

Jan. 24, 1939.

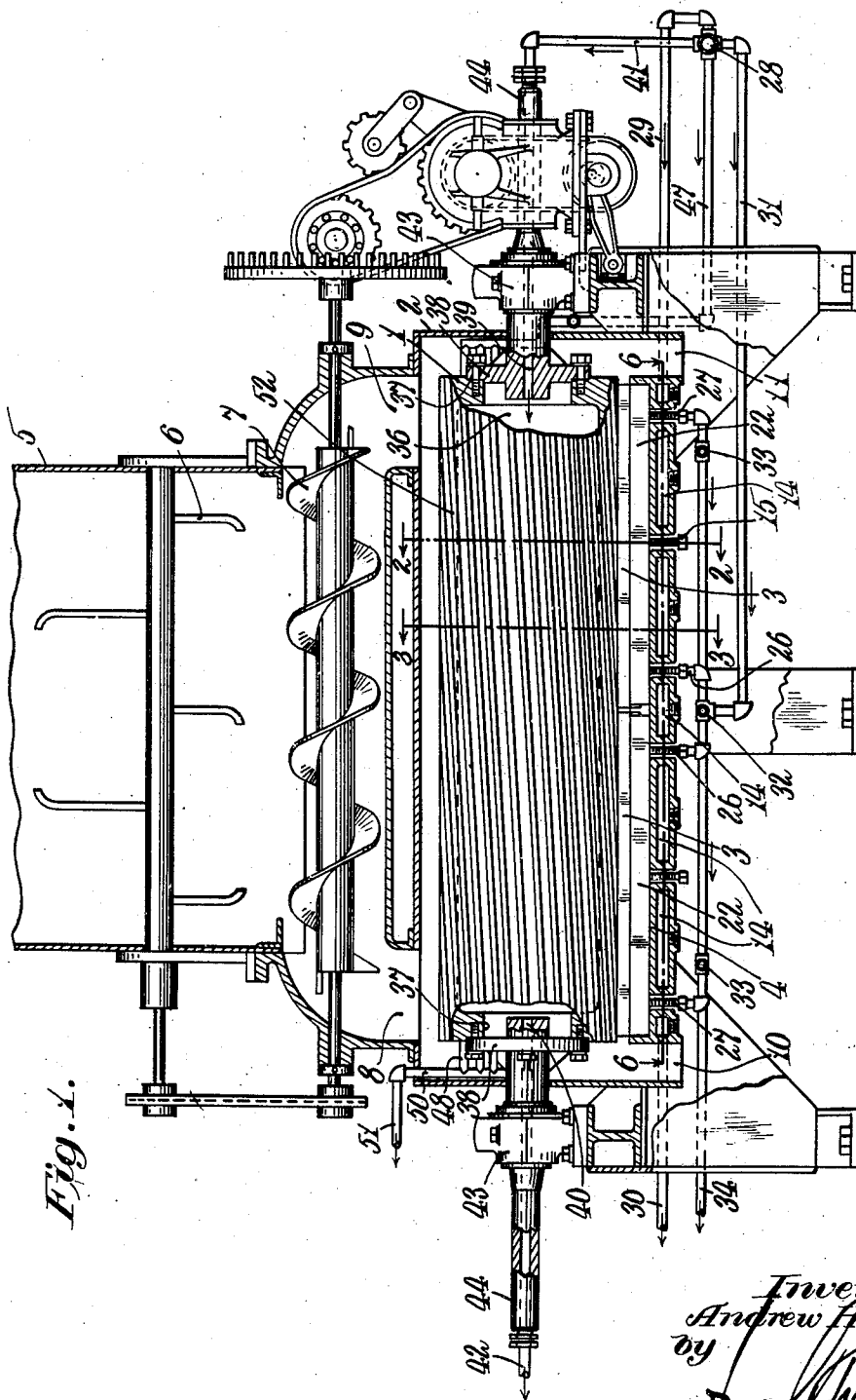
A. HAUGE

2,145,175

FLOCK CUTTING MACHINE

Filed June 18, 1935

4 Sheets-Sheet 1



Inventor:
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[Signature]
Att'y

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