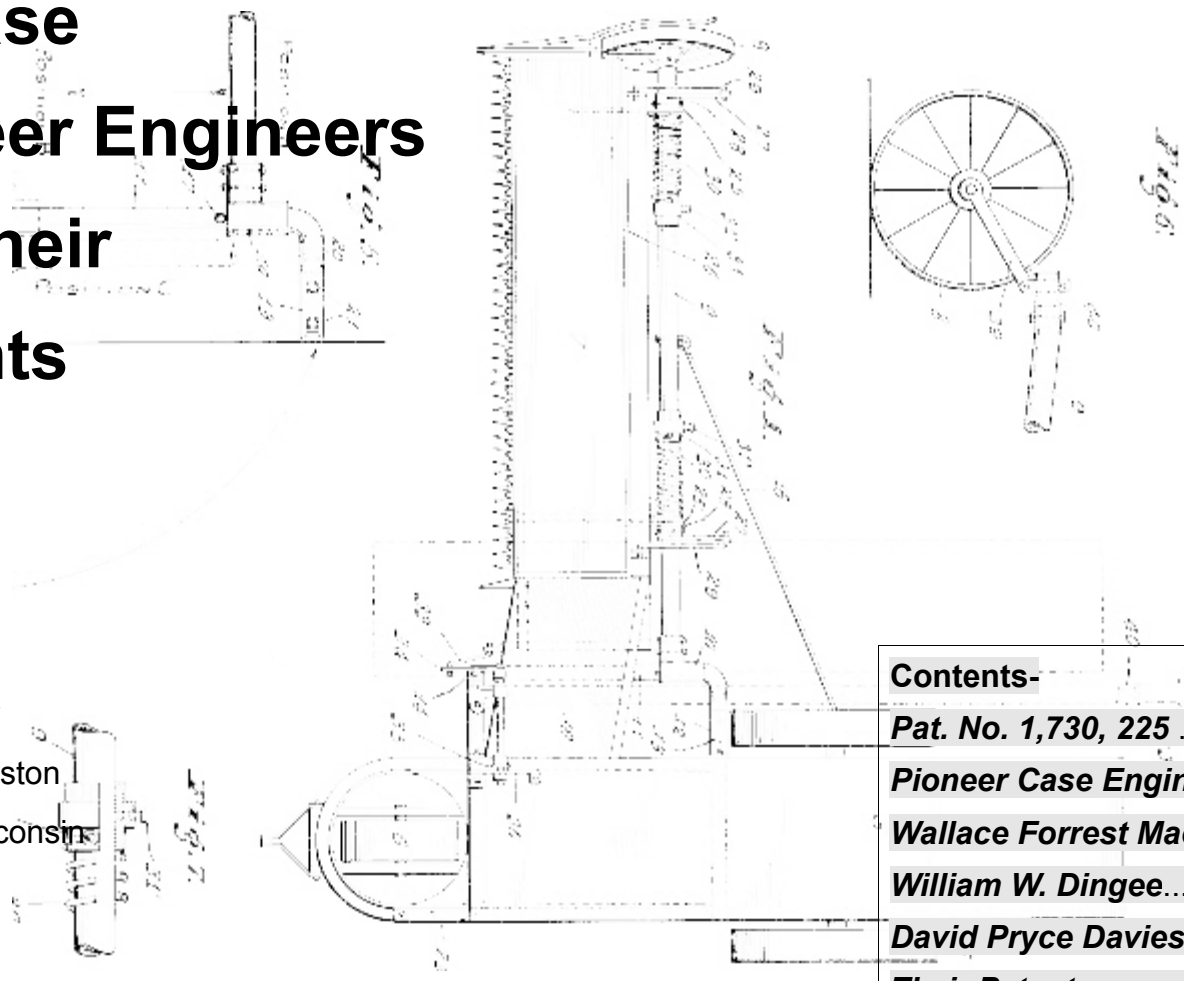


The J I Case Pioneer Engineers and their Patents

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Racine, Wisconsin
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Pat. No. 1,730, 225

My curiosity was aroused when I saw "Pat. No. 1,730, 225" affixed to the side of a scale model combine. Karen Braun, curator, was cataloging artifacts from the CNH donation and this model was among those she had brought into the Racine Heritage Museum work room.

I wondered why this model had been made and why had this patent number been placed on it?



Figure 1 Harvester-Thresher Model

A search of the U S Patent Office web site showed it was issued to W. F. MacGregor of Racine, Wisconsin and assigned to J I Case Company of Racine, Wisconsin Oct. 1, 1929. The application was filed March 21, 1925. A four and a half year delay between the filing and issuing seems like a rather lengthy time period, perhaps the patent office needed clarification and That was the reason for the model.

The patent describes improvements to a Combination Harvester-Thresher. The patent drawings show a pull type. ground wheel driven, combine and describe components that provide a means to swing the cutting portion of the machine back against the side of the threshing unit so that the width will be considerably reduced when moving between fields.

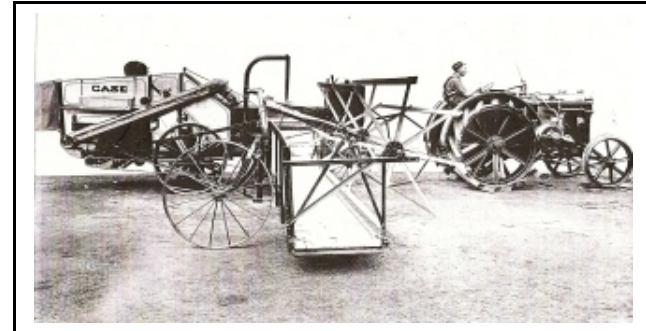


Figure 2 Early model of Case Harvester-Thresher with provision for swinging the cutting unit back against the thresher unit.

Another search of the U S Patent Office web site brought up a list of 39 U S Patents issued between 1922 and 1941 to Wallace F. MacGregor and assigned to Case Co. Most of them were dealing with harvesting equipment. (It is not known if he personally invented all of these, or if, as an experimental department manager he was responsible for making the filings, a common practice at some companies.)

MacGregor also co-authored, with Wm. W. Dingee, a 248 page hardcover handbook titled "Science of Successful Threshing", 1911, Published by J I Case Threshing Machine Co., Racine, Wis.

Pioneer Case Engineers-

During my research on Mr. MacGregor, I found mention of two other pioneer Case engineers who were involved in threshing machine and tractor development: William W. Dingee, co-author with MacGregor, and David Pryce Davies.

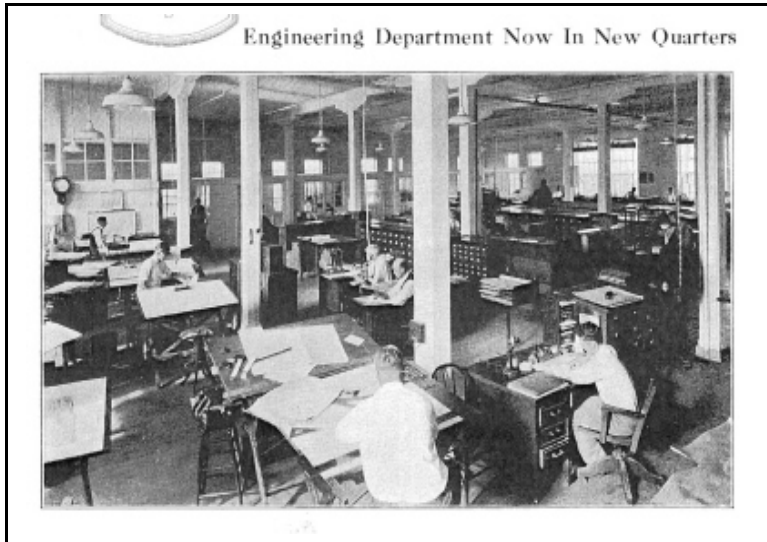


Figure 3 1925 Case Engineering Offices in Garfield Building

One of the Case buildings located near 700 State St. Racine.

Wallace Forrest MacGregor (1874-1939)

He was born in Wisconsin and died in Racine, with burial in Mound Cemetery.

He had a lengthy career with Case, about 1900 to 1939. The Society of Mechanical Engineers, (Vol. 26, 1907), list him as Superintendent of Experimental Dept., living at 1434 Main St., Racine.

The 1910 U S Census lists him as Superintendent of the Threshing Machine Shop. The 1920 census as Superintendent, farm machinery.

The 1902 Racine City Directory lists him at 728 Wisconsin Ave., in 1904 at 823 Lake Ave., in 1907-1910 at 1434 Main St., from 1912 to 1939 the Racine City Directories show him living at 422 16th Street in Racine.¹

He co-authored a book titled “Science of Successful Threshing” that includes instructions for operation of threshing machines and steam engines.

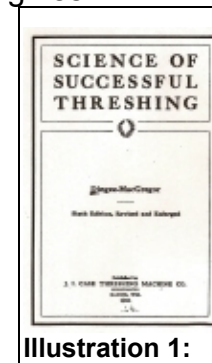


Illustration 1:

His name appeared in several issues of *The Case Eagle*, an employee publication. The Dec. 1926 issue mentions him in an

¹ Racine City Directories at Racine Heritage Museum, Racine, WI.

interesting article about an event near El Reno, OK. The article is titled *From Standing Grain to Bread in a Few Hours*. "...This very thing was done during the early part of July on the farm of J C Petree located 14 miles southwest of El Reno. In the morning the wheat was in the field. It was cut, threshed and rushed to the Canadian Mill and Elevator Co. in El Reno and dumped into bins. The wheat was then taken from the bin, milled into flour and about half an hour before noon the first batch of bread was taken from the oven by the mill chemist, Leslie O'Brien... What made this possible? The *combine*- the greatest advancement made in grain harvesting machinery since the invention of the grain binder."

In this same article, W. F. MacGregor is referred to as the author of a paper delivered before the Farm Power and Machinery Division of the American Society of Agricultural Engineers in Chicago outlining the history of combine development that began about 1836².

The October 1929 issue of *The Case Eagle* contains an article about an event in Spearman, TX. MacGregor is among Case people who visited the local Case dealer R. L. McClellan who had sold over thirty Case combines along with 39 Model "L" Case tractors. A group photo includes MacGregor, E. J. Gittings Vice President, L. R. Clausen President and D. P. Davies Vice President from Racine.³

The May 1940 issue has an article about the Case 20 Year Club banquet where MacGregor is recognized among those 'departing' since the previous banquet.⁴

²Farm Power and Machinery Division of the ASAE, Chicago, Dec. 4, 1924.

³ The Case Eagle Vol. 12 No. 10 Oct 1929 page 5, at RHM.

⁴ *Ibid.*, Vol. 23 No. 5 May 1940 page 8.

A search of the U S Patent Office web site showed 43 patents issued to him from 1905 and 1943. There could very well be more since the search engine probably didn't find all of them.

William W. Dingee (1831-1919)

Started his career as an apprentice machinist in Baltimore and in 1852 he worked at A. B. Farquhar in York, PA where he became a partner in the business.⁵



Figure 4 Dingee Advertisement

When their facilities were destroyed by fire he went to work for Geiser Threshing Machine Company and moved to Racine in 1863 to establish an additional Geiser facility, There he soon met Jerome I. Case.

⁵ *Commemorative and Biographical Record of Prominent and Representative Men of Racine and Kenosha, Wisconsin*, J H Beers & Co., Chicago 1906. Page 67.

(Jerome I. Case started making improved wheat threshing machines in Rochester, Racine County in 1842. In 1844 he moved to Racine on the Root River and by 1848 was operating the city's leading industry, J I Case Threshing Machine Co. About 1865 Case started production of the "Eclipse" thresher and in 1880 the "Agitator" thresher.)

When the Geiser facility in Racine was destroyed by fire, Dingee moved to Oshkosh and with Philetis Sawyer built the Dingee horse-power and an agitator thresher under the Sawyer name.

J I Case was so impressed with Dingee's abilities that he went to Oshkosh to persuade Dingee to work for him in Racine. Then Case purchased the Sawyer interests and in 1878 Dingee agreed to return to Racine.⁶ Dingee remained a Case man for the rest of his career.

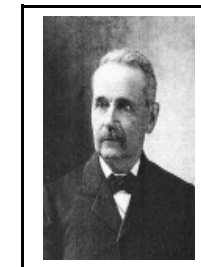


Figure 5 Wm. W. Dingee

Soon a new Case thresher was developed using the agitator principle for straw separation. The new machine threshed extremely well with modest power requirements. The honor of the agitator patents went to Dingee for the Case machines and put J I Case Threshing Machine Co. ahead of competitors. Case

⁶ *Full Steam Ahead*, J I Case Tractors & equipment 1842-1955; David Erb and Eldon Brumbaugh, 1993, American Society of Agricultural Engineers, St. Joseph, MI. Page 14.

also produced the famous Dingee-Woodbury horse power units to drive the Case threshers.⁷

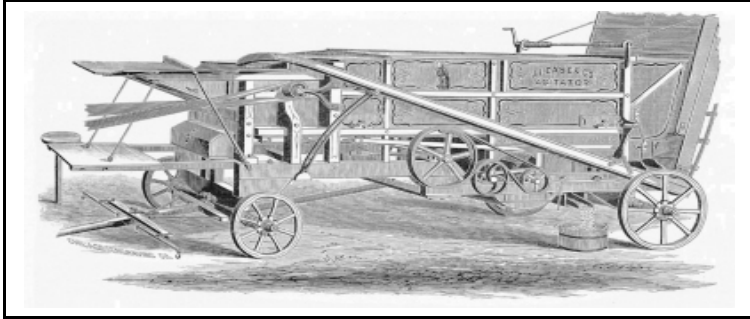


Figure 6 "Agitator" Case Threshing Machine

Dingee has been credited with having taken out perhaps one hundred patents.^{8, 9}

I have found 28 of them at the web site of the U S Patent Office issued from 1864 through 1906.

