O.P. No. 3319
ACE No. 94

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Agricultural Chemistry and Engineering
and
Agricultural Marketing Service

March 1941 Stoneville, Miss.

UNLOADING-FAN IMPROVEMENTS FOR INCREASED EFFICIENCY IN COTTON GINNING

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The reduction of power requirements in commercial gins is one of the main factors in lowering the operating costs of ginning. With the increased use of electric- and Diesel-powered gins this problem of wasted power has been emphasized, especially where the owner desired to modernize his outfit and his motive power was loaded almost to the limit. As a result, an increasing number of requests from ginners for power surveys, advice, and assistance, has been received by the United States Cotton Ginning Laboratory and the power companies.

Cotton handling fans and separator systems in which attempts are made to utilize various kinds of seals are one of the main sources of power waste, especially when badly worn or leaky connections exist. However, even new and well-sealed separators have a significant intake of air through the vacuum wheel. A Laboratory survey of 14 gins where the separator loss averaged 42.7 percent indicated that the power required to operate successfully for seed-blowing fans was 27.6 howsepower for a 4-stand gin. By reducing the separator losses to 27.3 percent in a similar group of gins, the corresponding horsepower requirements amounted to 19.2 for a 4-stand gin. Many modern gins have eliminated the suction separator by installing a Rembert-type fan, discharging the cotton either into a separator converted into a blow-box with ample vent, or into an especially constructed angle-screen blow-box.

Extensive laboratory and field tests have shown that the Rembert fan unloading cotton from wagon and feeding it to drier, cleaner, or distributor is practicable in many cases, and is more economical in operation than the customary standard fan and separator arrangement. Comparative tests of these methods of unloading indicated very definitely that there is no difference in lint quality from seed cotton handled by the two methods. The saving in power was effected because, with the Rembert-type fan, all the air handled by the fan was employed in unloading the cotton, while with the other system, the fan had to run at a high speed or be of a larger size for handling more air, because of separator losses, to provide a suction as good as the Rembert system.

This method of unloading is growing in favor with tower-drier installations where the hot air and cotton are mixed at the top of the tower and blown through the drier as shown in Figure 1. From 20 to 25 horsepower now appears to be the maximum power required to operate both fans shown in this set-up, which is being successfully used on 4-stand gins, in comparison to 32.8 horsepower in a corresponding ginning set-up where a suction fan and separator were used to handle the cotton in combination with the drier fan. Additional power from 2 to 5 horsepower is required to operate the separator.

The recent development by the United States Cotton Ginning Laboratory in unloading-fans is a cone-shaped Rembert fan which is proving to be more efficient than the flat-disc type. 1/ The tests at the Laboratory have shown that the efficiency of this fan is 44 percent as compared to 35 percent for the standard flat-disc Rembert-type under the same operating conditions. Several of these fans are now being run at commercial gins in the Mississippi Delta. In addition to the increased efficiency of these cone-type unloading fans, tests have shown that they do not tend to crack the seed as much as flat disc types, especially when handling dry cotton at high velocities. This feature alone is a factor in its favor when used as a cotton house unloading fan. Figure 2 is a photograph of the Government-design cone-type fan, and Figure 3 provides the important dimensions and details necessary for its construction.

