Aug. 24, 1954 C. A. BOWMAN 2,687,084

OIL EXTRACTION PRESS

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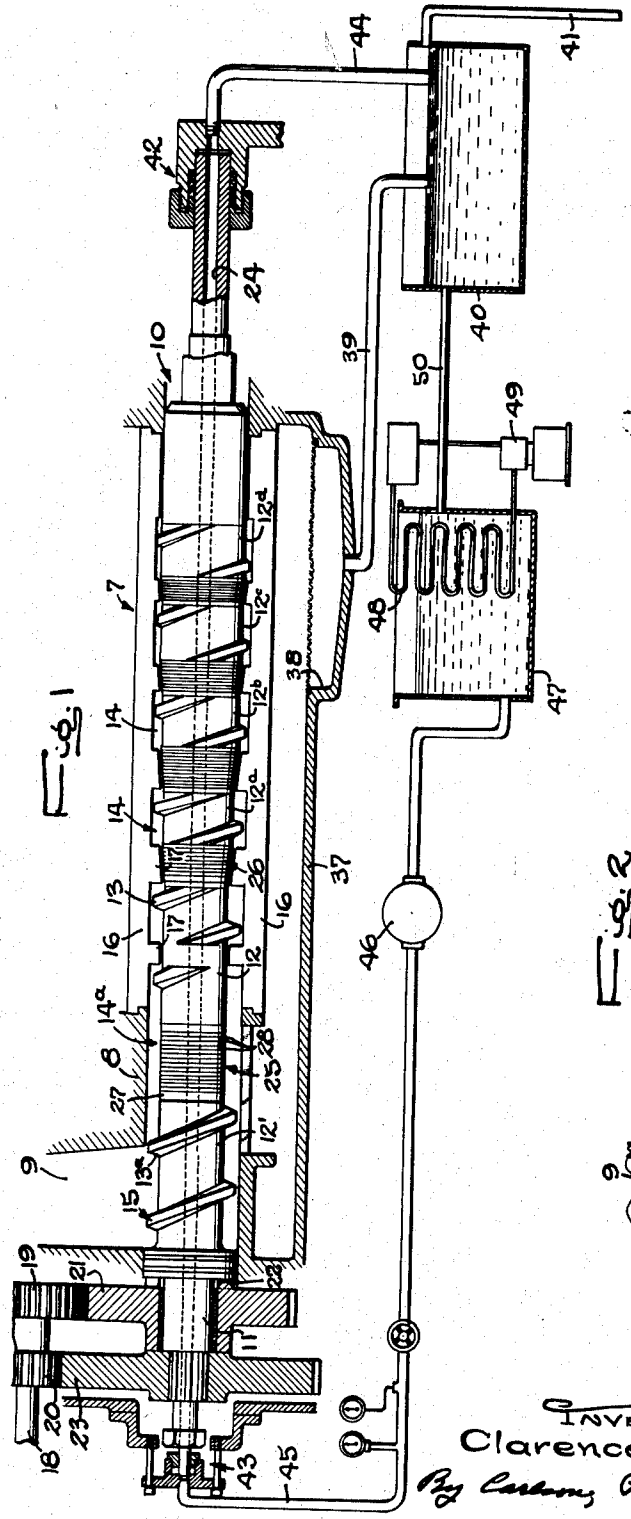