He was an early member of the American society of Mechanical Engineers.¹⁰

The 1870 U S Census shows him age 39, threshing machine mfr., 1880 census age 49, mfr. of threshing machine, 1900 census Mechanical Engineer.

In the Racine City directories for 1862-1872 he is living at S. Chatham St. bet. 8th & 9th and in 1882-1906 at 1124 Main St.

⁷ *Machines of Plenty*, page 64

⁸ *Ibid.*, J H Beers.

⁹ *Full Steam Ahead* page 16.

¹⁰ *Ibid.*, J H Beers.

David Pryce Davies (1870-1949)

He had a long and varied engineering career. Born in Wales, he came with his family to Racine in 1873 and settled on a farm.

He was employed by Case in 1886 as a machinist apprentice and in 1891 enrolled in a mechanical engineering program with the University of Wisconsin. In 1892 he returned to Case as draftsman and engineer.

He assisted in development of the first Case gas tractor,



In 1895 he was made assistant Shop Superintendent. In 1896 he designed the Case side crank steam tractor.

Between 1898 and 1910 he worked in engineering positions with Edward P. Allis Co. of Milwaukee, Marinette Iron Works, Allis-Chalmers Co. in Germany and Illinois Steel Co.

In 1910 he returned to Case as an engineer to develop gas tractors. In 1919 he was made Vice President and Chief Engineer and in 1941 became Vice President and Consulting Engineer.¹¹

¹¹ *The Case Eagle* Vol. 25 No. 3 June-July 1942, page 14.

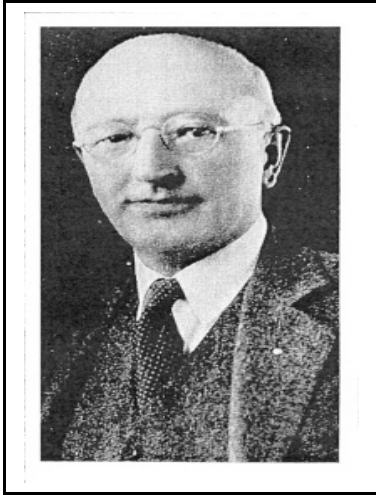


Figure 7 D. Pryce Davies

During his career he was credited with many design innovations and was responsible for the design of the new Model "L" Case Tractor introduced in 1929. In 1940 he was presented with the "Modern Pioneer Award" by The National Association of Manufacturers¹², and in 1942 he was awarded the "Deere Medal" by the American Society of Agricultural Engineers.¹³

A search of the U. S. Patent Office web site produced a list of 17 patents issued to him between 1911 and 1943.

¹² *Ibid.*

¹³ *Ibid.*

Their Patents

The following pages contain pictures of the patents issued to the above individuals in chronological order.

These are the ones I found on the Internet searching for the inventor name at the U S Patent Office web page advanced search, and since this didn't seem to find all of them, I used Google Advance Books Search to find the "Annual Report of the Commissioner of Patents" (published by the U S Patent Office) limited the search to "books" and "full view only", and then used that page search form to locate the inventor's name in a given annual report.

There are probably patents that were missed due to the vagaries of the search.

Note that not all of the patents were assigned to the employer. For example three of MacGregor's were assigned to The Indiana Manufacturing Co., Indianapolis, IN while he was employed by Case (The Indiana Mfg. Co., advertised *Pneumatic* or *Wind Stackers* for sale in a 1907 'Farm Implement News' magazine. There may have been a license agreement and the patents were sold to them by Case.) Other patents were unassigned by the inventors.

These three men were not the only inventors who had patents issued to them during this 79 year span and assigned to J I Case companies. A few of the others are included here.

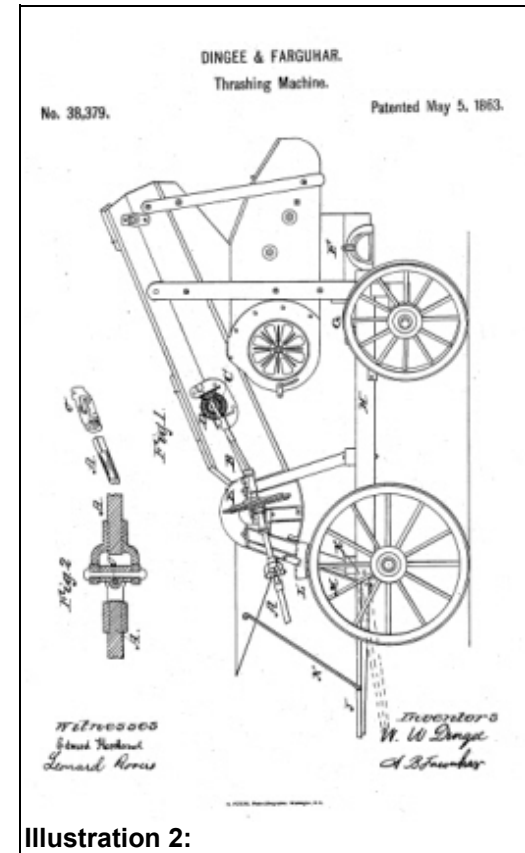


Illustration 2:

This 1863 Threshing Machine patent was issued to Dungee and Farquhar when he was located there.

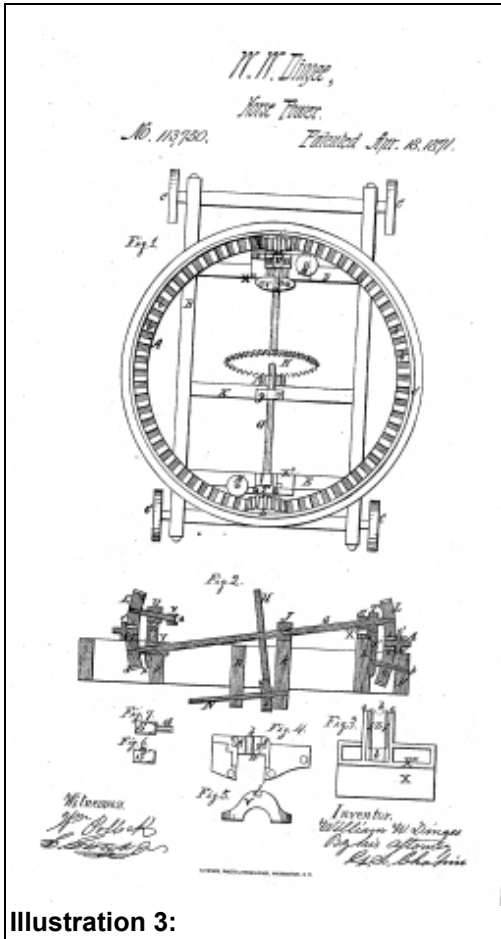


Illustration 3:

This 1871 patent was issued when Dingee was working for Geiser Mfg. in Racine, WI.

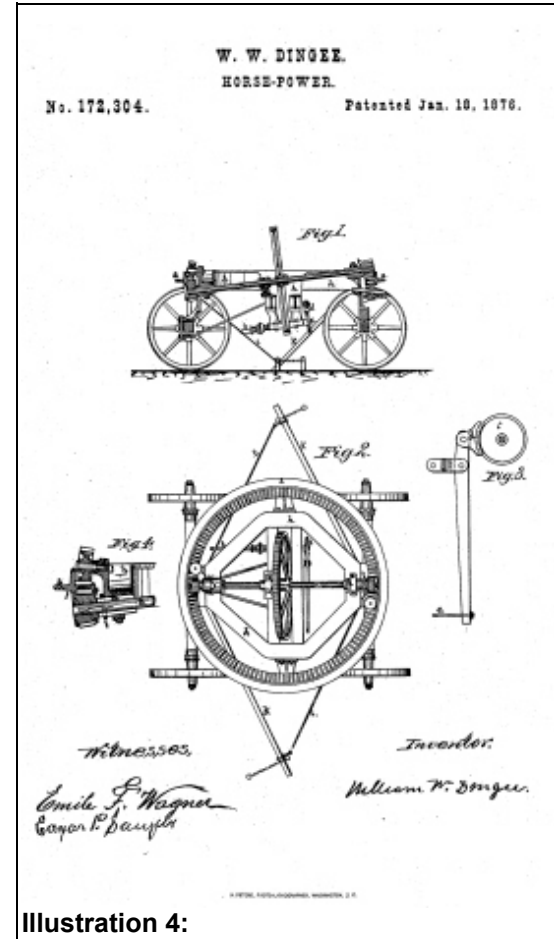
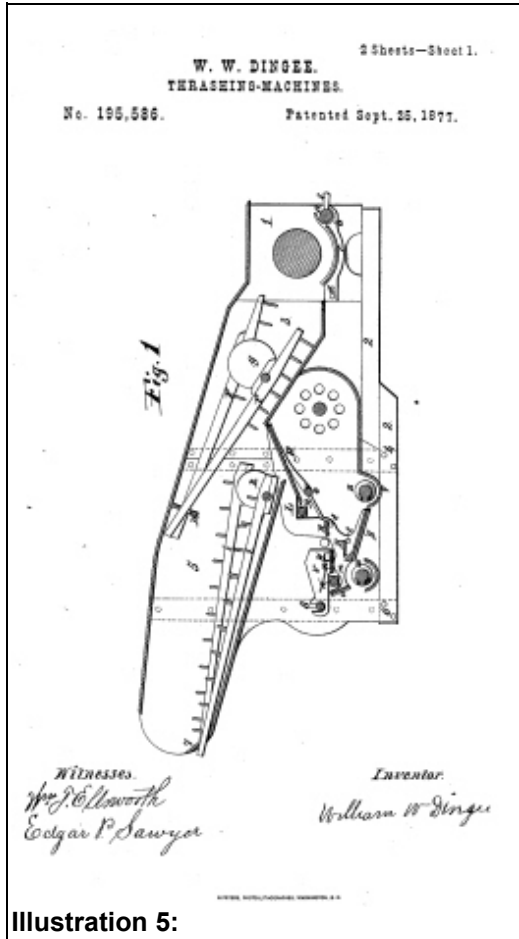
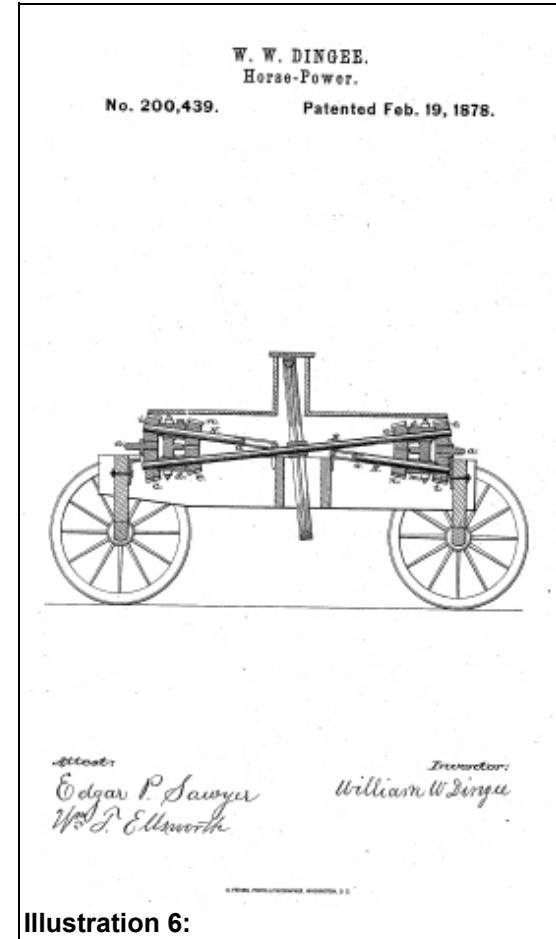


Illustration 4:

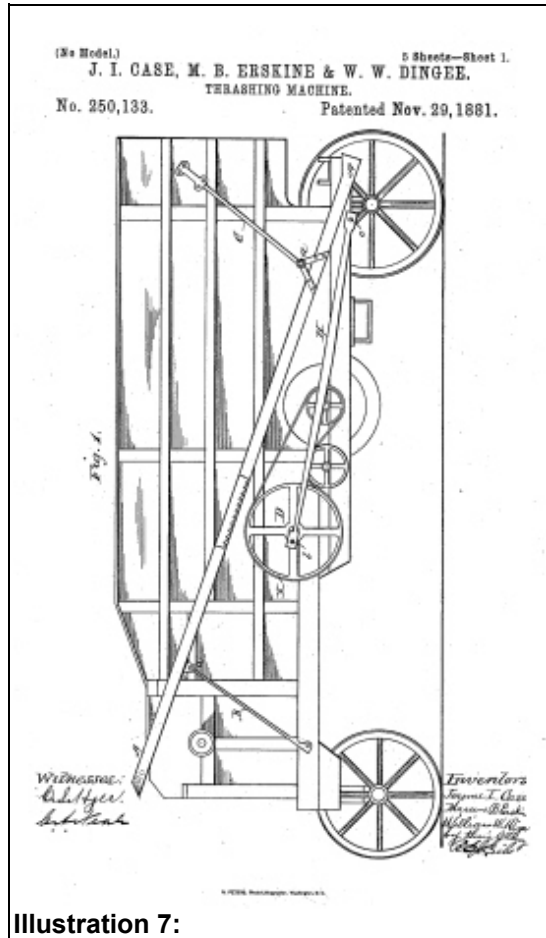
This 1876 Horse-Power patent was not assigned to an employer.