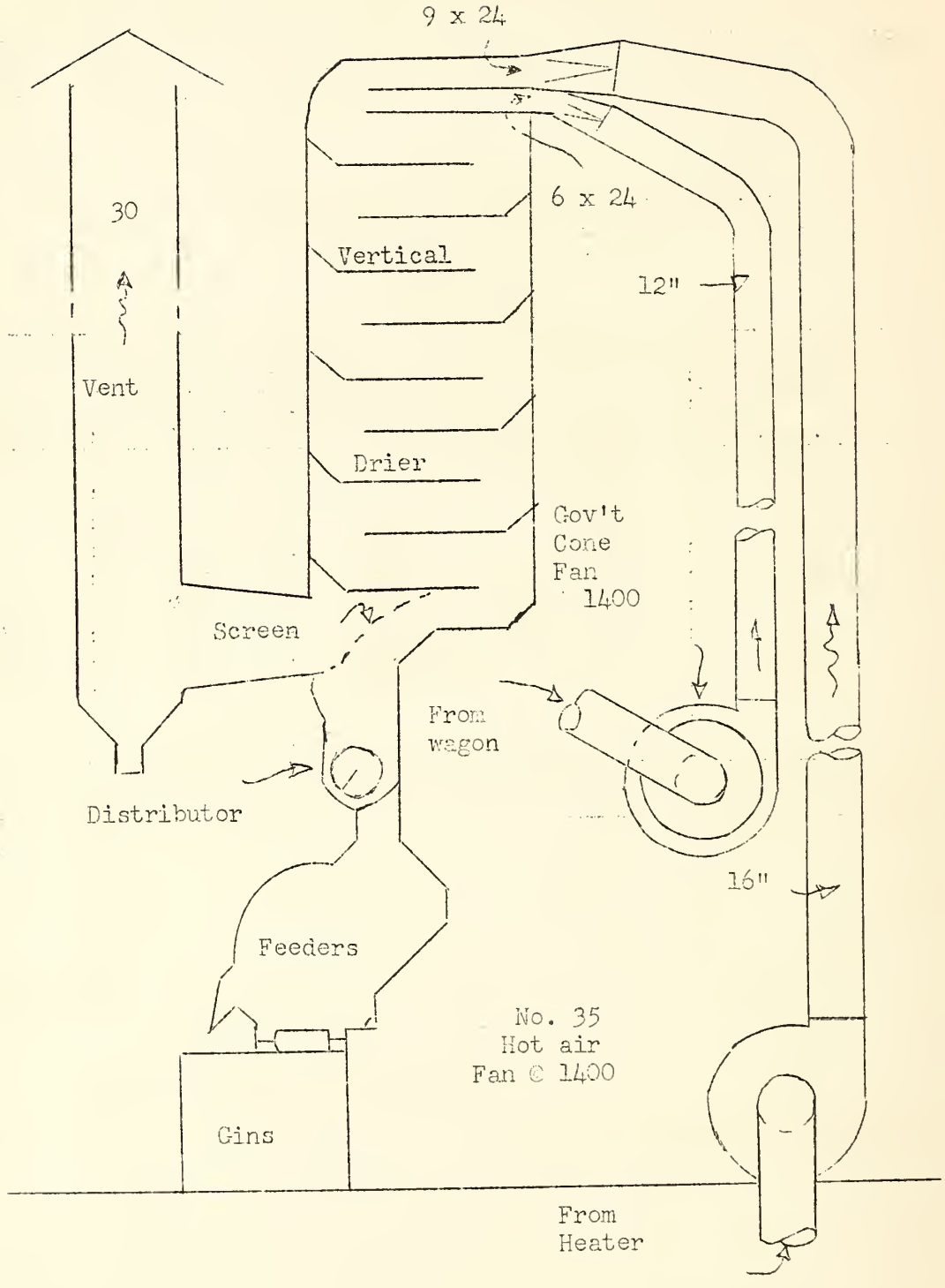
The fan casing, usually a size 40 having 11-inch width, is of the kind customarily used with a 32-inch diameter flat-disc wheel. The wheel itself, a size 35 having 6 or 8 blades, is adapted to the cone construction with plates which may be single-plate or built up on the existing wheel. The perforated cone must be smoothly welded on all inside and outside surfaces, seams, and edges, so that "tags" of lint and "fly" cannot be built up to unbalance the wheel. The rounded nose of the cone should likewise be smoothly welded inside and out, and all burrs should be removed from the plate edges and disc hub of the wheel. An access plate on the housing of the fan should be provided so that the interior of the cone may, from time to time, be inspected and cleaned out if there is tendency for cotton "fly" to build up.