Fig. 1

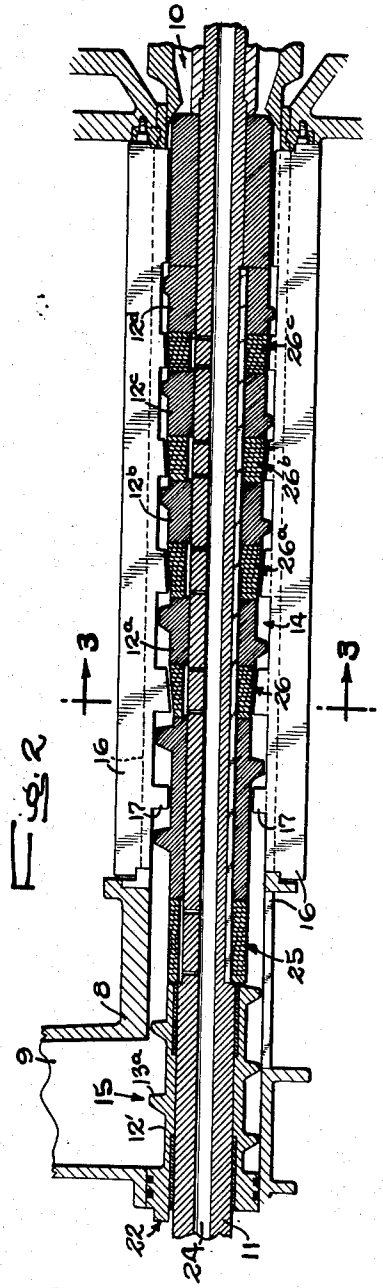


Fig. 2

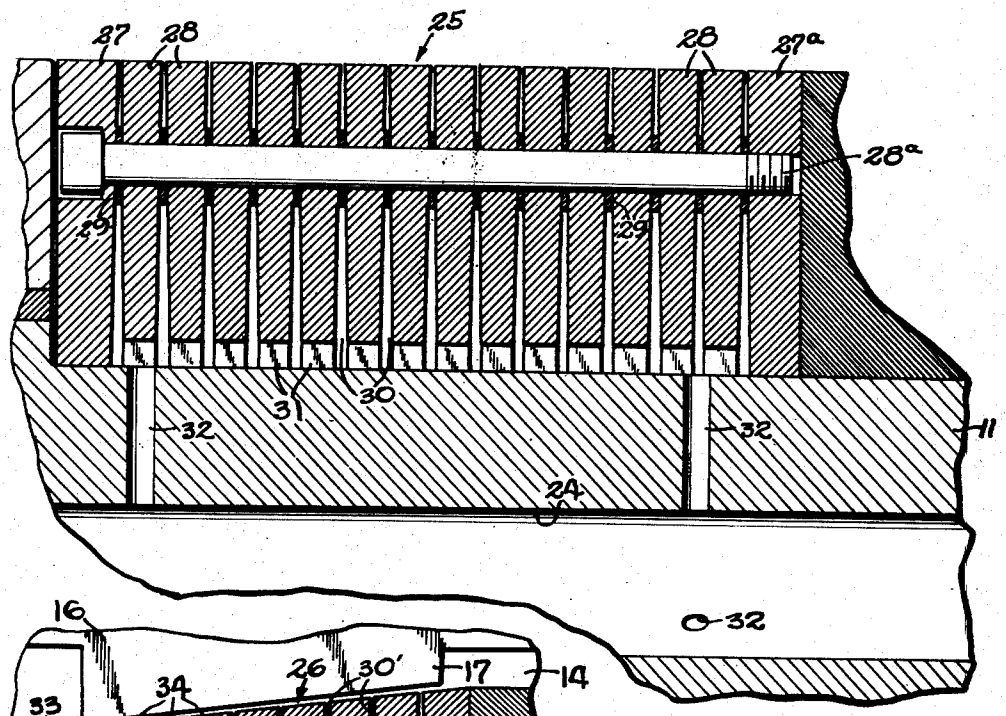
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Fig. 5