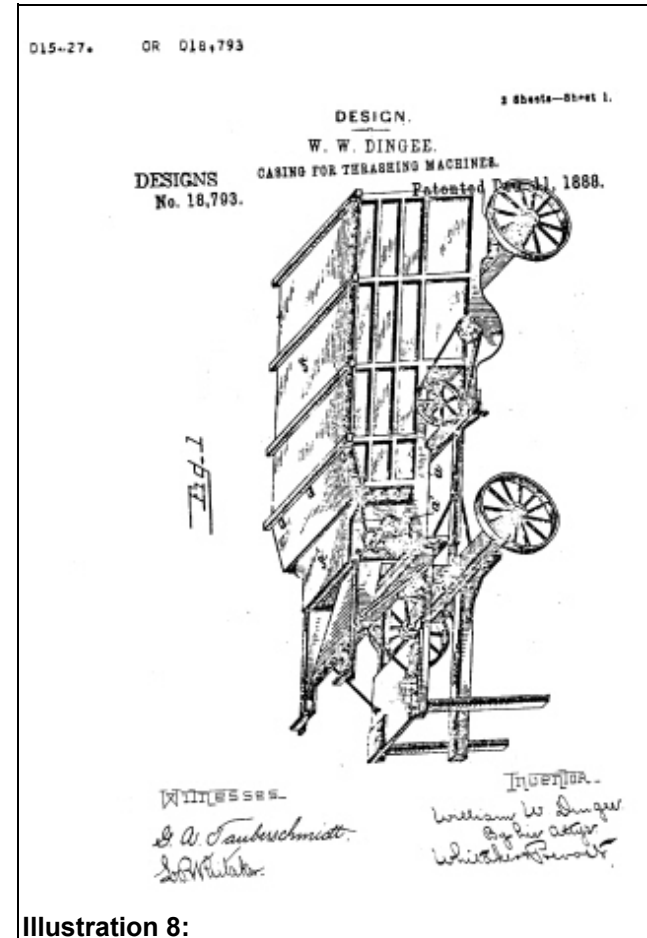
This 1877 threshing machine patent was issued when he was in Oshkosh at Sawyer Mfg.



He was at Sawyer Mfg. when this horse-power patent was issued in 1878.



This 1881 threshing machine patent was issued to three individuals; J I Case, M B Erskine and W W Dingee in Racine. Not assigned to any company.



This design patent was for a “threshing machine casing” or frame structure, assigned to J I Case Threshing Machine Co. in 1888. This appears to be the Case “Agitator” Threshing machine.

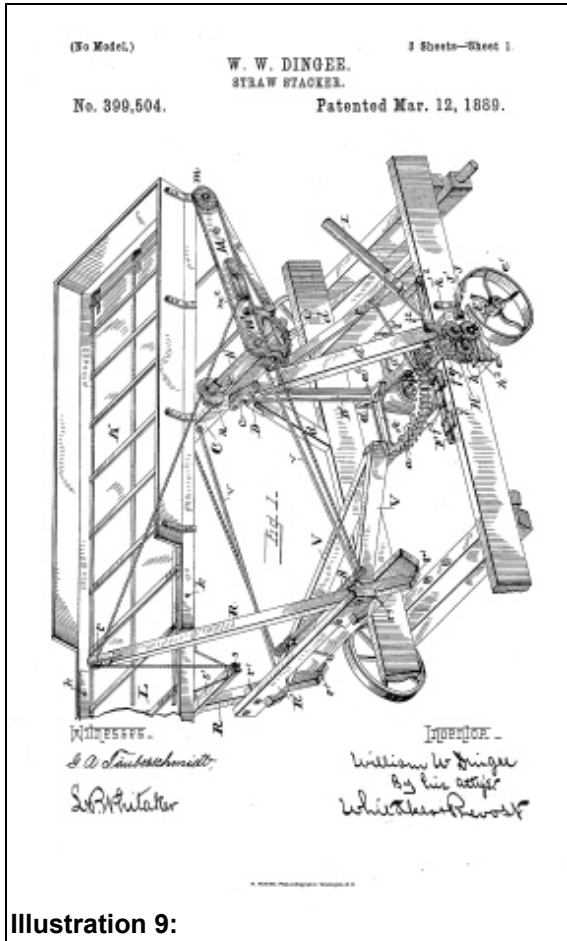


Illustration 9:

This 1889 patent for a threshing machine straw stacker was assigned to J I Case Threshing Machine Co.

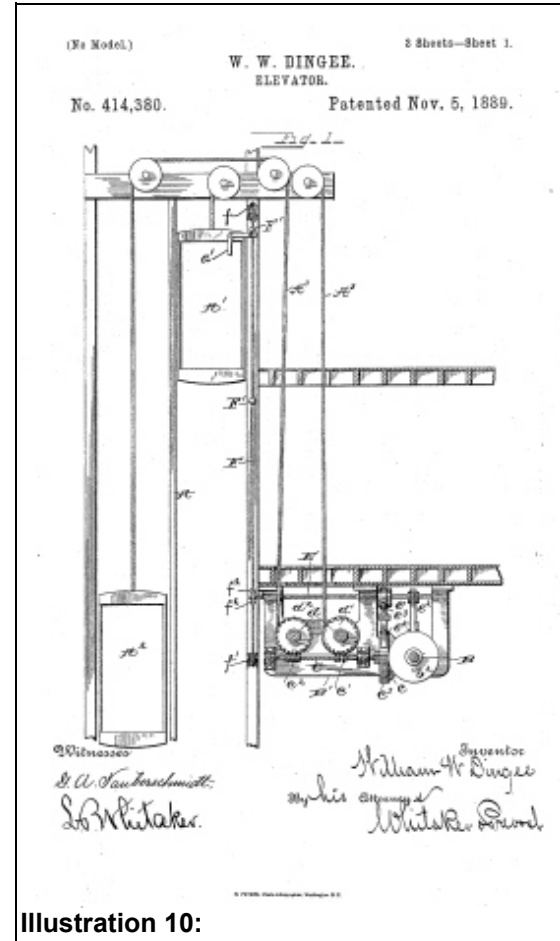


Illustration 10:

This 1889 patent for elevator was issued to Dingee and not assigned to a company.

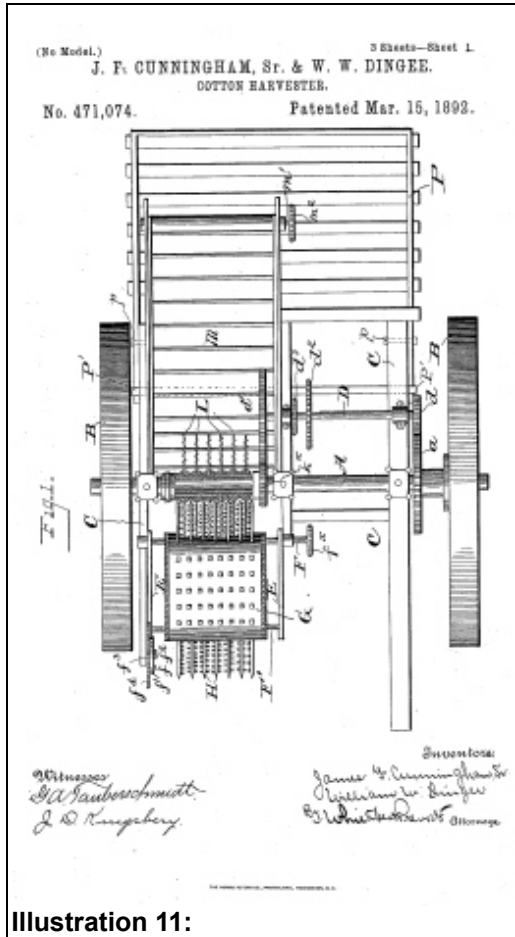


Illustration 11:

This 1892 cotton harvester invention of W W Dingee and J F Cunningham, Jr., was assigned to J I Case Threshing Machine Co. and James F Cunningham, Sr. of Anson, TX.

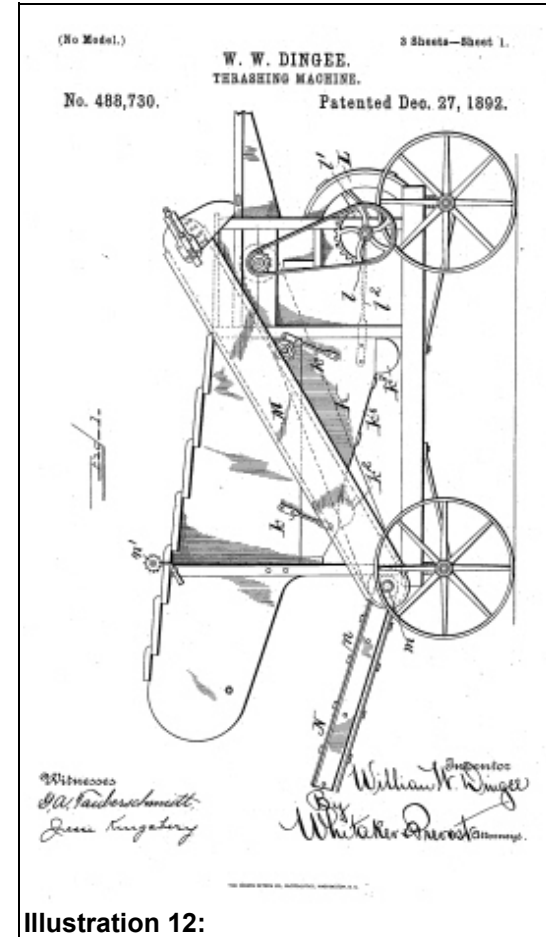


Illustration 12:

This 1892 Thrashing Machine patent issued to Dingee of Racine, WI, was unassigned.

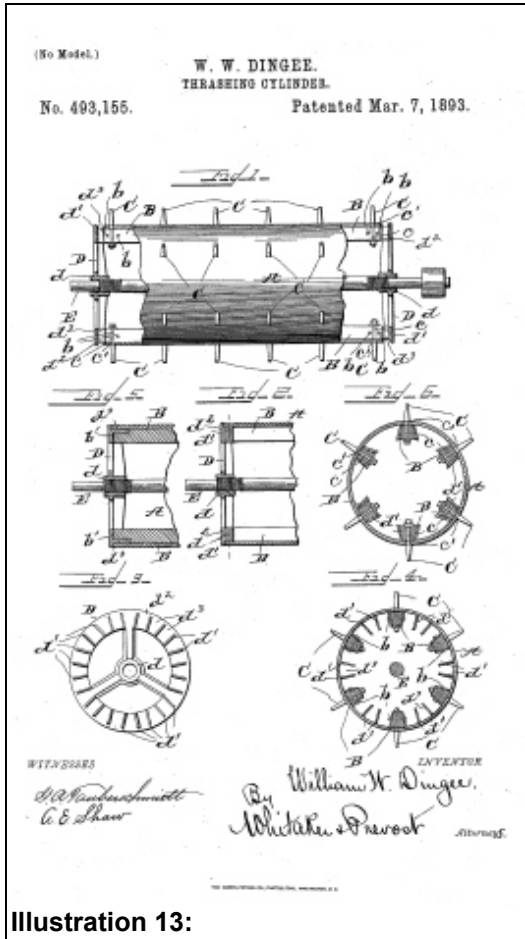


Illustration 13:

This 1893 Dingee patent for threshing cylinder was not assigned.