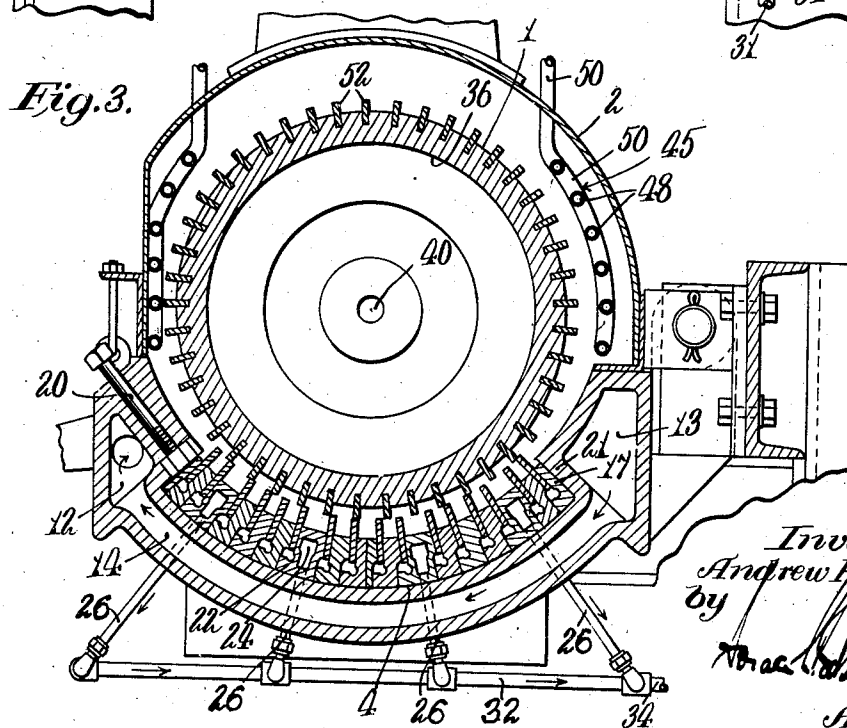
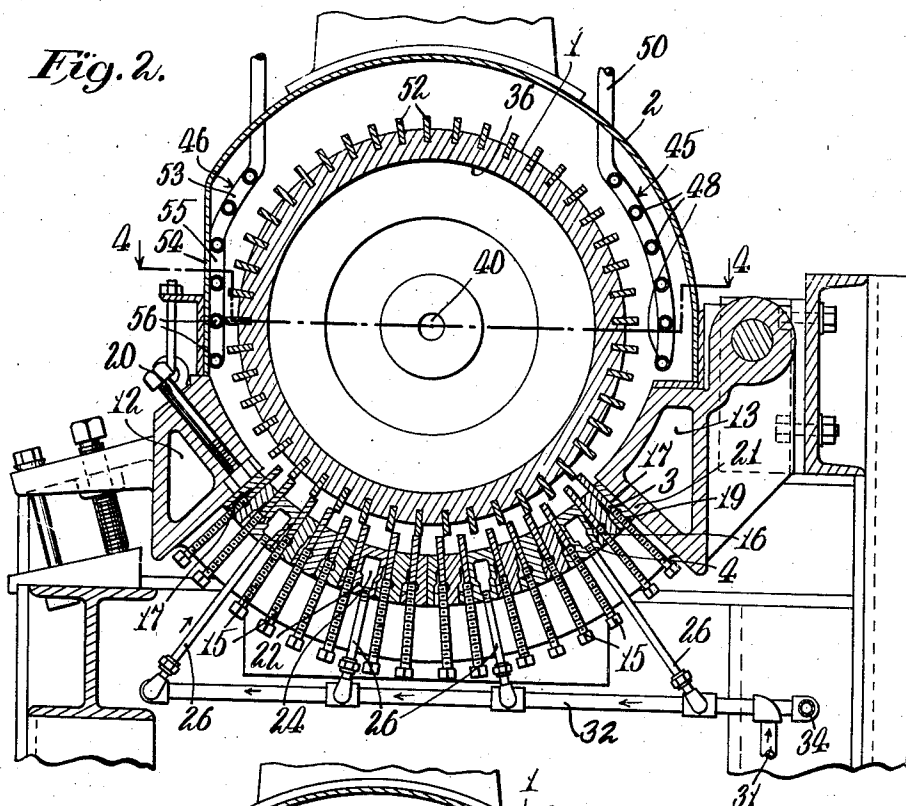
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4 Sheets-Sheet 2



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Fig. 4.

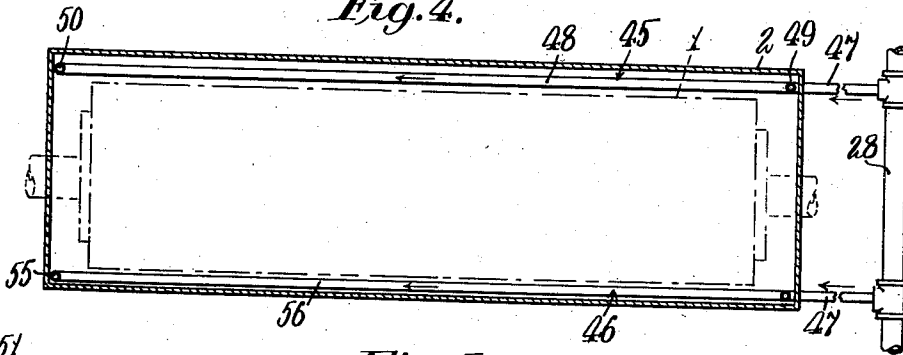


Fig. 5.