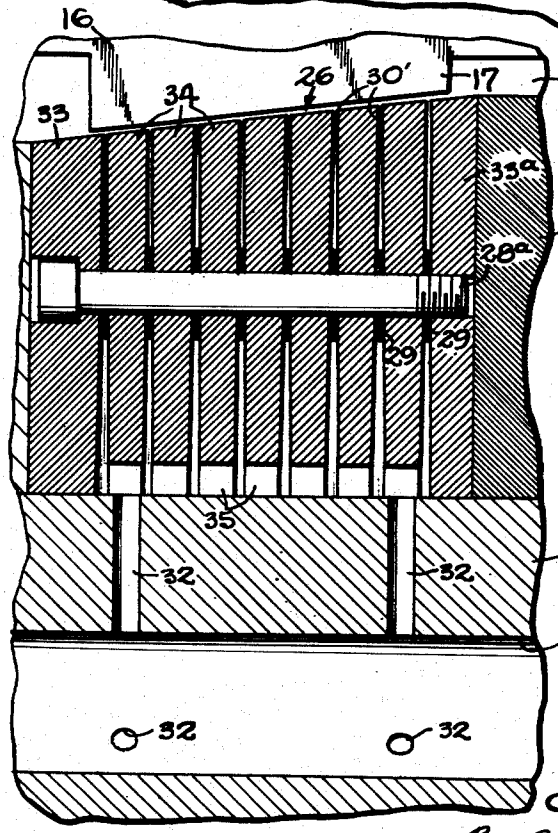


Fig. 6

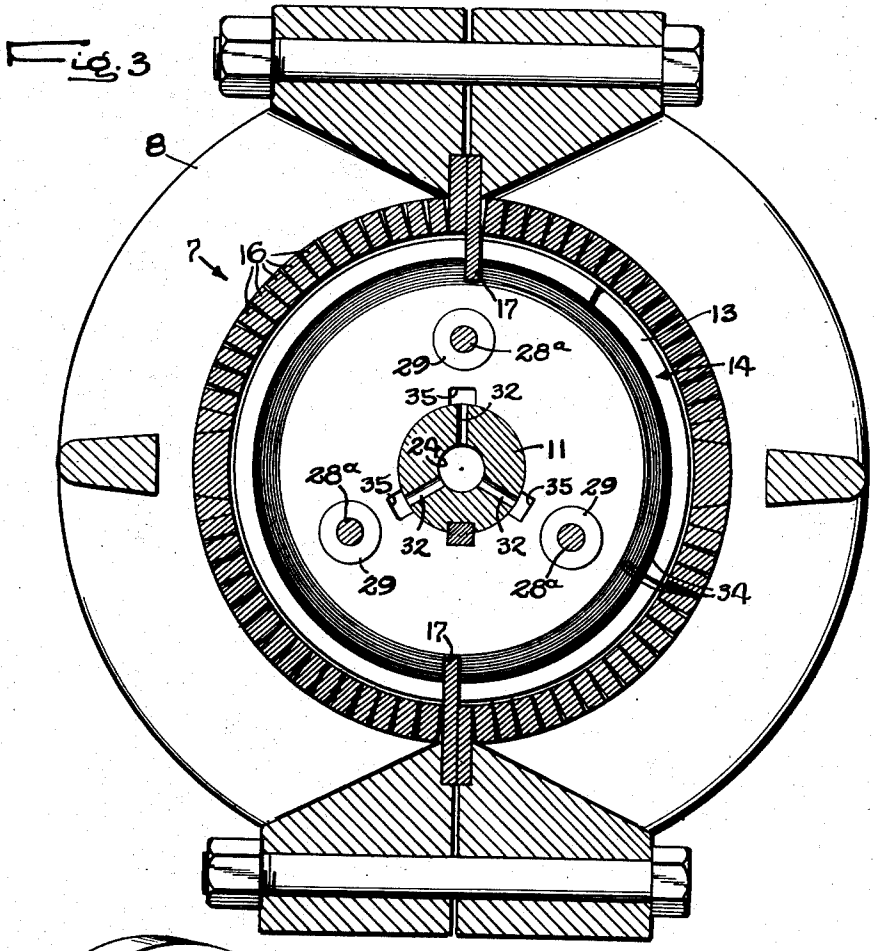
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Fig. 3



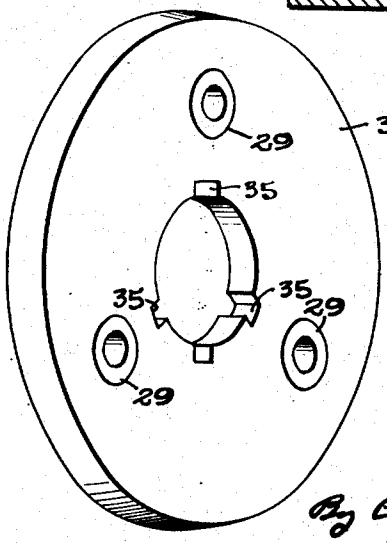


Fig. 4

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OIL EXTRACTION PRESS

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6 Claims. (Cl. 100—93)

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The invention pertains to an improved press or expeller for extracting oil from various materials such as cottonseed, soy beans and like materials; and the primary object of the invention is to increase the amount of oil obtainable from such material in the operation of the press.