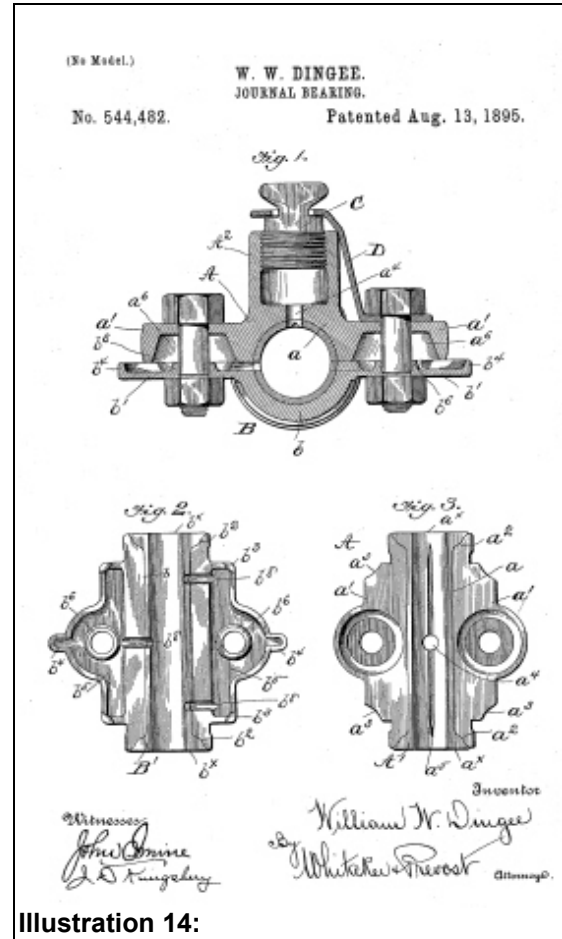


Illustration 14:

Dingee 1895 patent of journal bearing assigned to J I Case Threshing Machine Co.

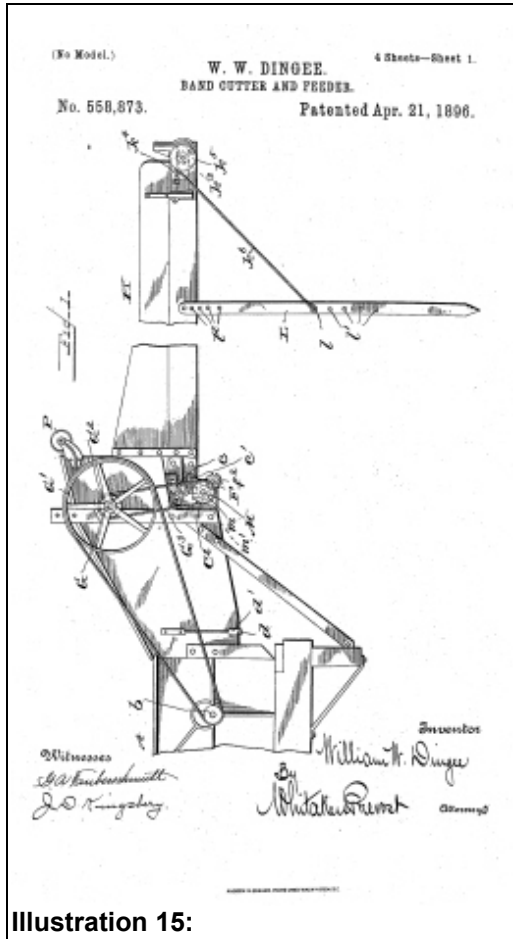


Illustration 15:

This 1896 Dingee patent for threshing machine feeder and band cutter was assigned to J I Case Threshing Machine Co.

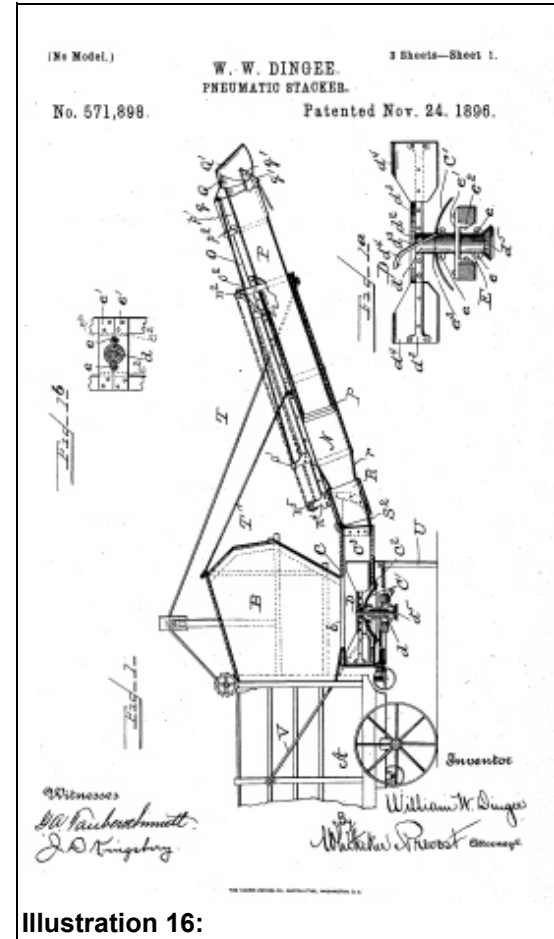


Illustration 16:

This 1896 Dingee patent for threshing machine pneumatic stacker (wind) was assigned to J I Case Threshing Machine Co.

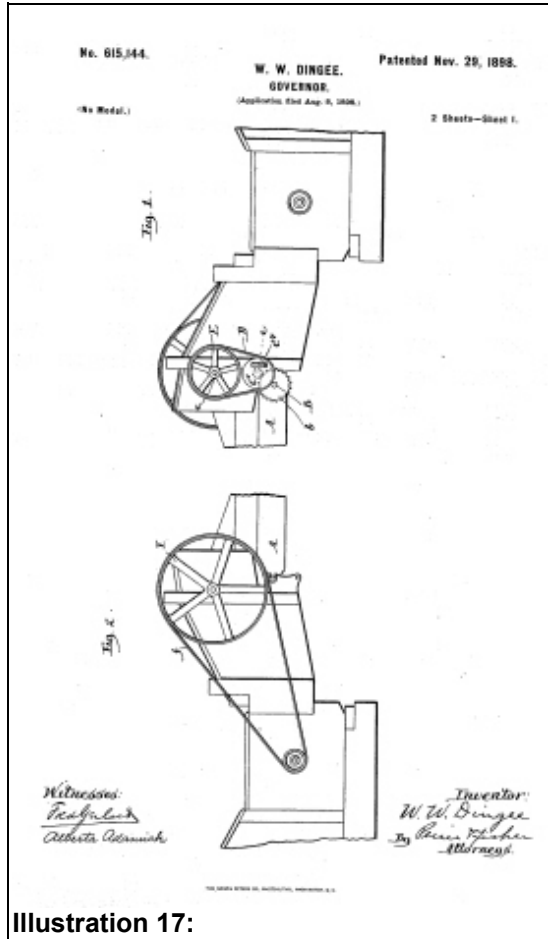


Illustration 17:

This 1898 Dingee patent was for a governor to automatically control the feeder speed on a threshing machine, assigned to J I Case Threshing Machine Co.

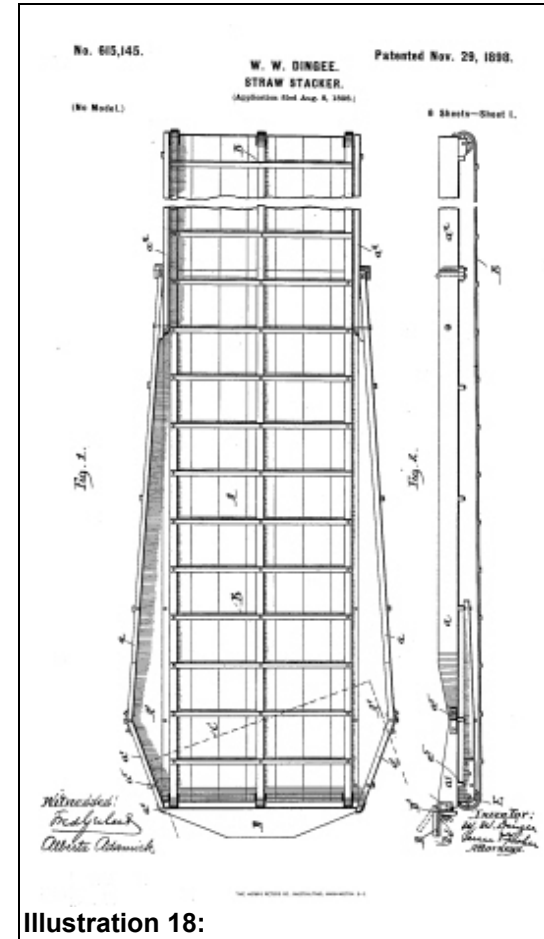
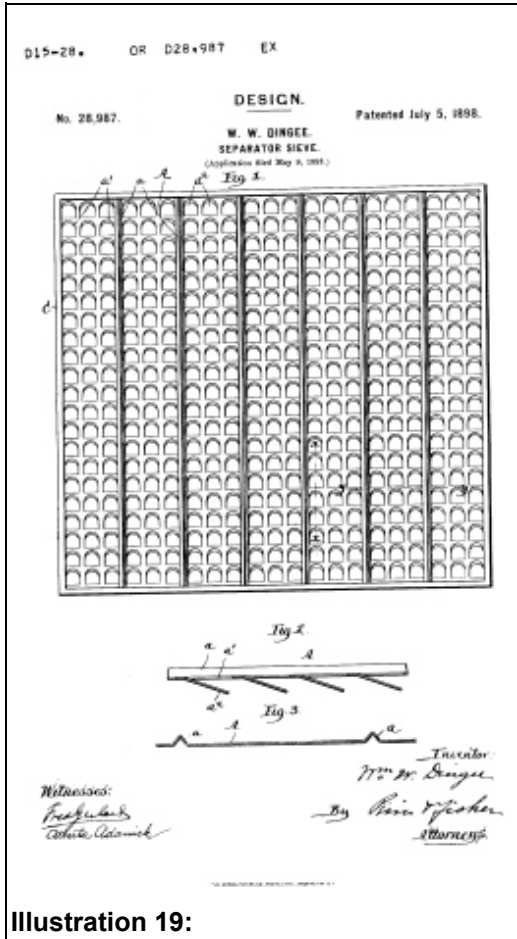
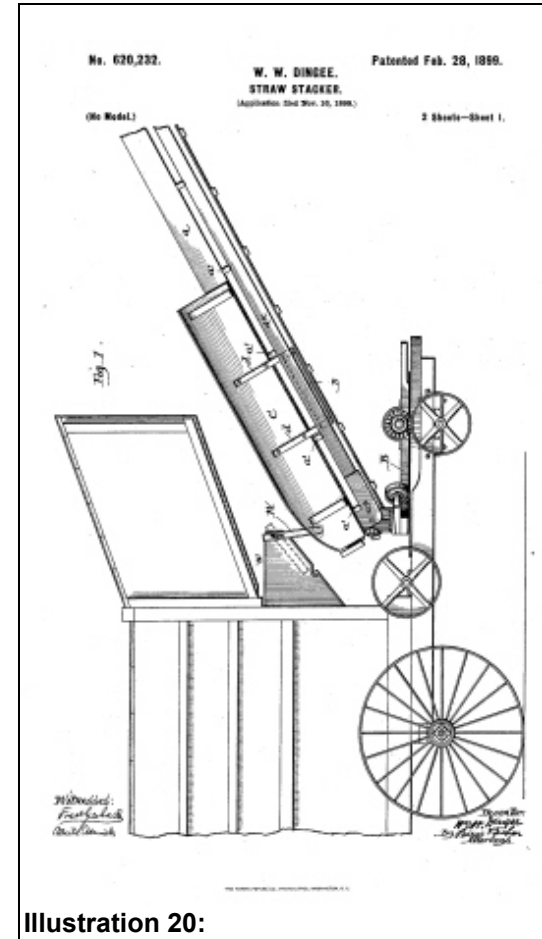


Illustration 18:

This 1898 Dingee patent for threshing machine straw stacker was issued to J I Case Threshing Machine Co.



This Dingee 1898 design patent for separator sieve was assigned to J I Case Threshing Machine Co.



1899 Dingee patent for threshing machine straw stacker was assigned to J I Case Threshing Machine Co.

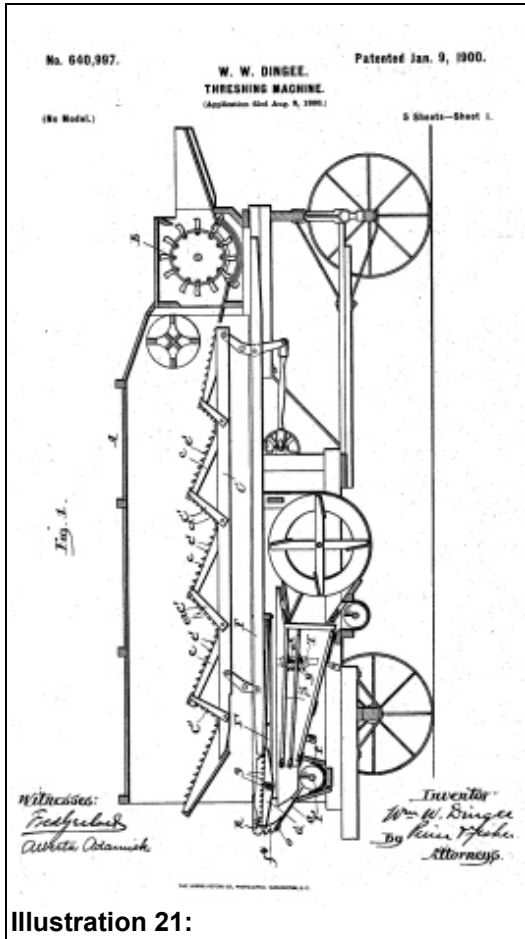


Illustration 21:

This 1899 Dingee patent is for an improved threshing machine straw rack, assigned to J I Case Threshing Machine Co.