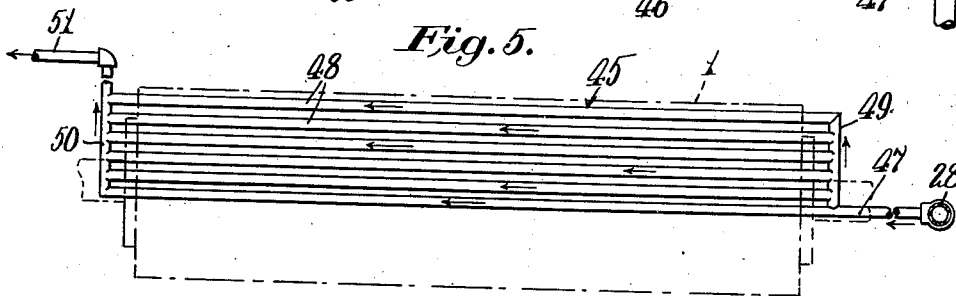


Fig. 6.

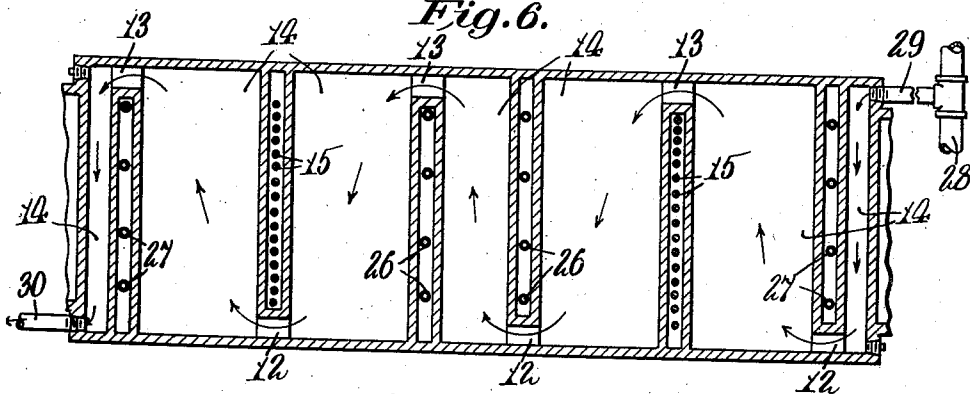
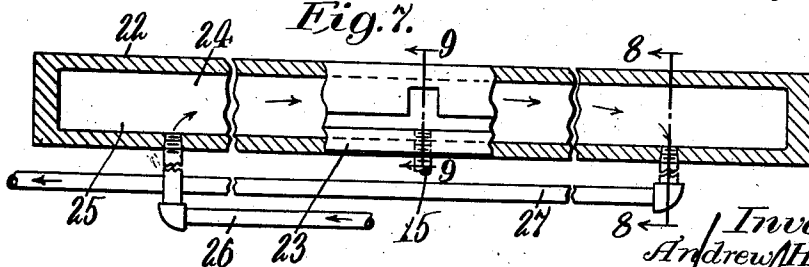


Fig. 7.



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Fig. 8.

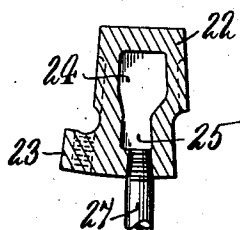


Fig. 9.

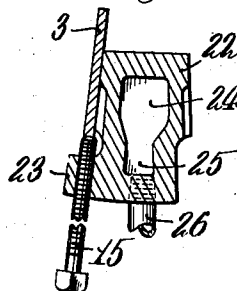


Fig. 10.