Oil extraction presses of the character heretofore in use have commonly employed a cylindrical cage having pressure creating screw means therein consisting of a shaft having spaced screw flights thereon operative to compress the material in successive stages, so as to cause the oil in the material to be pressed therefrom, the cage providing an outer peripheral wall or screen having minute passages through which the oil passes outwardly in the extracting process. As an incident to the compression of material the latter is heated to a very high degree so that it has been common to provide for the cooling of the press by circulating cooling water through a central or axial bore in the screw shaft. In accordance with the present invention the extracted oil is collected, cooled and then circulated through the shaft for cooling purposes, and one or more inner screens are provided on the shaft for the passage of oil inwardly through such screen or screens as well as outwardly through the cylindrical cage, the portion of the oil passing inwardly discharging into the stream of oil circulating through the central bore of the shaft. In addition to its cooling function the oil circulated under pressure through the shaft serves to remove the foots which would otherwise clog the bore of the shaft.

In some presses a feed worm driven at a speed substantially higher than the screw shaft is employed for advancing the material to the cylindrical cage for compression by the screw flights on the shaft. Another feature of the present invention is the provision of an inner screen on the shaft, located in the feed housing between the feed worm and the first screw flight rotating with the shaft so as to take advantage of the high pressure developed by the rapidly driven worm in the passage of the material through the feed housing.

A further object is the provision of an improved pressure creating screw means for oil extraction presses embodying a plurality of inner screen sections between axially spaced screw flights for the passage of oil inwardly as well as outwardly from the compression spaces between the flights.

The objects of the invention thus generally set forth, together with other and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

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Figure 1 is a fragmentary schematic illustration of a press embodying my invention and showing in particular the oil circulating and cooling means in its relation to the press.

Fig. 2 is a fragmentary longitudinal sectional view through the press and showing especially the construction of the shaft with its inner screens.

Fig. 3 is a transverse sectional view taken approximately in the line 3—3 of Fig. 2 but on an enlarged scale.

Fig. 4 is a perspective view of one of a series of disks composing the inner screens.

Fig. 5 is a fragmentary longitudinal sectional view through the inner screen located in the feed housing.

Fig. 6 is a similar view showing a preferred form of construction for the inner screens in the cylindrical cage.

My invention is herein shown as applied to a press comprising in general an elongated generally cylindrical body including a main cage section 7, a feed housing 8 with an inlet 9, and a discharge section 10; and a screw shaft assembly journaled in the casing and comprising a shaft 11 extending entirely through the body and having keyed thereon a series of sleeves 12, 12*a*, 12*b*, 12*c* and 12*d* having screw flights 13 on their outer peripheries spaced apart longitudinally so as to form between them a series of compression spaces 14 progressively decreasing in volume toward the discharge end of the press. Material to be operated upon is introduced into the press from a hopper (not shown) and enters the feed housing 8 through inlet passage 9, where it is acted upon by a feed worm 15 and delivered to the cage 7, the residue material being ultimately discharged from the opposite end of the casing through the discharge section 10.

The cage 7 is constructed to provide a main outer screen composed of a circumferential series of longitudinal screen bars 16 (Fig. 3). The screen is in the form of a complete annulus except that the upper bars terminate short of the feed housing while the lower bars are extended so as to form a lower segment underlying the feed screw. The screen provides a multiplicity of small passages or slits or the escape of oil outwardly from the cage as the material is successively compressed by the feed worm 15 and the screw flights 13. At diametrically opposite sides of the cage are mounted knife bars 17 protruding into the compression spaces 14, the inner edge portions of

the bars being notched to provide operating clearance for the several screw flights.

The cage construction forms per se no part of my invention, and it is therefore deemed unnecessary to illustrate and describe it in detail. For a complete disclosure reference is made to Patent No. 2,149,736 to Hiller et al. patented March 7, 1939.

The feed worm 15 comprises a sleeve 12' journaled on the forward end of the shaft 11 and having a screw flight 13a on its periphery. The shaft and worm are driven by means of a well known character operative to drive the worm at a substantially higher speed than the shaft. As herein shown, the drive mechanism comprises a drive shaft 18 having two drive pinions 19 and 20 thereon, the former meshing with a gear 21 acting through a clutch connection 22 to drive the worm 15, and the latter meshing with a gear 23 splined on the projecting end of shaft 11.