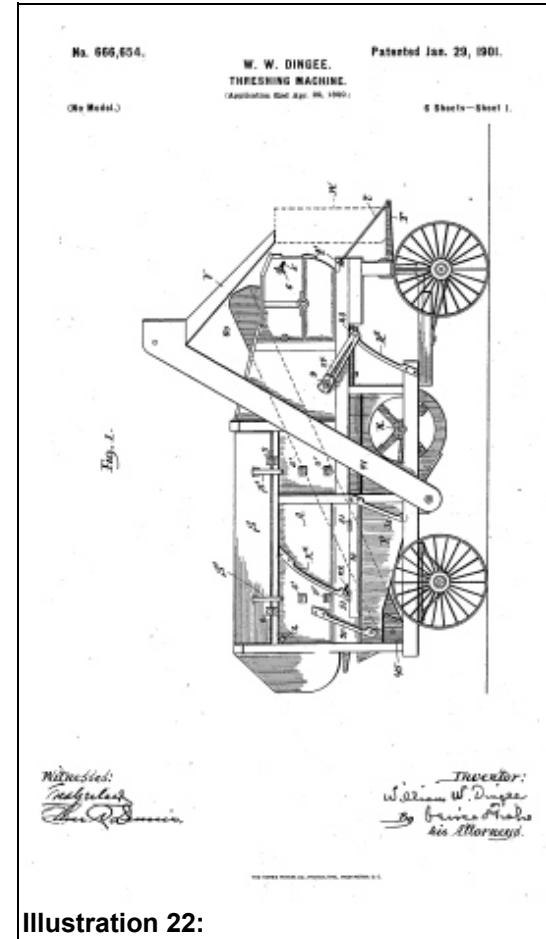


Illustration 22:

This 1901 Dingee patent for a threshing machine was not assigned.

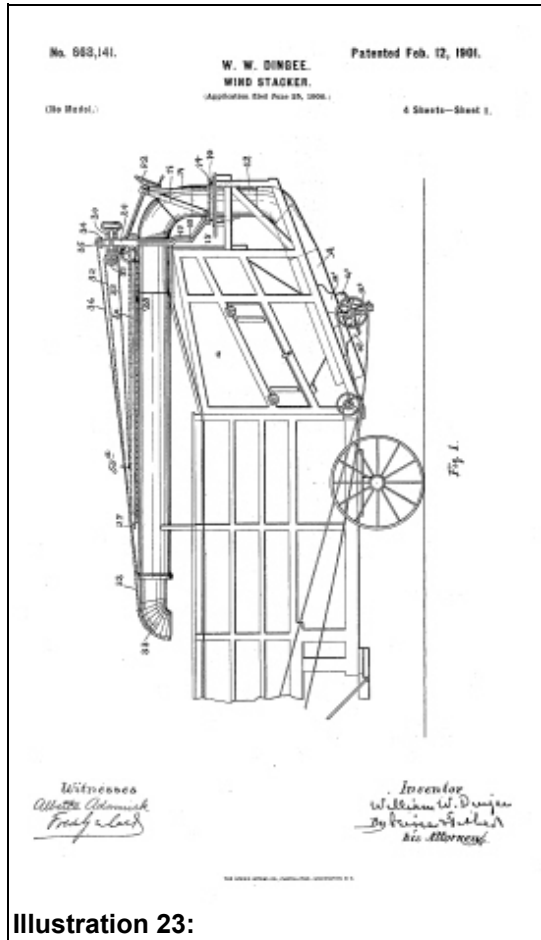


Illustration 23:

1901 Dingee patent for wind stacker was assigned to J I Case Threshing Machine Co.

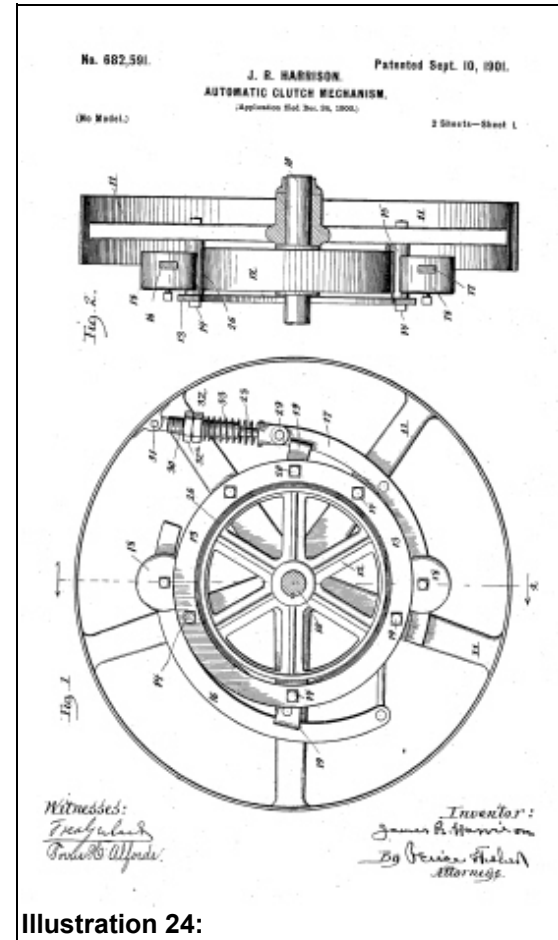


Illustration 24:

This 1901 patent for an automatic clutch, issued to James R Harrison, was assigned to J I Case Threshing Machine Co.

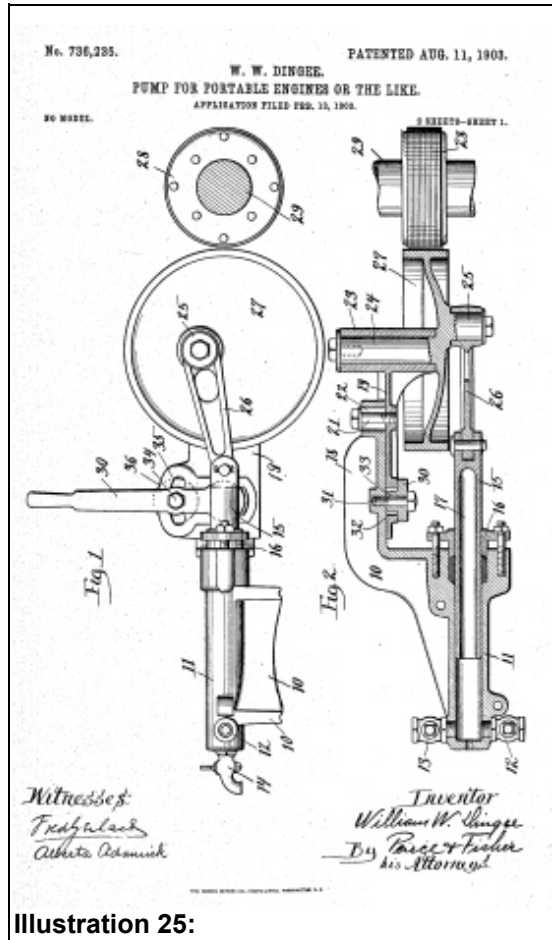


Illustration 25:

This 1903 Dingee patent of a pump for portable engines was assigned to J I Case Threshing Machine Co.

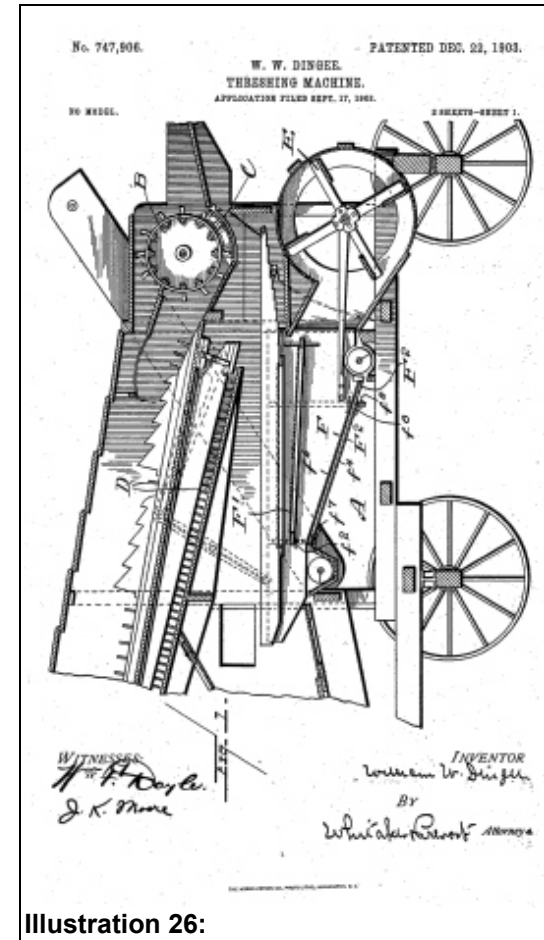


Illustration 26:

This 1903 Dingee patent for a threshing machine was not assigned.

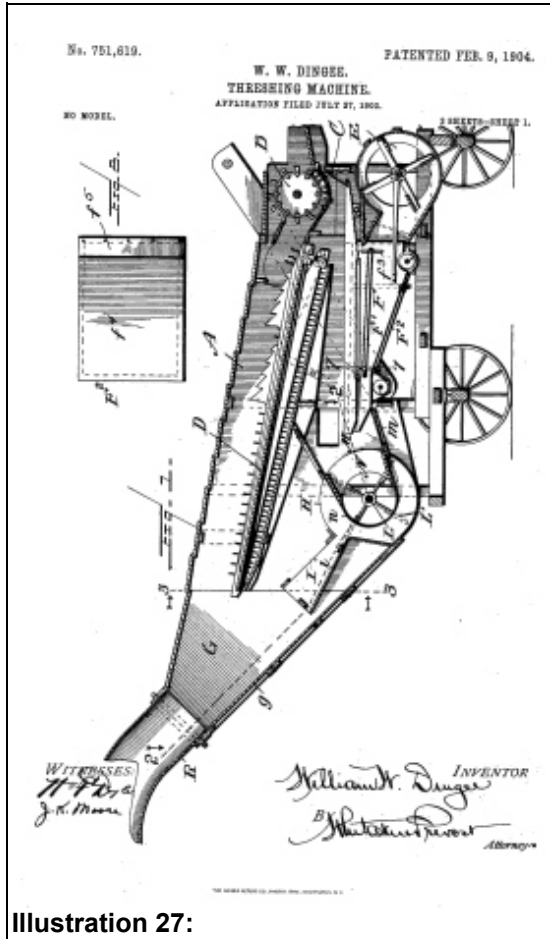


Illustration 27:

This 1904 Dingee patent for threshing machine was not assigned.

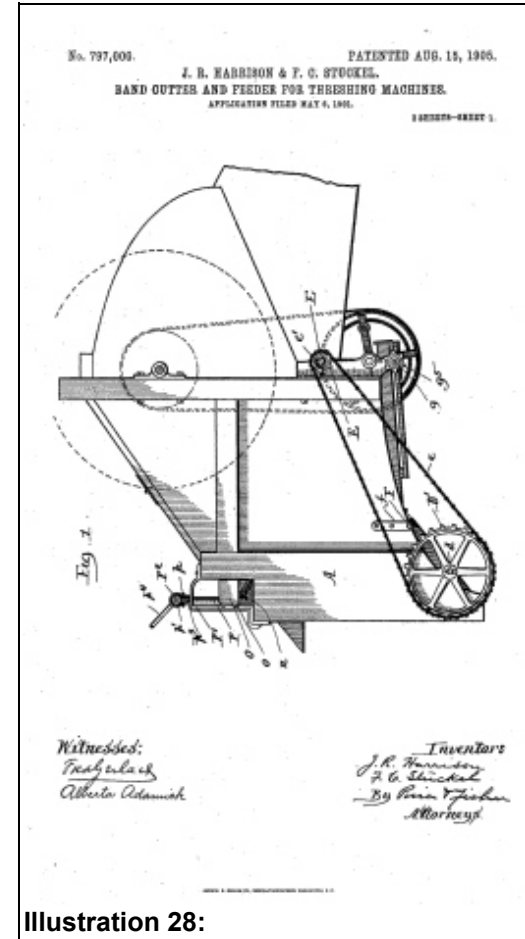


Illustration 28:

This 1905 band cutter patent issued to James R Harrison and Frank C Stuckel was assigned to J I Case Threshing Machine Co.