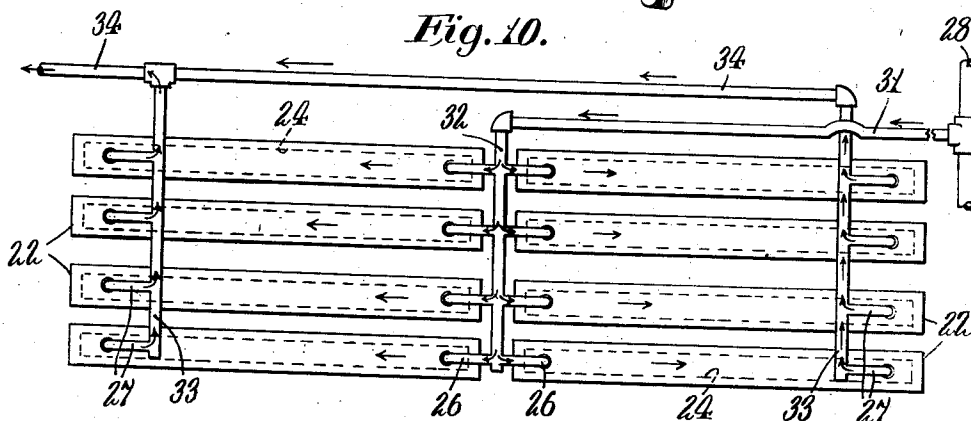
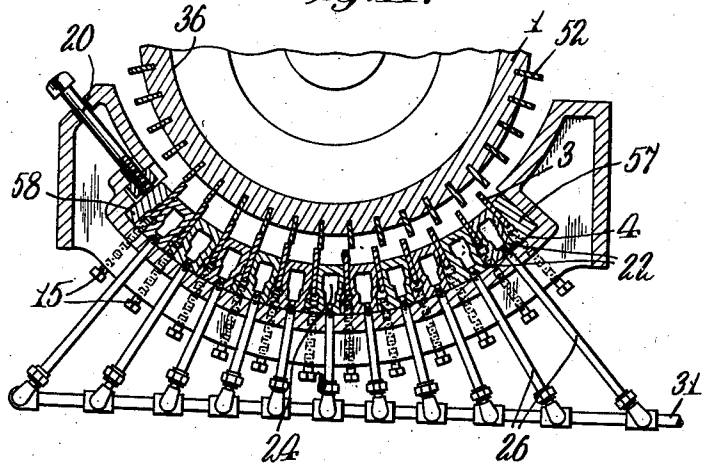


Fig. 11.



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UNITED STATES PATENT OFFICE

2,145,175

FLOCK CUTTING MACHINE

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Application June 18, 1935, Serial No. 27,180

8 Claims. (Cl. 83—6)

My invention relates to flock cutting machines.

It has heretofore been proposed to cool flock cutting machines by cooling the outside of the socket for the knife bed for the stationary knives, the cooling flow flowing always wholly outside of the knife bed containing chamber and consequently never engaging the lags in said chamber which engage and carry the knives and in which the latter are adjustably mounted; such constructions being shown, for example, in the Parent Patents Nos. 1,688,296 and 1,861,064. Further, as shown in the Parent Patent No. 1,688,297, it has been proposed to supply cooling water to the rotating knives on the cylinder at the same time that water is supplied wholly externally of the lag socket, as previously described, to cool the knives in the bed. It is found, however, that while such stationary knife and rotating cylinder cooling means are effective as applied to machines of small capacity, they are wholly unadapted to meet the requirements of machines of larger capacity, and particularly machines wherein the quantity of flock operated upon is substantially increased and wherein the number of knives operating upon the flock is also substantially increased; it appearing that, contrary to normal expectations, a proportional increase in size of the cooling passage means above described will not satisfactorily meet the situation.

My invention has among its objects to provide an improved flock cutting machine which is of large capacity and especially adapted to meet the problems incident to heating of the machine and the flock during operation and the prevention of fires resulting from over-heating. Other objects of my invention are to provide an improved machine of the automatic cooled type described and claimed in the Parent Patents Nos. 1,688,296 and 1,688,297, and wherein improved means are provided to enable the machine to have substantially increased capacity as compared with machines of that construction, and wherein, further, a plurality of improved cooling means is provided which cooperate in an improved manner to obtain improved cooling results despite the increased capacity of the machine. A further object of my invention is to provide improved cooling means for the stationary knives which are constructed and arranged in an improved manner relative to the knives in the bed and adapted to maintain these knives at the desired low temperature, in such manner as to enable the same and the bed to be kept within safe temperature limits under conditions which would fire the flock

in a water cooled bed of prior known constructions. Still another object of my invention is to provide improved means associated with the rotating knives or cylinder and adapted further to reduce the temperature of the blades of these knives during operation of such a cylinder in a machine of large capacity, in such manner as to enable continuous operation under conditions which, with the water cooled cylinder previously known, would have resulted in firing the flock. Still further objects are to provide improved co-operating cooling means for the stationary knives of the machine, whereby the bed and these knives are maintained at the desired low temperature, together with improved means for maintaining the rotating knives or cylinder and the flock supplied thereby to the stationary knives, at the desired safe temperature despite the increased capacity of the machine; all in such manner as to enable the machine to operate continuously over long periods free from danger of over-heating or fire, and in such manner as substantially to reduce the production cost of the flock. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawings, I have shown for purposes of illustration, two embodiments which my invention may assume in practice.

