producing a pressure as high as 20 ounces per square inch. The fan wheel consists of a light but strong hub with extending arms and a series of galvanized steel-plate blades or floats attached thereto. Conical side plates are attached to these blades and extend from inlet to

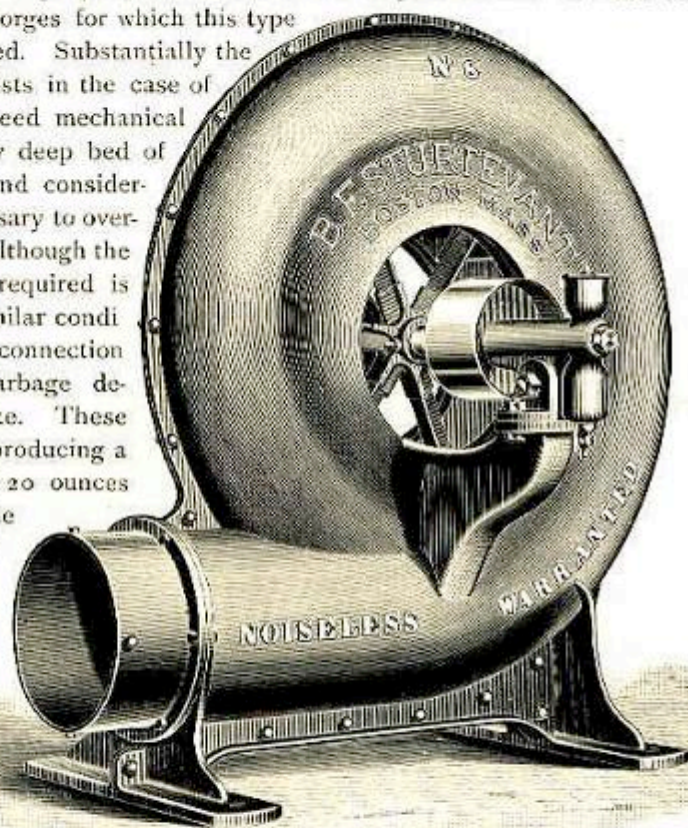


FIG. 15. STEEL PRESSURE BLOWER.

circumference. The steel shaft, to which the hub is keyed, is supported upon either side by special continuous-oiling journal boxes, which are of such length and so thoroughly oiled that heating is practically impossible. The smaller fans are each provided with a single pulley, placed between the box and the fan case upon the right-hand side as one faces the outlet, the fan being then known as a *right-hand fan*. The larger-sized fans are each provided with two pulleys, one upon either side.



**"Monogram" Blower on Adjustable Bed.**—It is particularly important, in the case of a blower employed for draft production, that there should be no liability of its stoppage during working hours. So far as the construction of the Sturtevant blower is concerned, this is obviated by the character of the design and the perfection of the construction. But when driven by belt there is always a possibility of the tension thereon gradually decreasing until it suddenly becomes apparent in the slowing-down of the blower. To shut down long enough to take up the slack is a great inconvenience when boilers are depending upon the blower for the production of their draft. To avoid this necessity, the arrangement illustrated in Fig. 17 can be furnished. As is evident from the cut, the blower is placed upon a bed upon which it is adjustable, so that the belt may be continually kept tight.

In its construction the bed consists of substantial steel side beams which are rigidly connected at their ends by castings, to which they are bolted.

The blower it-

self is clamped to the beams by

bolts passing down through its feet. The combination of beams and bolts serves to guide the blower and keep the belt aligned as it is drawn forward by means of the shackle bolt, which is attached to the front of the blower, just beneath the outlet, and passes through the front casting. To avoid interference with any connecting outlet pipe, resulting from the movement of the blower, a telescopic outlet is provided which is bolted to the end casting of the bed and within which a sheet-iron extension of the outlet of the blower slides as it is moved. The steel pressure-blower type of fan may be fitted up in the same way. The entire combination is readily portable.