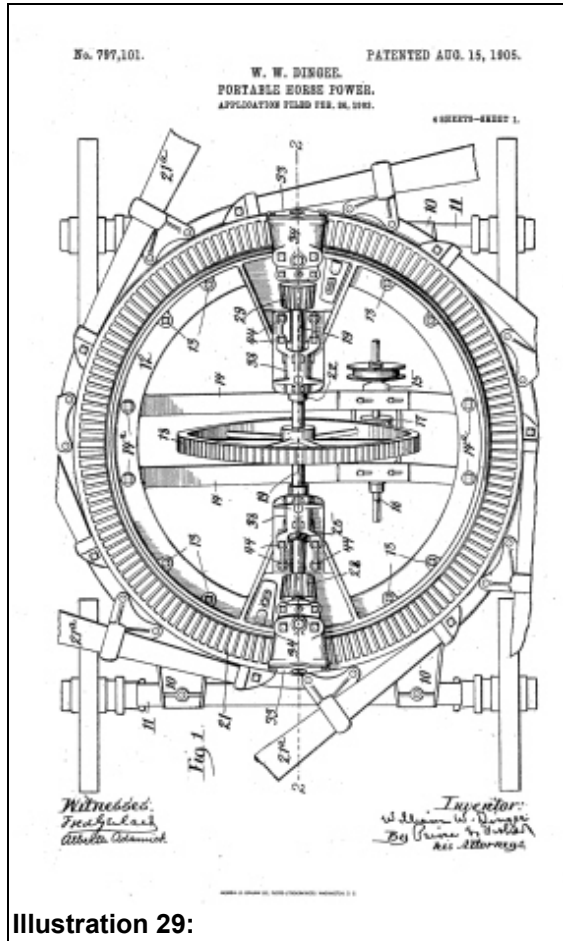


Illustration 29:

1905 Dingee patent for Portable Horse Power assigned to J I Case Threshing Machine Co.

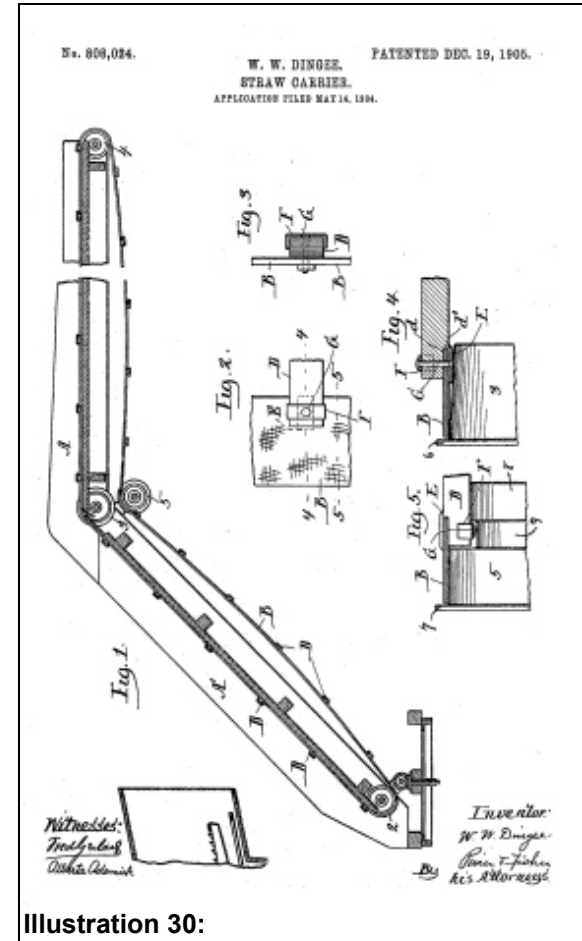


Illustration 30:

This 1905 Dingee patent for Straw Carrier was assigned to J I Case Threshing Machine Co.

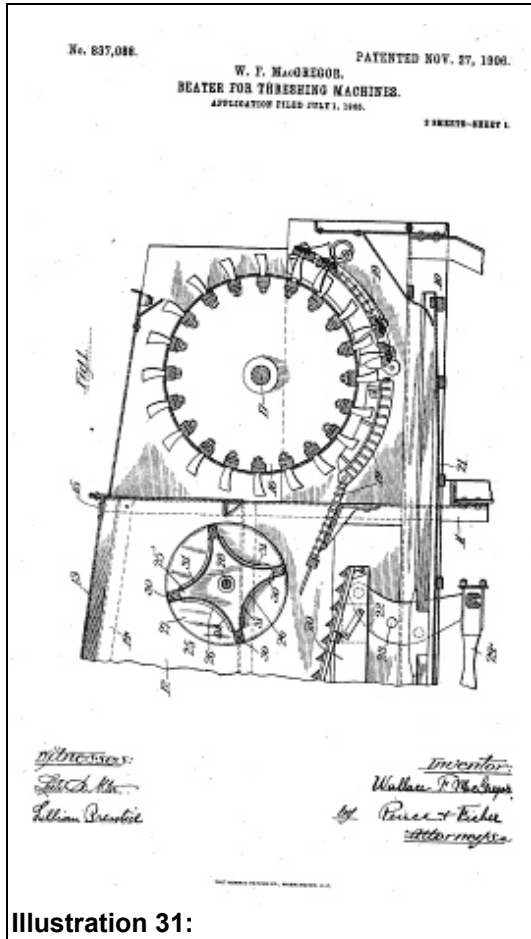


Illustration 31:

This 1906 patent "Beater for Threshing Machine" was issued to Wallace F MacGregor and assigned to J I Case Threshing Machine Co.

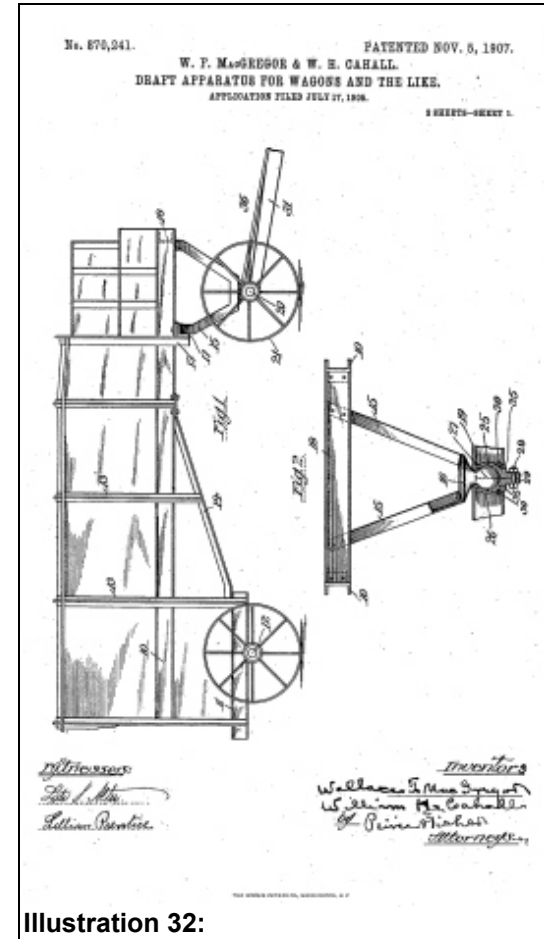


Illustration 32:

This 1907 patent "Draft Apparatus for Wagons and the Like" was issued to MacGregor and William H Cahill, assigned to J I Case Threshing Machine Co.

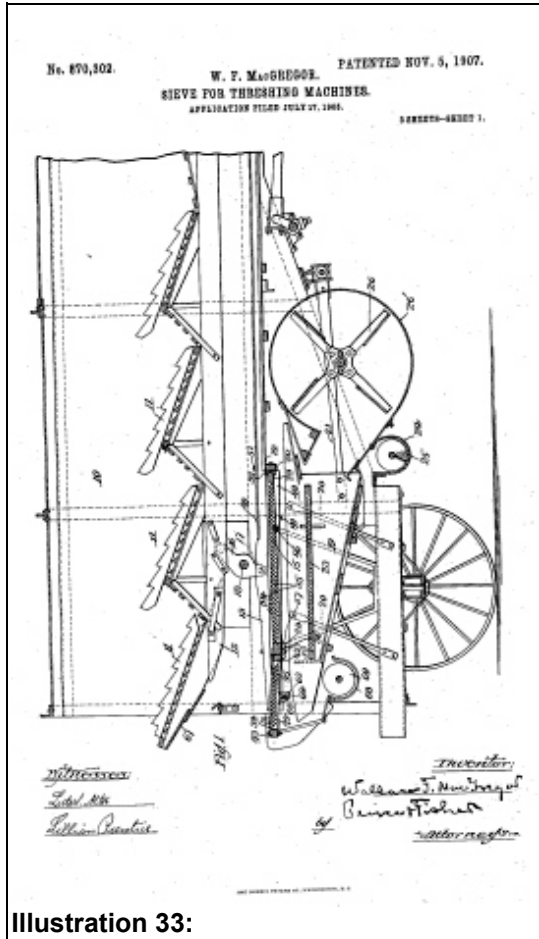


Illustration 33:

This 1907 patent "Sieve for Threshing Machine" was issued to MacGregor and not assigned.

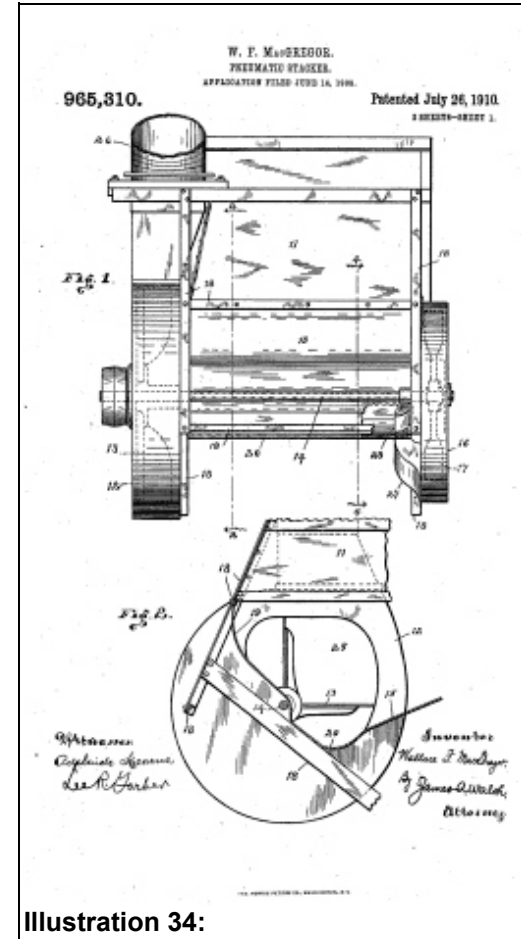


Illustration 34:

1910 patent "Pneumatic Stacker" issued to MacGregor and assigned to Indiana Mfg. Co., Indianapolis, IN.

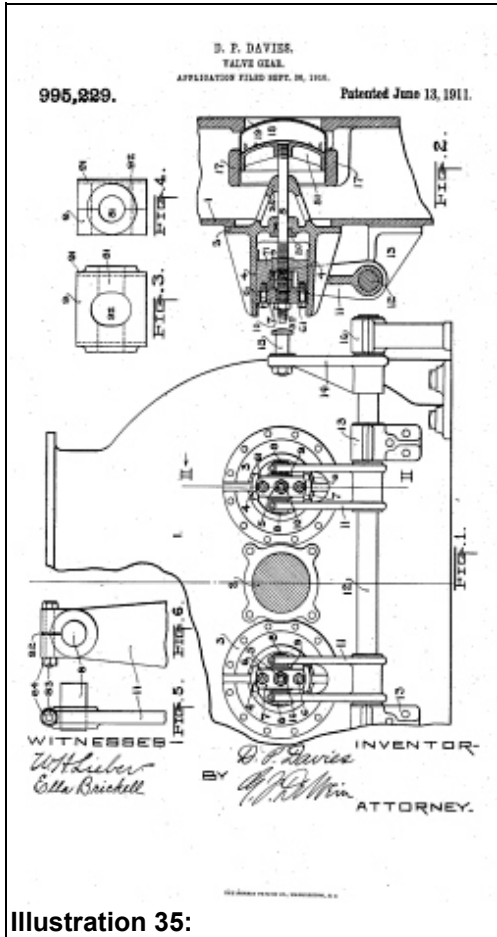


Illustration 35:

This 1911 patent "Valve Gear" was issued to D P Davies and assigned to Allis-Chalmers Co., Milwaukee, WI. Intended for "blowing engines".