In these drawings,—

Figure 1 is a central longitudinal sectional view of a flock cutter equipped with my improvements, certain parts being shown in side elevation to facilitate illustration;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 1;

Fig. 4 is a longitudinal sectional view of the cylinder casing, taken substantially on line 4—4 of Fig. 2, but with the cylinder indicated only in dot and dash lines and showing the inlets for the cooling means;

Fig. 5 is a side elevation of one of the outside cylinder cooling means showing the inlets and outlets therefor, the cylinder being indicated in dot and dash lines to facilitate illustration;

Fig. 6 is a detail section on line 6—6 of Figure 1 showing the cooling water and knife adjusting screw passages therein;

Fig. 7 is a detail section of one of the cooling lags for the stationary knives, the lag and the pipes leading thereto being broken away to facilitate illustration in limited space;

Fig. 8 is an enlarged sectional view on line 8—8 of Figure 7;

Fig. 9 is an enlarged sectional view on line 9—9 of Figure 7;

Fig. 10 is a diagrammatic view of the water connection to and from the water cooled lags in the knife bed, showing the same as they would appear looking up toward the bottom of the machine, and

Fig. 11 is a sectional view similar to Figure 2 but showing the modified construction of water cooled lags.

Referring first to the illustrative form of my invention shown in Figures 1—10, it will be noted that I have shown therein an improved flock cutter which is of the general type described and claimed in the Parent patents mentioned, but of substantially greater capacity and length. As illustrated, it includes a rotating knife carrying cylinder 1 rotatable inside a usual pivoted cover or casing 2 and relative to a series of cooperating stationary knives 3 carried in a chamber or socket 4 on a suitable base; the several knives cooperating in such manner as to grind up flock fed thereto from a hopper 5 by usual agitating means 6 and a screw feed conveyor 7 rotatable with the cylinder 1 and which selectively feed the flock to opposite ends 8 or 9 of the casing 2 upon opposite rotation of the cylinder 1, while the ground flock is also selectively delivered through end outlets 10 and 11.

Referring more particularly to the mounting for the stationary knives 3, it will be noted that the latter are disposed in a usual chamber or socket 4. Further, it will be noted that as in the prior construction mentioned, this chamber or socket is cooled by longitudinal water passages 12 and 13 passing along the sides thereof and by connected transverse passages 14 passing under portions of the socket or bed 4, while between certain of the passages 14, the knives are acted upon by adjusting screws 15. Attention is further directed to the fact that each knife is herein elongated and of usual cross section and has its base carried in a usual pocket 16 in usual cooperating upstanding lag members 17. Moreover, as shown in Figure 2, it will be noted that the adjusting screws 15 are threaded up through a lateral extension 19 in certain of the lags 17 and that the end of this screw acts upon the bottom or base of the knife 3 within the limits of the pocket 16. Here also it will be noted that the knives 3 are arranged in two longitudinally spaced sets, as shown in Figure 1, while two longitudinally spaced sets of lags 17 are also provided. It will also be noted that the screws 15 are so disposed that one set of screws 15 acts upon each set of longitudinally spaced knives 3 midway between the ends of that set of the latter. As shown, lateral adjusting or clamping screw means 20 are also provided which are disposed just above the longitudinal passage 12 and function to force all the knife blades 3 and their cooperating lags 17 laterally toward the opposite wall 21 of the socket 4 and thereby firmly clamp the knives between the lags in proper position in the socket. Thus it will be evident that while it is made possible to make the cylinder 1 and the stationary knives 3 cooperating therewith of unusual length, it is still made possible to adjust the stationary knives 3 toward the cylinder 1, as desired, and also to locate the same securely laterally in the knife chamber or socket and with respect to the several cooperating lags in the latter.

More specifically considering the improved cooling means for these stationary knives, it will

be noted that as usual the longitudinal passage 13, which is the passage connected to the inlet, communicates through the passages 14 with the longitudinal passage 12 which is connected to the discharge. Further, it will be observed that between these passages 12 and 13 and in the knife bed between the several knives and lags comprising the latter, improved cooling means are provided. Herein these means include improved cooling lags, generally indicated at 22, and shown in detail in Figures 8 and 9. As shown, each of these lags is substantially larger than the lags 17 previously described. Further, it will be observed that each of these lags 22, while provided with a portion 23 corresponding to the portions 19 and otherwise corresponding in shape to lags 17, is additionally provided with a longitudinally extending water passage 24 of substantial width at its top and having a narrower lower portion 25. Herein also, it will be observed that knife adjusting screws 15 are disposed through lateral bottom lugs 23 on each of these lags 22 and that each has connected thereto near opposite ends thereof, an inlet pipe 26 and an outlet pipe 27, as shown in Figure 7. Further, the several lags 22 are so spaced from one another and the longitudinal passages 12, 13 and across the stationary knife bed as effectually to cool the latter. For example, in this illustrative construction, each outside cooling lag 22 is spaced by two knife blades and uncooled lags from its adjacent longitudinal passage 12 or 13, while the two intermediate cooling lags 22 are each equally spaced by four knife blades and their usual uncooled lags from these outside cooling lags and from one another. With these two sets of longitudinally spaced water cooled lags 22, one on each side of the longitudinal center line of the bed, and with the passages 12, 13 and the transverse passages 14, it will be apparent that not only will the bottom and side walls of the chamber 4 be effectively cooled, but that the new cooling lags 22 will cool the bases of the knives themselves and the lags within the knife and lag socket 4 in a new and very effective manner.