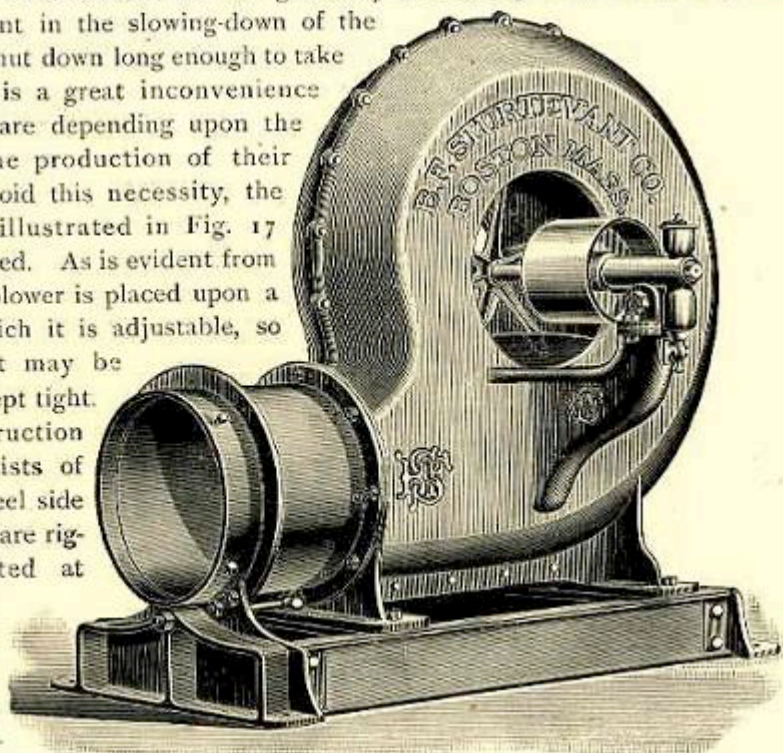


FIG. 17. "MONOGRAM" BLOWER ON ADJUSTABLE BED.



**"Monogram" Blower on Adjustable Bed with Engine.**—The arrangement just illustrated and described depends for its propulsion upon some means independent of the blower itself. But in such an important matter as the constant maintenance of draft it is particularly desirable that the blower should be provided with such means of operation as to render it entirely independent of any other source of power. In the case of a blower of the type under discussion, an engine may be readily combined with it upon the same bed. Such is the arrangement shown in Fig. 18, where the engine is double-cylindere, entirely enclosed, maintaining high speed, perfect regulation by governor. The enclosed engine prevents the throwing of oil and avoids the danger of injury to the bearings from the flying dust and dirt, almost always present

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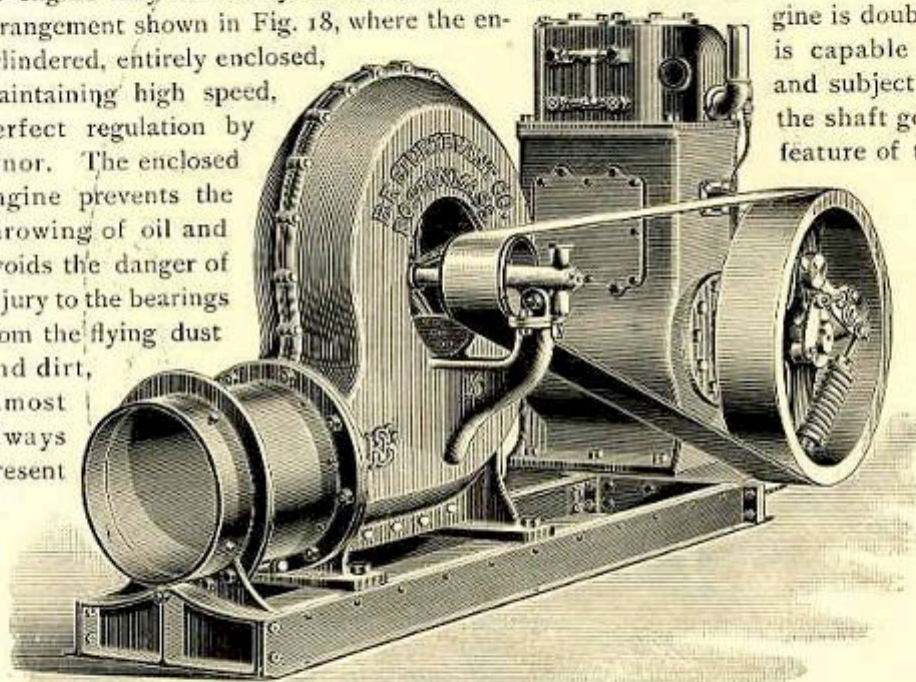


FIG. 18. "MONOGRAM" BLOWER ON ADJUSTABLE BED WITH COMBINED DOUBLE ENCLOSED UPRIGHT ENGINE.

in a boiler room. The same arrangement can be furnished with a single upright or a horizontal engine in place of the engine here shown. Any such combination makes it possible to start up the boilers independently of any other portion of the steam plant.