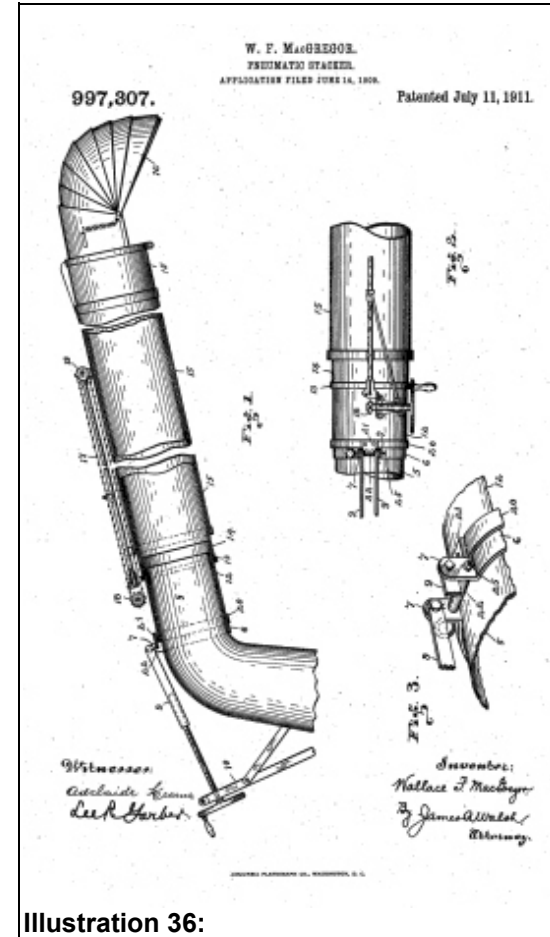
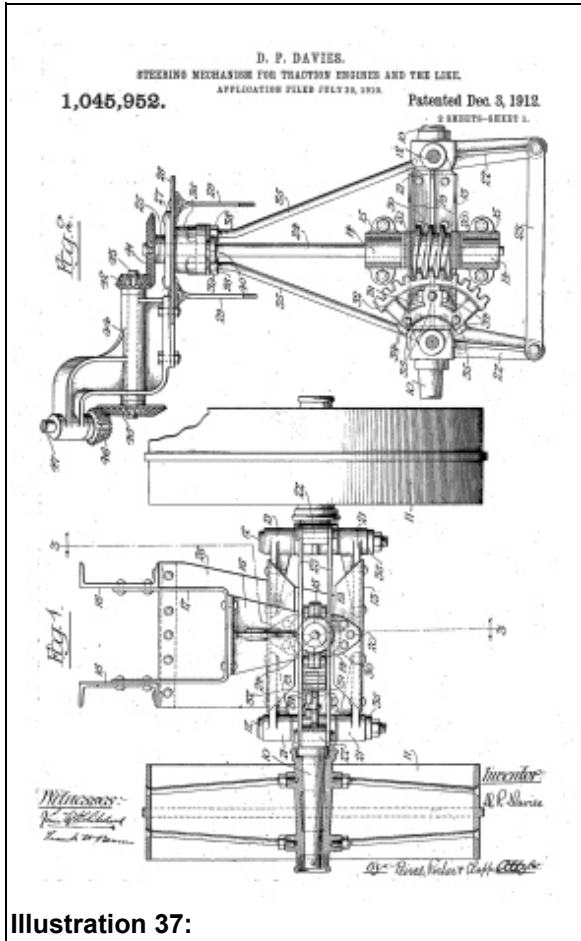
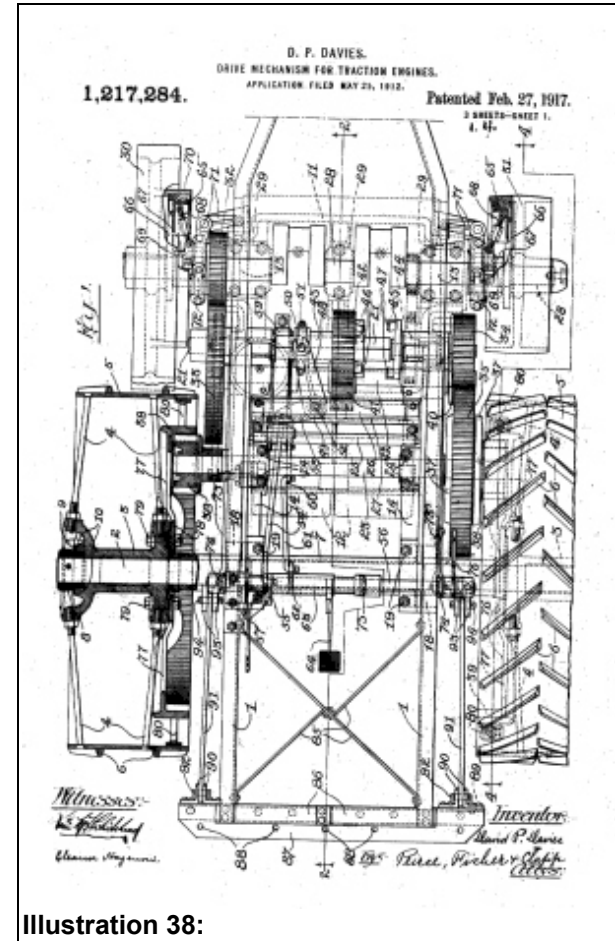


Illustration 36:

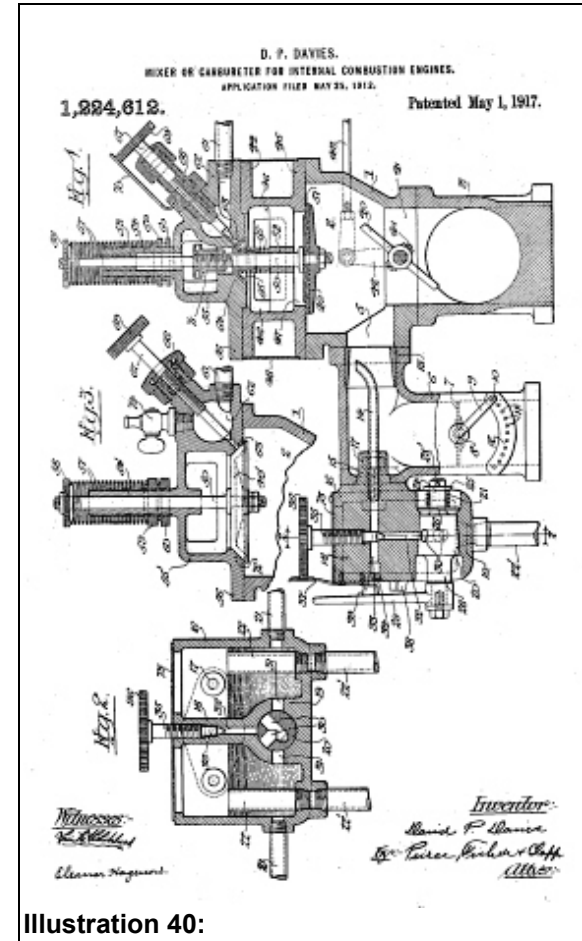
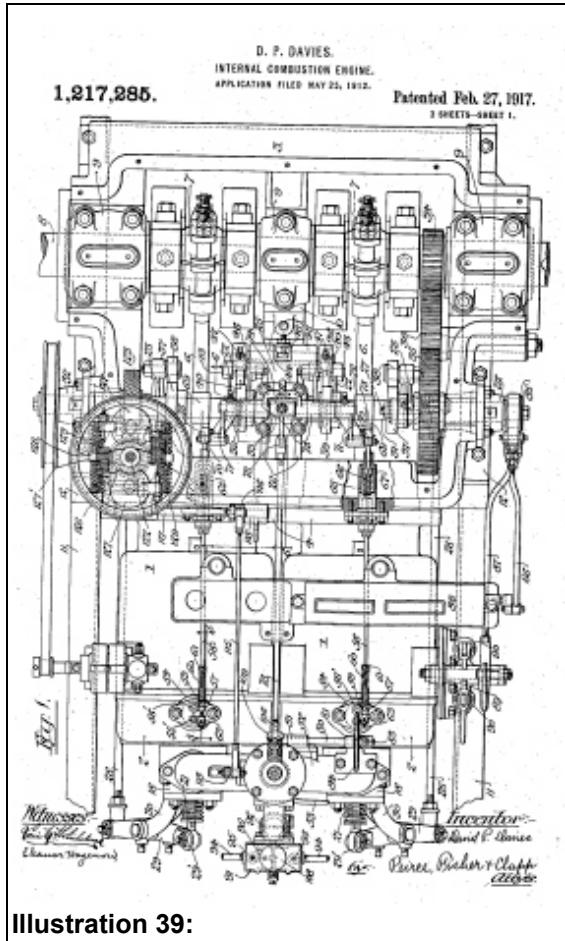
1911 patent for "pneumatic Stacker", (wind stacker), issued to MacGregor and assigned to Indiana Mfg. Co., Indianapolis, IN.



1912 Davies patent "Steering Mechanism for Traction Engines and the Like" assigned to J I Case Threshing Machine Co.



1917 David P Davies patent "Drive Mechanism for Traction Engines" assigned to J I Case Threshing Machine Co.



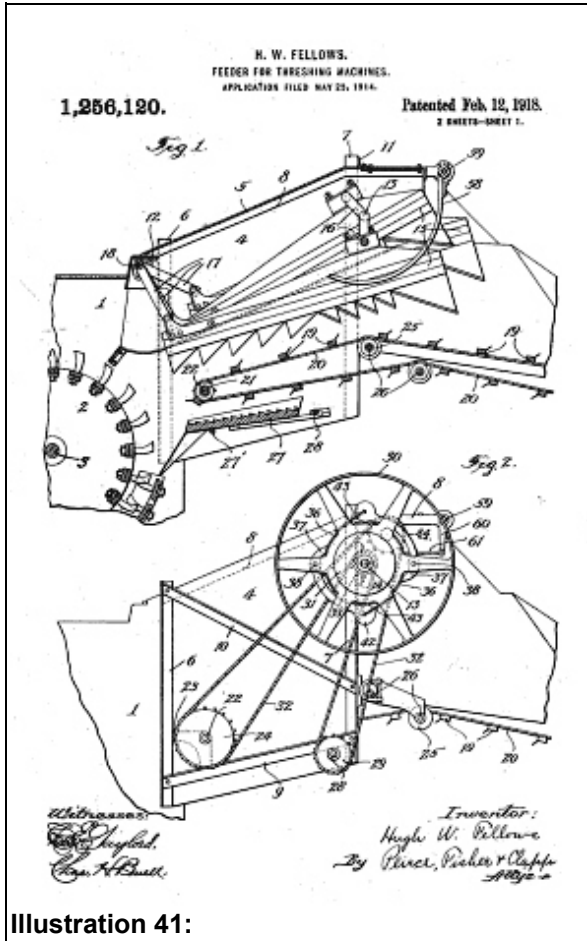


Illustration 41:

1918 patent "Feeder for Threshing Machine" issued to Hugh W Fellows, Los Angles, CA, assigned to J I Case Threshing Machine Co.

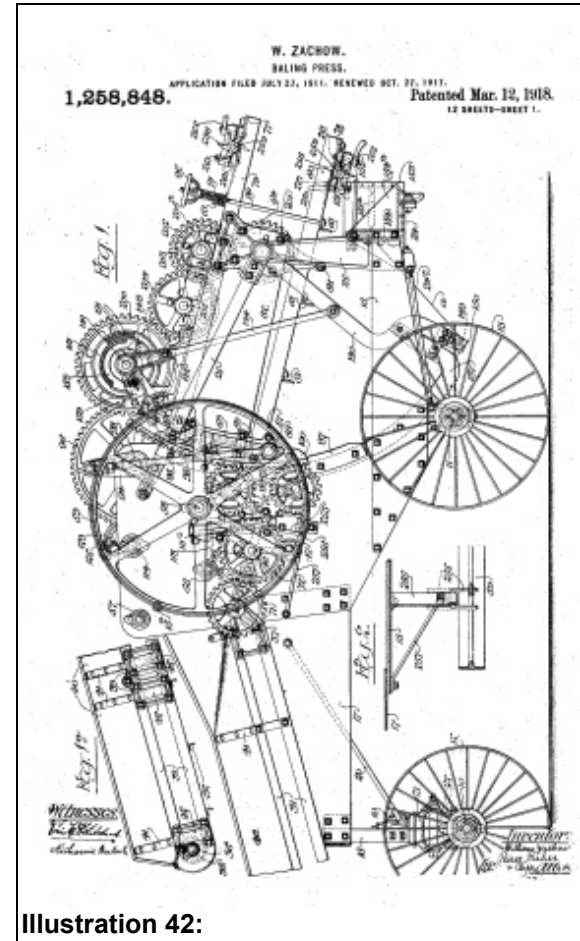


Illustration 42:

1918 patent "Baling Press" issued to William Zachow and assigned to J I Case Threshing Machine Co.