The several water flows, i. e. through the passages 12 and 13 along the sides of the socket 4, through the transverse passages 14 beneath the bottom of the socket 4, and through the water cooled lags 22, are preferably supplied from a common water supply, herein indicated at 28. Referring to Figure 6, it will be noted that this pipe 28 is connected through a pipe 29 with the first transverse passage 14, while the other passages 14 are connected at their ends in such manner as to establish the usual flow therebetween and to an outlet pipe 30, herein connected diagonally opposite the pipe 29 to the last transverse passage 14. Herein also, it will be noted that, as shown in Figure 6, the inlet pipes 26 for the water cooled lags 22 are adjacent one another near the center of the bed, while the outlet pipes 27 are at opposite ends of the bed. Moreover, as shown diagrammatically in Figure 10, the water main 28 is connected through a pipe 31 with a common transverse pipe or manifold 32, herein disposed below the space between the spaced ends of the longitudinally spaced sets of lags 17, the lag inlet pipes 26 being connected to this pipe 32 and branching from opposite sides thereof. Also, as shown in Figure 10, the outlet pipes 27 in each set are connected to common discharge pipes 33, one pipe 33 being provided at each end, and these pipes 33 are also connected to a common outlet connection 34. Thus it will be apparent that the cooling water

will flow from the main 28, not only through the various passages 12, 13 and 14, and emerge through outlet 30, but that the same will flow from the same main through the pipe 31 and inlet 26 to outlets 27 and outlet pipe 34; all in such manner as effectually to cool the whole of the bed and its contents, including the knives and lags therein.

As regards the cylinder 1, it will be noted that the same herein is hollow, as indicated at 36, in such manner as to form a suitable water cooling chamber therefor. Further, it will be noted that openings 37 in opposite ends of the cylinder are closed by suitably attached plates 38 having axial water passage means 39 and 40 therein, of which the passage 39 is connected through an inlet pipe 41 while the passage 40 forms a discharge outlet leading to an outlet pipe 42. Here, of course, it will be understood that since the members 38 rotate with the cylinder 1 in the bearings 43 for the latter, a usual water tight connection 44 will be provided between these rotating parts and the stationary piping 41, 42, but which need not be described herein. Further, it will be noted that the inlet 41 is connected to the water supply pipe 28, and understood that the outlet pipe 42 is also suitably connected to a common outlet pipe, and to which the pipes 30 and 34 are also connected.

Cooperating with the water cooled cylinder 1 in this present construction is also a plurality of improved cooling means disposed externally of the cylinder and inside the cover or casing 2. Herein, these means are in the form of two copper tube cooling units 45 and 46, each of which is carried by the cover 2 and comprises a plurality of parallel lengths of pipe. Of these units, the unit 45 is connected through an inlet 47 at its bottom with the main 28, and comprises a series of horizontal pipes 48 disposed in parallel relation and connected to vertical terminal pipes 49 and 50 at their opposite ends, of which the pipe 50 is connected to a suitable outlet 51. Here it will be observed that the terminal pipes 49 and 50 are bent in the form of like arcs conforming to the curvature of the casing 2 and cylinder 1, as shown in Figure 2. Further, the pipes 48 are substantially equally spaced from the cover 2 and from the knives 52 on the cylinder 1 and it will also be noted that the bottom pipe 48 is spaced slightly above the top wall of the passage 13 and that the several pipes 48 are spaced from one another by substantial distances. As regards the unit 46, the same is of generally similar structure to the unit 45. However, only the upper end 53 of this unit is curved to conform to the curvature of the cylinder 1 and casing 2, both the casing and this unit 46 herein being provided with straight depending portions 54 and 55, respectively. Here attention is also directed to the fact that, although the several pipes 56 are spaced from one another as are the pipes 48 on the unit 45, the bottommost one of these pipes 56 is closely adjacent the depending portion 54 on the cover, while the bottommost three are also substantially closer to the knives 52 on the cylinder 1 than the corresponding pipes on unit 45. Attention is further directed to the fact that each of the copper units 45 and 46 is provided with a bottom inlet and a top outlet, which top outlets are preferably connected to the common discharge outlet heretofore described. As a result of this construction, it will be noted that the flock in the casing 2 and between the same and the water cooled cylinder 1, is further cooled by the circulating water in the units 45, 46, at the same time that the tempera-

tures of the cylinder 1 and casing 2, and the base carrying the passages 12 and 13, as well as the knives 3 and lags carrying the latter, are all correspondingly lowered.