The bed proper is of the same general construction as that described in connection with Fig. 17. In case an engine is not desired, a counter-shaft (with tight and loose pulleys, if required) can be substituted, and the adjustable feature still retained. Evidently a pressure blower may be as readily fitted up in any of these various combinations.

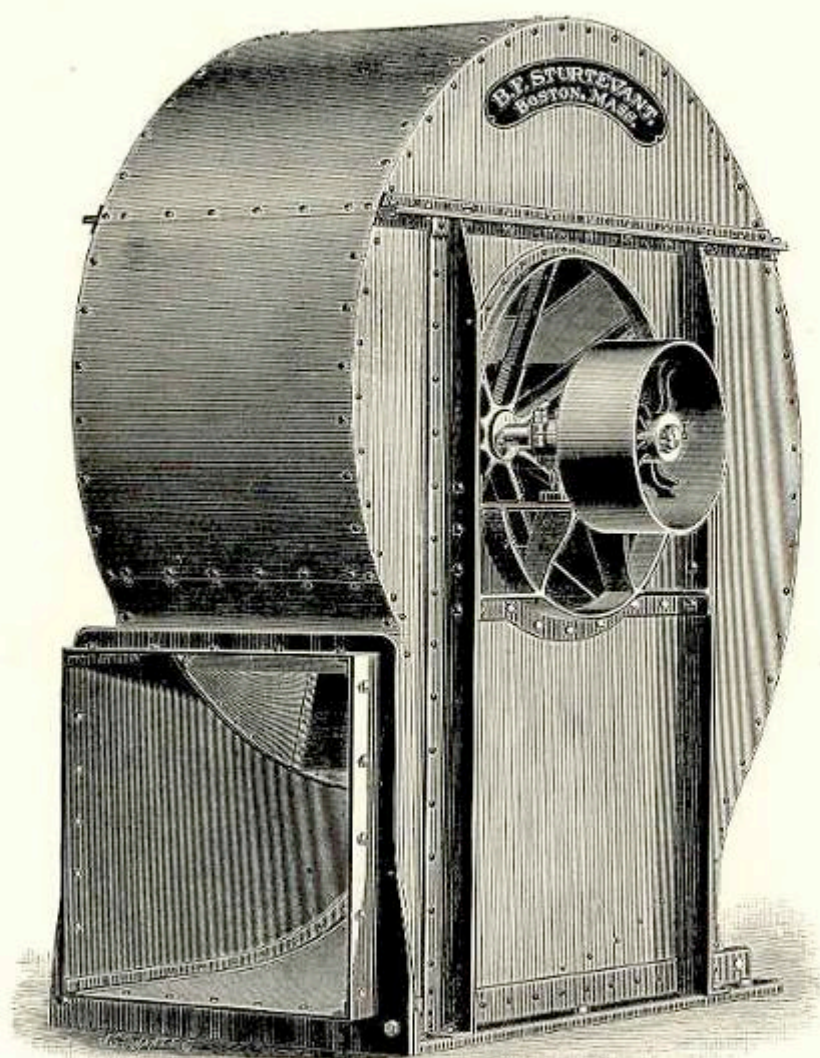


FIG. 19. STEEL-PLATE BLOWER WITH OVERHUNG PULLEY.



**Steel-Plate Blower.** — For moving large volumes of air under moderate pressure, the type of fan illustrated in Fig. 19 is extensively employed. The shell is constructed throughout of steel plate supported upon an angle-iron foundation frame and braced and stiffened by the same material. The entire construction is relatively light but strong, and may obviously be made to conform to any desired requirements. As here shown, the blower has a bottom horizontal discharge. This type is also regularly built to discharge horizontally at the top or directly upward or downward.

An inlet is provided in each side of the shell. A fan thus provided is designated as a *blower*, while one having only a single inlet (which is placed on the side farthest from the pulley) is known as an *exhauster*. This blower has a bearing in each inlet, with the fan wheel between, and the pulley overhung on the end of the shaft. The minimum of width is thus occupied, and this type of fan is thus rendered convenient for most applications for forced draft. In the larger sizes it is so constructed that the entire top may be readily taken off to obviate the objection to excessive height under the conditions of railroad transportation, which permit of only a certain maximum height.