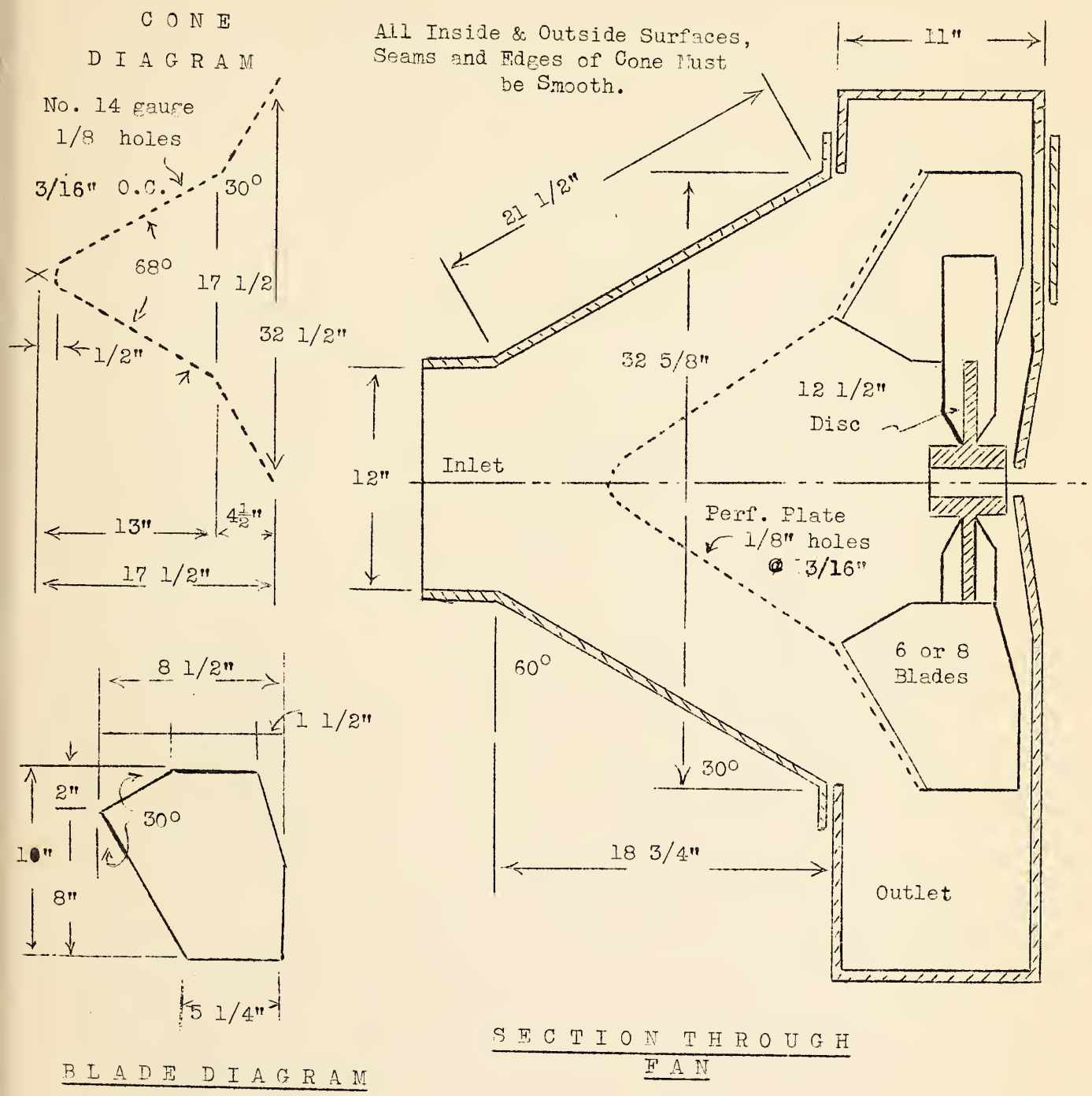
1/ Franks, Gerald N., U. S. Patent No. 2,225,397, Cotton Fan issued December 17, 1940.

Volumetric performances of this fan, as compiled from tests and other sources, are given in the performance table. The fan is customarily referred to as a size 40/35, Government-design, cone-fan and should preferably be operated within the speed range indicated in the table. The volume figures are approximate, because modifications in piping sizes, lengths, and resistances may produce minor variations.

Government-Design Cone Fan 40/35, Approximate Speeds and Volumes in Cubic Feet Per Minute

SPEED	STATIC PRESSURE ACROSS FAN			
R.P.M.	6"	9"	12"	15"
1200	3100			
1300	3350	3100		
1400	3550	3344		
1500	3860	3600	3200	
1600	4130	3832	3532	3170
1700	4380	4076	3750	3400
1800	4640	4310	3980	3630
1900	4900	4566	4233	3900


9 x 24
30
Vent
Vertical
6 x 24
12"
Drier
Gov't
Cone
Fan
1400
Screen
From
wagon
Distributor
16"
Feeders
No. 35
Hot air
Fan @ 1400
Gins
From
Heater


CONE
DIAGRAM
No. 14 gauge
1/8 holes
3/16" O.C.
30°
68°
17 1/2
32 1/2"
1/2"
13"
4½"
17 1/2"
All Inside & Outside Surfaces,
Seams and Edges of Cone Must
be Smooth.
11"
21 1/2"
32 5/8"
12 1/2"
Disc
12"
Inlet
Perf. Plate
1/8" holes
Ø 3/16"
6 or 8
Blades
60°
30°
18 3/4"
Outlet
8 1/2"
1 1/2"
2"
30°
10"
8"
5 1/4"
BLADE DIAGRAM
SECTION THROUGH
FAN