In the use of the flock cutter, it will be understood that as the cylinder 1 is rotated by suitable power connections (not shown), the feeding mechanism 6, 7 will be driven from the cylinder shaft and that the cylinder 1 will be reciprocated back and forth in a well known manner, both the feeding drive and the reciprocation of the cylinder being effected through the mechanism generally shown at the right in Figure 1. It will also be understood that as the flock to be ground is supplied to the hopper 5, the same is fed therefrom by the agitating means 6 and screw conveyor 7 in a well known manner to the selected end of the cylinder 1, depending upon the direction of rotation of the latter. Further, it will be noted that as the flock is so fed, the same is acted upon by the pipes 48 in the copper units 45 and 46 in such manner as to some extent to pre-cool the flock before grinding while keeping down the temperature of the casing 2 and the cylinder 1 and the other parts in contact with the flock. Also, the cylinder 1 is being simultaneously cooled by the flow of circulating water through the inlet connection 39 and into the hollow chamber 36 within the cylinder and out through the outlet 40. At the same time that both of the above cooling means are functioning, cooling water is also flowing in the passages 13, 14 and 12 in such manner as further to cool the base and keep down the temperature of the flock and cylinder, as well as the walls of the stationary knife bed socket 4 and also the bottom of that socket and the lags and knives therein. Moreover, through the provision of the improved water cooled lags 22 having the water passages 24 therein, it will be observed that the lags in the socket 4 and the stationary knives 3 are directly cooled by these water cooled lags, the temperature of which is, of course kept down by the circulation of the cooling water therethrough.

As a consequence of my improvements, it is found that it is possible to make the machine in large sizes with a capacity as large as twenty times that of previous machines, and yet to operate the same at the desired knife speed without causing fires or objectionable discoloration of the product due to overheating, all in such manner as materially to reduce the costs as compared with those where a number of smaller machines is required to effect the same production. Moreover, it is possible so to continue to operate it for long periods without causing such overheating of the machine as to require the same to be shut down for cooling. To put the matter another way, it is made possible to grind a given quantity of flock with greater efficiency during grinding and in a shorter time, while also continuing to obtain this efficiency as long as necessary. Moreover, it is not only made possible to reduce the cost per pound due to a marked reduction in friction losses, etc., but also substantially to halve the labor costs.

Attention is further directed to the large number of stationary knives capable of being provided in my improved construction to increase the capacity while keeping the flock within a proper temperature limit, and also to the reduction in the speed of rotation of the cylinder which, due to the large diameter of the latter, is made possible while obtaining the desired knife speed and both increased capacity and proper flock cooling.

Further, it will be evident that both the copper tubing in the casing and the improved water cooled lags will cooperate to reduce the temperature of the flock in a most effective manner through direct engagement of all sides of the tubing therewith, and through effective cooling of the stationary knives by the improved lags, while both this tubing and these lags will also cooperate with the water cooled cylinder and the stationary transverse and longitudinally cooling passages in such a manner as to effect a substantial further reduction in the flock temperature. It will also be noted that, due to the central inlet for the water cooled lags, a very efficient cooling water flow is maintained and that the effectiveness of the copper tubing in the casing is also increased by the bottom inlets and top outlets thereof.

As a result of the plurality of longitudinally spaced water cooled lags, it is also made possible to produce more practical castings for large size machines, but it will be understood that I do not wish to be limited to the use of such multiple lags or to the use of my improved lag construction in such sizes as to require the provision of longitudinally divided lags. Further, as regards the flow of cooling fluid through the lags and the copper tubing, it will also be understood that while the flows described are advantageous, I do not wish to be limited thereto, since it is evident that the improved structures may be used with reversed flows. Attention is further directed to the fact that while I have shown the socket 4 as filled with two series of lags, each occupying half of the socket and the two series abutting along the longitudinal center line of the machine, I do not wish to be limited to any particular arrangement of the lags in the socket, it being understood that this arrangement is subject to variations in order to meet new conditions and to accommodate different numbers of stationary knives, as necessary.

In Figure 11 I have shown a modified water cooled lag arrangement which may be used if desired. In that figure, it will be noted that instead of having the water cooled lags 22 spaced from one another by uncooled lags, as previously described, all of the lags in the socket 4 are water cooled with the exception of end lags 57 and 58. As a result of this construction, the number of stationary knives 3 is decreased due to the necessity for utilizing the wider water cooled lags. Also, it will be observed that all of these lags are connected by pipes 26 to an inlet similar to that shown in Figure 3, but with eleven such inlets shown herein, as distinguished from the four shown in the latter figure. Here, of course, it will also be understood that the flow connections for the lags constructed as shown in Figure 11 are preferably the same as those shown in Figure 10. In this construction, while some reduction in capacity results from the reduction in the number of stationary knives, it will be noted that as a result of the increased cooling effect obtained, it is also possible to reduce materially the need for other cooling of the bed and, in some instances, to eliminate need for further cooling of the latter.