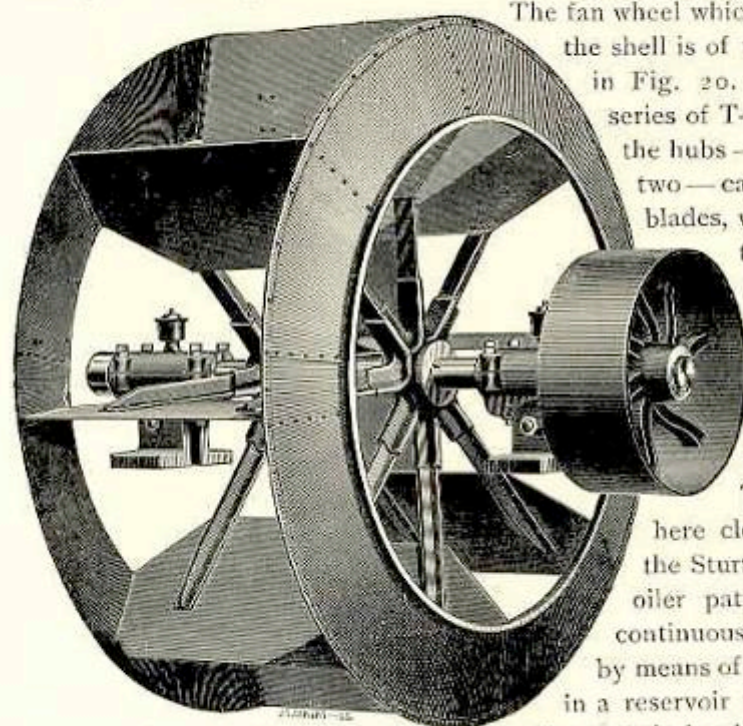


FIG. 20. FAN WHEEL.

The fan wheel which is enclosed within the shell is of the form illustrated in Fig. 20. It consists of a series of T-steel arms cast into the hubs — of which there are two — carrying the floats or blades, which, together with the side plates of the wheel, are constructed of steel plate. The fan wheel is carefully balanced to insure its steady running. The journal boxes, here clearly shown, are of the Sturtevant patent brush-oiler pattern, the oil being continuously fed to the bearing by means of a brush submerged in a reservoir which remains filled to a certain level.



**Steel-Plate Blower on Adjustable Bed with Engine.**—The adjustable arrangement which has already been illustrated in connection with the pressure and "Monogram" blowers is also applicable to the steel-plate blower, as is rendered evident in Fig. 21. A single engine is here shown, but a double engine or a counter-shaft could as readily form a part of the combination. The necessity of a belted engine is due to the high rotative speed of the fan, which would be excessive for a direct-connected engine of proper power. The utility of such an arrangement is obvious. It is readily portable, may be set up wherever desired without the preparation of special foundations, is not dependent for