In accordance with my invention, oil extracted from the material is collected, cooled and circulated through a longitudinal flow passage preferably in the form of a central bore 24 extending axially through the shaft 11, and in addition to the discharge of oil radially outward through to the main cage or screen 7, provision is made for the discharge of oil radially inward through one or more annular screens on the shaft into a central longitudinal flow passage preferably formed by an axial bore 24 in the shaft, through which a quantity of cooled oil is constantly circulating. In the present illustrative embodiment, the shaft is provided with a pluraltiy of inner screens providing small discharge passages connected with the bore, including a cylindrical screen 25 mounted on the shaft between the feed worm 15 and the sleeve 12, and also a series of four conical or tapered screens 26, 26a, 26b and 26c mounted on the shaft between the sleeves 12, 12a, etc.

The cylindrical screen 25 preferably comprises a series of circular plates or rings including a pair of end plates 27 and 27a (Fig. 5) and a plurality of intermediate plates 28 clamped together in axially spaced relation by means of bolts 28a. As shown, thin spacing washers 29 on the bolts 28a maintain the plates in spaced relation to provide passages 30 in the form of annular slits. At their outer edges these slits open into a compression space 14a formed in the feed housing 8 between the feed worm and the first screw flight 13. Preferably, the plates greatly decrease in thickness in an inward direction so that the annular slits increase in thickness toward the shaft.

At their inner edges the annular slits 30 communicate with the bore 24 in the shaft 11 so as to permit the discharge of oil inwardly into the bore. For this purpose I have shown in the present instance a plurality of notches 31 formed in the inner peripheral edges of the disks and alined so as to form a plurality of longitudinal grooves or channels, and opposite these channels the shaft has a plurality of radial passages 32 opening into the bore 24.

The conical or tapered screens 26, 26a, 26b, 26c (Fig. 6) are of a construction generally similar to that of the cylindrical screen 25. Each comprises a pair of end plates or rings 33 and 33a and a plurality of intermediate rings 34 progressively increasing in diameter, all of the rings having outer tapered edges so that the periphery of the screen is of frusto-conical shape. As in the case of the cylindrical screen 25 the spaces between the plates form annular slits 30' gradually increasing in thickness in an inward direction, and these slits open into longitudinal grooves or channels formed by alined notches 35 and communicating with the bore 24 in the shaft through radial passages 32.

Oil extracted from the material and discharged radially outward through the cage 7 between the screen bars 16 is collected in an underlying pan 37 having a well 38 from which it is conducted by a pipe 39 to a suitable reservoir 40, and oil discharged radially inward to the shaft bore 24 through the inner screens 25, 26, 26a, 26b, 26c is likewise delivered to the reservoir 40. For this purpose the opposite ends of the shaft 11 are respectively connected through the medium of suitable packing glands 42 and 43 with pipes 44 and 45, the former discharging into the reservoir 40 and the latter leading from a circulating pump 46. Between the pump and the reservoir is a suitable cooling means for the oil comprising as shown a tank 47, a refrigerating coil 48 and a compressor 49. The reservoir 40 is equipped with a runoff pipe 41, and a pipe 50 connects the tanks 40 and 47, the general arrangement being such that a predetermined quantity of oil is maintained in the reservoir and sufficient to insure adequate cooling of the press.

It will be seen that by collecting and circulating a quantity of cooled oil through the longitudinal flow passage herein provided by the shaft bore 24, the press is not cooled but the passage provides for the escape of oil discharging radially inward through the inner screen or screens, and the passage is itself cleared of foots by the circulation of oil under pressure therethrough. Thus the quantity of oil extracted through the outer screen in the conventional manner is augmented, with the result that I have found it possible to increase very substantially a percentage of oil extracted from the material. Of substantial importance in the attainment of this result is the provision of an inner screen for the expulsion of oil from the initial compression space 14a in the feed housing, so as to utilize to advantage the high degree of compresison of the material by the rapidly driven feed worm. Thus I have found that the major portion of the oil may be extracted from the material through this screen before passage to the cage 7 where the remaining portion of the oil is extracted.