While I have in this application specifically described certain forms which my invention may assume in practice, it will be understood that these forms are chosen for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. In a flock cutter, a rotary cutter, stationary knives disposed transversely to the direction of rotation of said cutter and cooperating therewith, a plurality of separate elongated lag means supporting said knives in heat conducting relation and extending longitudinally thereof, means for adjusting said knives relative to said cutter, and temperature controlling means associated with said rotary cutter and knives for maintaining the flock below the igniting point during the operation of said cutter including cooling fluid passages extending lengthwise of said knives substantially throughout the length thereof and having sufficient cross section for circulating sufficient cooling fluid to cool said lag members and said knives supported thereon and disposed in a sufficient number of said lag means adjacent the knives thereon to cool the lag means and the knives, and fluid inlet and outlet means for said passages for introducing and withdrawing a stream of cooling fluid.

2. In a flock cutter, a rotary cutter, stationary knives disposed transversely to the direction of rotation of said cutter and cooperating therewith, a plurality of separate lag members supporting said knives in heat conducting relation and extending longitudinally thereof, means for adjusting said knives relative to said cutter, temperature controlling means associated with said knives for maintaining the flock below the igniting point during the operation of said cutter including cooling fluid passages extending substantially throughout the length of said knives and longitudinally of said lag members and within the latter having sufficient cross section for circulating sufficient cooling fluid to cool said lag members and said knives supported thereby, and separate inlet and outlet connections to each of said passages and on opposite ends of said lag members for introducing and withdrawing a stream of cooling fluid.

3. In a flock cutter, a rotary cutter, stationary knives disposed transversely to the direction of rotation of said cutter and cooperating therewith, a plurality of separate elongated lag members extending longitudinally of and supporting said knives in heat conducting relation and having knife engaging portions on opposite sides of said lag members, means for adjusting said knives relative to said cutter, cooling fluid passages having sufficient cross section for circulating sufficient cooling fluid to cool said lag members and knives and disposed in a sufficient number of said lag members longitudinally thereof substantially throughout the length of said knives between and adjacent said opposite knife engaging portions, to cool said lag members and knives, and fluid inlet and outlet means for said passages for introducing and withdrawing a stream of cooling fluid.

4. In a flock cutter, a rotary cutter, stationary knives disposed transversely to the direction of rotation of said cutter and cooperating therewith, and fluid cooled lag means for supporting and cooling said knives extending longitudinally substantially throughout the length of said knives and in heat conducting relation therewith including a sufficient number of longitudinally spaced hollow cooling lag members having cooling passages therein extending longitudinally thereof substantially throughout the length of said lag members and of said knives disposed adjacent the latter and of sufficient cross section to circulate sufficient cooling fluid to cool said lag

members and said knives and also having fluid inlet and outlet connections for said passages.

5 5. In a flock cutter, a rotary cutter, stationary knives disposed transversely to the direction of rotation of said cutter and cooperating therewith, fluid cooled lag means extending longitudinally of said knives in heat conducting relation therewith and including a plurality of series of longitudinally spaced hollow cooling lag members having cooling passages therein extending longitudinally thereof substantially throughout the length of said lag members and of said knives and disposed adjacent the latter and of sufficient cross section to circulate sufficient cooling fluid to cool 10 said lag members and said knives, and inlet and outlet connections for said passages including an inlet manifold extending transversely between said series of lag members.

20 6. In a rotary cutter, a stationary knife carrying bed having a socket, cooling fluid passage forming means in said bed and external of said socket for cooling the latter, stationary knives in said socket, cooperating cooling fluid passage forming means in said socket extending longitudinally thereof and of the knives therein and comprising a plurality of lag members supporting said knives in heat conducting relation and extending longitudinally adjacent said knives substantially throughout the length thereof and 25

cooling fluid passages disposed longitudinally substantially throughout the length of said lag members and in a sufficient number of said lag members and of large enough cross section to circulate sufficient cooling fluid to cool the knives carried thereby, and fluid inlet and outlet means for said passages for introducing and withdrawing a stream of cooling fluid. 5

7. In a rotary cutter, a rotary cutter member, a knife bed carrying cooperating stationary knives and having material directing side portions, a casing enclosing said rotary cutter, and cooling means extending above said portions in said casing and in the path of the material operated upon by said rotary cutter for cooling said material and dividing the same into a plurality of streams on opposite sides of said cooling means. 10 15

8. In a rotary cutter, a rotary cutter member, a knife bed carrying cooperating stationary knives, a casing enclosing said rotary cutter, and means in said casing for cooling the material operated upon by said rotary cutter presenting a plurality of cooling fluid passages in the path of said material between said cutter and casing at each side of said bed and comprising a series of spaced pipes in each side of said casing and each series having a bottom inlet and a top outlet at opposite ends thereof. 20 25

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