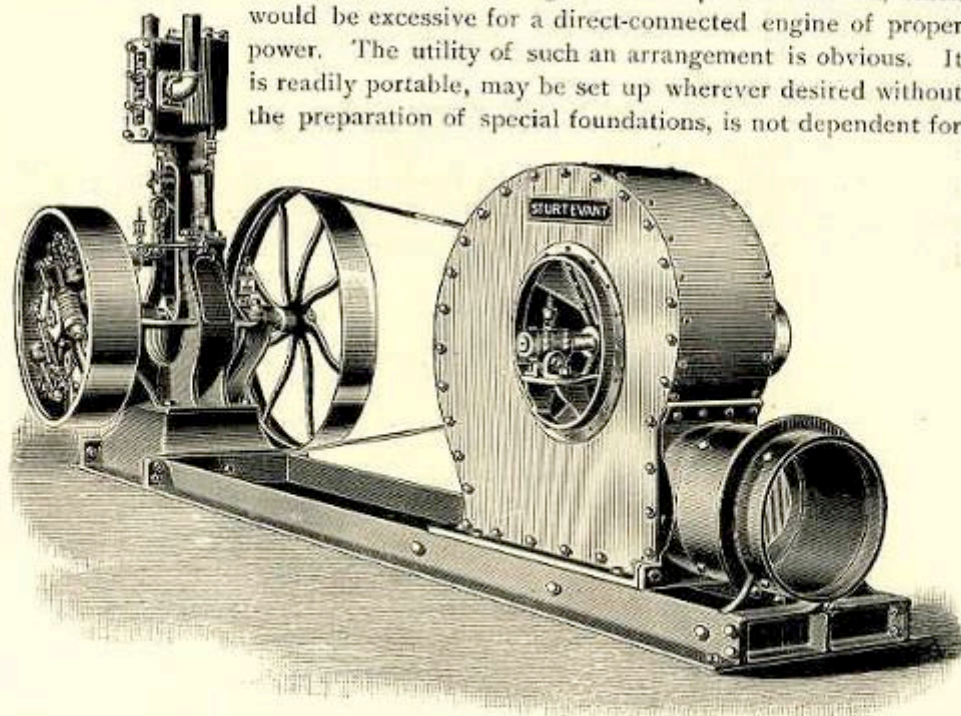


FIG. 21. STEEL-PLATE BLOWER ON ADJUSTABLE BED WITH COMBINED SINGLE UPRIGHT ENGINE.

its operation upon any other source of power, and may be so regulated that the speed of the engine shall increase as the steam pressure falls. By this latter combination the range of variation in steam pressure may be reduced to a minimum—in fact, kept within one or two pounds.

Evidently such an arrangement is suitable only for the production of draft by the forced method, but the entire equipment may, if desired, be placed on top of the boilers and the use of valuable floor space avoided; or it may, at the expense of comparatively little room, be placed along one side of the end boiler of a battery and discharge into an underground duct beneath or in front of the ashpits.

**Steel-Plate Exhauster.**—As already stated, the distinguishing feature of an exhauster is the single inlet, placed in the side farthest removed from the pulley or other means of propulsion. The standard form of steel-plate exhauster is shown in Fig. 22. This form of construction makes possible the ready connection of a pipe to this inlet for the purpose of exhausting air or gas from any particular space. The wheel being overhung upon the end of the shaft, and the pulley and boxes all being located upon the same side of the fan housing, the inlet is left entirely unobstructed and there is no opportunity for injury to the bearings by dust or heat. This type of fan is equally adaptable for use as a blower, all of the air then being taken in on one side. For the purpose of induced draft it is by far the best form, for a special Sturtevant water-cooled journal box may be easily substituted for the inner bearing and the transmission of heat along the shaft thereby prevented. If the air or gas handled is of excessively high temperature, the support may be set away from the shell by spacing pieces so as to allow a circulation of air between. This support, which may be rigidly bolted to the floor or foundation, carries the entire weight of the boxes, shaft, pulley and wheel, thereby removing from the fan casing all strain due to weight or tension of the belt. The casing itself is of substantial steel plate, except the outlet frame and bottom plate, which are of cast iron; while the wheel is of the same construction as that which has already been illustrated.

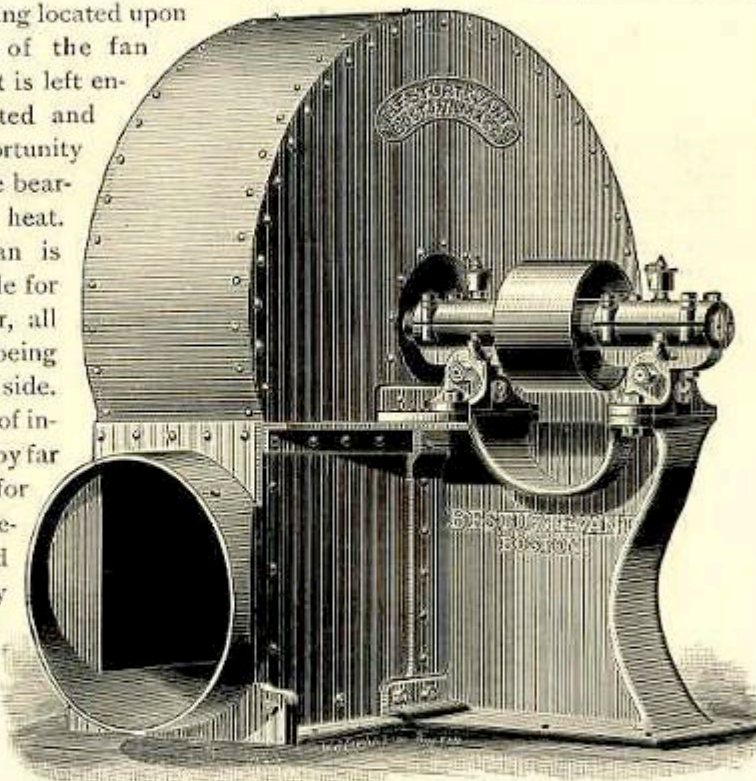


FIG. 22. STEEL-PLATE EXHAUSTER WITH OVERHUNG WHEEL.