It is to be understood that the construction and arrangement shown by way of illustration is subject to various changes without departing from my invention, both as to the particular construction of the inner screens as well as to the particular placement thereof. Also it will be understood that the term "oil" as herein used is intended to include animal fats as well as vegetable oils.

1. An oil extraction press having, in combination, an elongated body having pressure creating screw means therein including a shaft having an axial bore and screw flights spaced apart on the shaft to form a compression space between them, means for circulating a quantity of oil through said shaft bore, and an inner screen on the shaft comprising a series of annular plates encircling the shaft and keyed thereto, said plates being spaced apart axially to provide a plurality of minute passages between the plates opening outwardly into said compression space and having their inner peripheral edges notched to form a channel extending longitudinally of

the shaft, the shaft being apertured transversely for the passage of oil from said channel into the bore.

2. An oil extraction press having, in combination, an elongated body having pressure creating screw means therein including a shaft having an axial bore and screw flights spaced apart on the shaft to form a compression space between them, means for circulating a quantity of oil through said shaft bore, and an inner screen on the shaft comprising a plurality of rings of gradually increasing size in a direction toward the discharge end of the body and spaced apart axially of the shaft to form a plurality of minute passages opening outwardly into said compression space, said rings and shaft coacting to provide a longitudinal channel into which the inner ends of said passages open and said shaft being apertured transversely to connect said channel with said bore.

3. A rotary screw means for an oil extraction press having a feed end and a discharge end, comprising, in combination, a shaft having an axial bore and screw flights spaced apart axially of the shaft, and an inner screen on the shaft comprising a plurality of rings gradually increasing in diameter in the direction of movement of the material and spaced apart axially of the shaft to form a plurality of minute passages opening at their outer ends into the space between the flights and communicating at their inner ends with said bore in the shaft, said shaft being apertured for the passage of material inwardly into the said bore.

4. A rotary screw means for an oil extraction press having a feed end and a discharge end, comprising in combination, a shaft having an axial bore throughout its length, a pair of sleeves of different external diameters spaced apart axially of the shaft and each having a screw flight thereon and a frusto-conical screen on the shaft between said sleeves comprising a plurality of rings spaced apart axially of the shaft to form a plurality of minute passages opening at their outer ends into the space between the screw flights and communicating at their inner ends with said bore in the shaft, the portion of the shaft encircled by said rings being apertured for the passage of material inwardly into said bore.

5. A rotary screw means for an oil extraction press having a feed end and a discharge end, comprising in combination, a shaft having an axial bore throughout its length, a pair of sleeves of different external diameters spaced apart axially of the shaft and each having a screw flight thereon, and a frusto-conical screen encircling the shaft between said sleeves, said screen having a multiplicity of radial discharge passages communicating at their outward ends with the space between the screw flights and at their inner ends with said bore, the portion of the shaft encircled by the screen having apertures leading outward from the bore.

6. An oil extraction press comprising, in combination, an elongated body having a feed end and a discharge end; a rotary screw means in the body comprising a shaft having an axial bore extending throughout the length of the shaft, a pair of sleeves spaced apart axially of the shaft and each having a screw flight thereon, and an annular screen encircling the shaft between said sleeves, said screen having a multiplicity of radial discharge passages communicating at their outer ends with the space between the screw flights and at their inner ends with said bore, and the portions of the shaft encircled by the screen having apertures leading outwardly from the bore; means for collecting and cooling at least a portion of the oil discharged from the press; and means including a pump for delivering the cooled oil under pressure from said collecting and cooling means to one end of said shaft bore whereby to cool the screw means and to clear the passageway formed therethrough by the bore.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,049,834	Fiddyment	Jan. 7, 1913
1,233,930	Strickland	July 17, 1917
1,288,864	Fowler	Dec. 24, 1918
1,297,901	Peerson	Mar. 18, 1919
1,772,262	Naugle	Aug. 5, 1930
2,149,736	Hiller	Mar. 7, 1939
2,299,784	Anderson	Oct. 27, 1942
2,335,819	Upton	Nov. 30, 1943
2,560,147	Anderson	July 10, 1951

FOREIGN PATENTS

Number	Country	Date
554,916	Germany	July 13, 1932