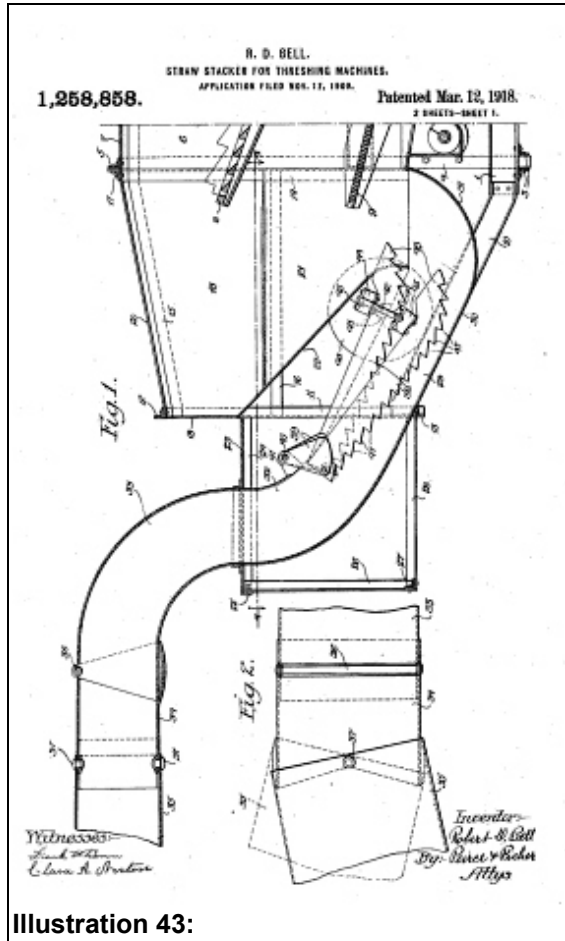


Illustration 43:

1918 patent “Straw Stacker for Threshing Machine” issued to Robert D Bell and assigned to J I Case Threshing Machine Co.

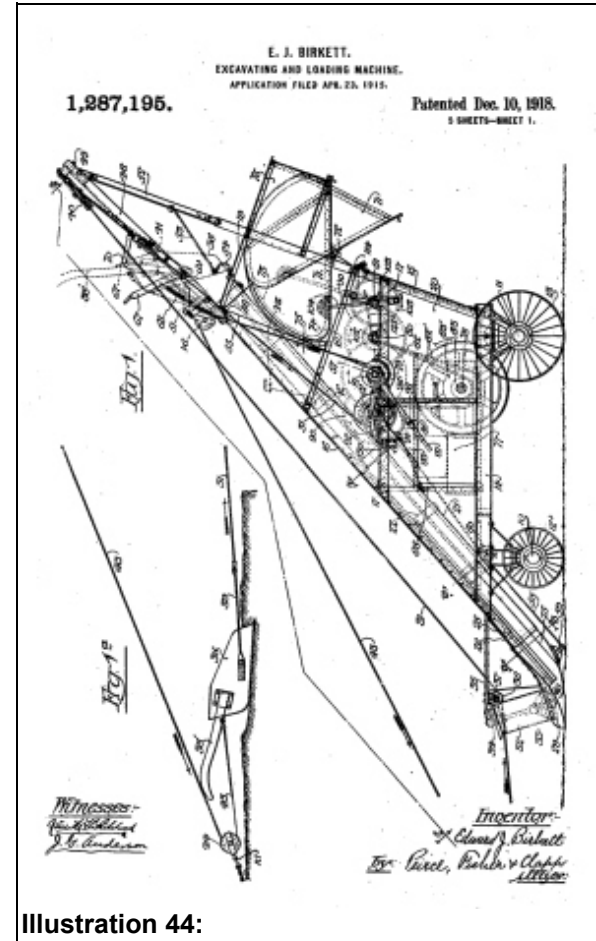


Illustration 44:

1918 patent “Excavating and Loading Machine” issued to Edward J Birkett and assigned to J I Case Threshing Machine Co.

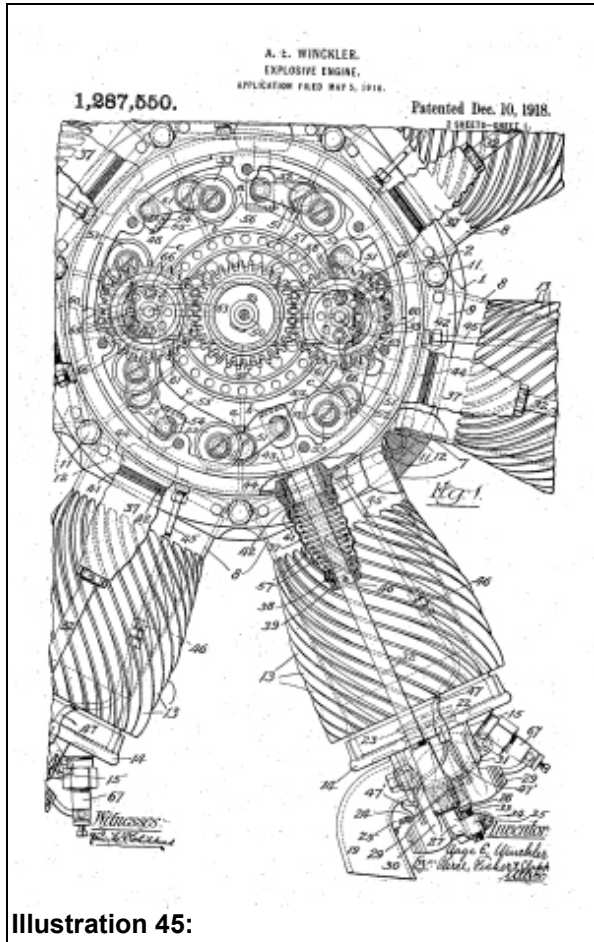


Illustration 45:

1918 patent "Explosive Engine" issued to Age E Winkler, ("a subject of the King of Denmark and a resident of Racine, WI"), and assigned one half to J I Case Threshing Machine Co.

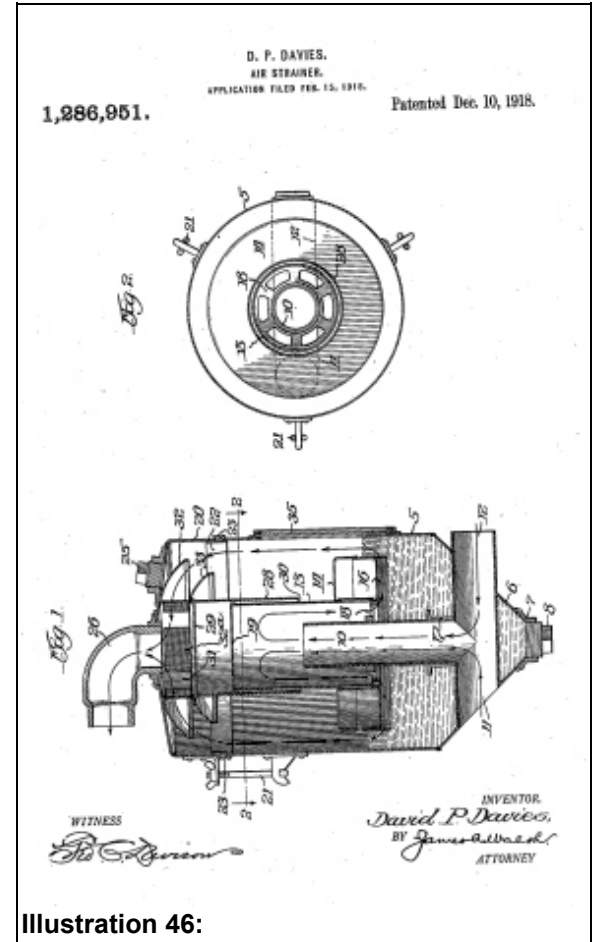


Illustration 46:

1918 Davies patent "Air Strainer" assigned to J I Case Threshing Machine Co.

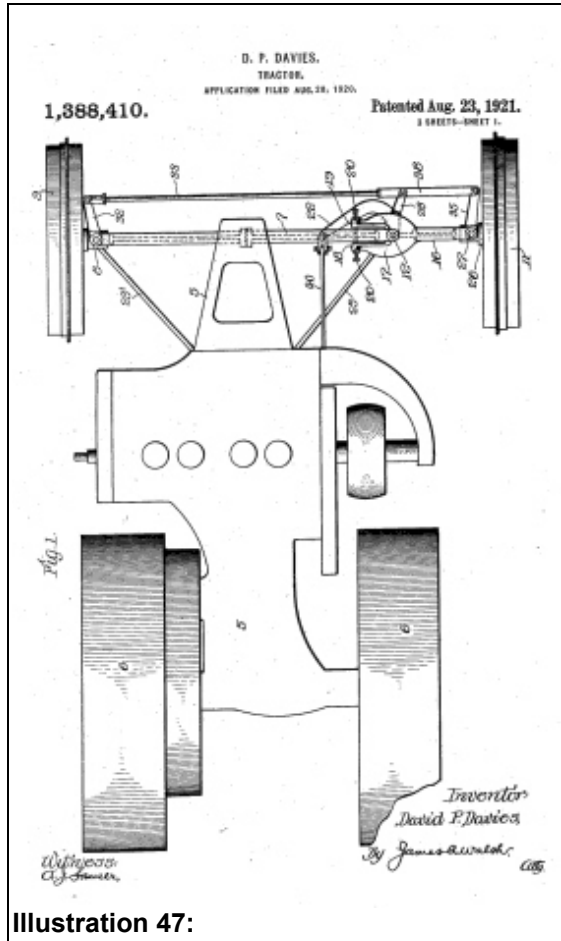


Illustration 47:

1921 Davies patent "Tractor" assigned to J I Case Threshing Machine Co.

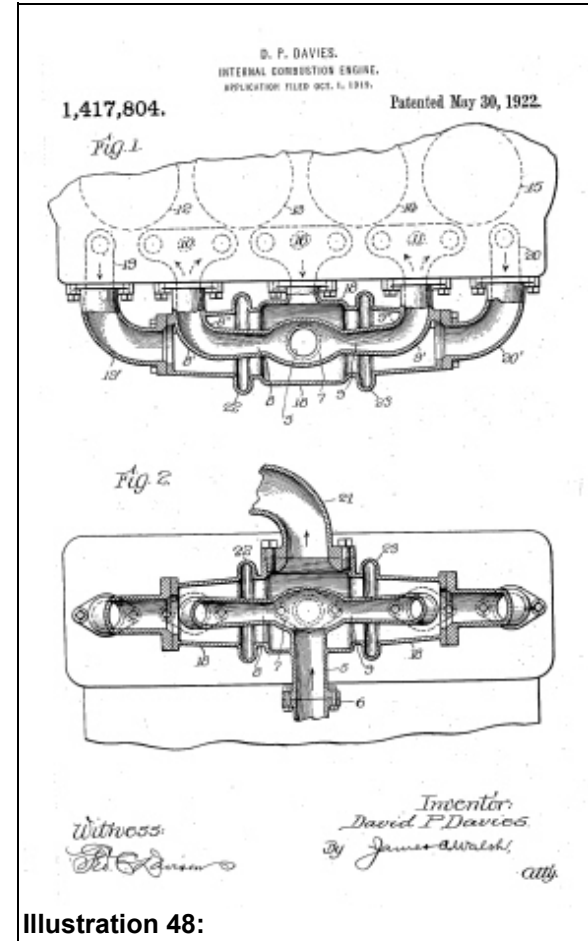


Illustration 48:

1922 Davies patent "Internal Combustion Engine" assigned to J I Case Threshing Machine Co.

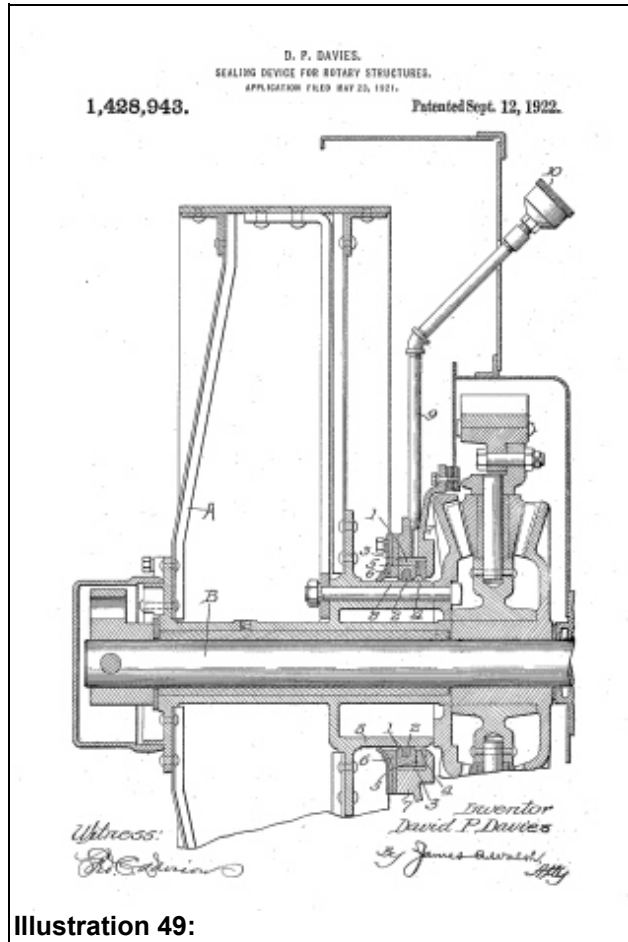


Illustration 49:

1922 Davies patent "Sealing Device for Rotary Structure" assigned to J I Case Threshing Machine Co.

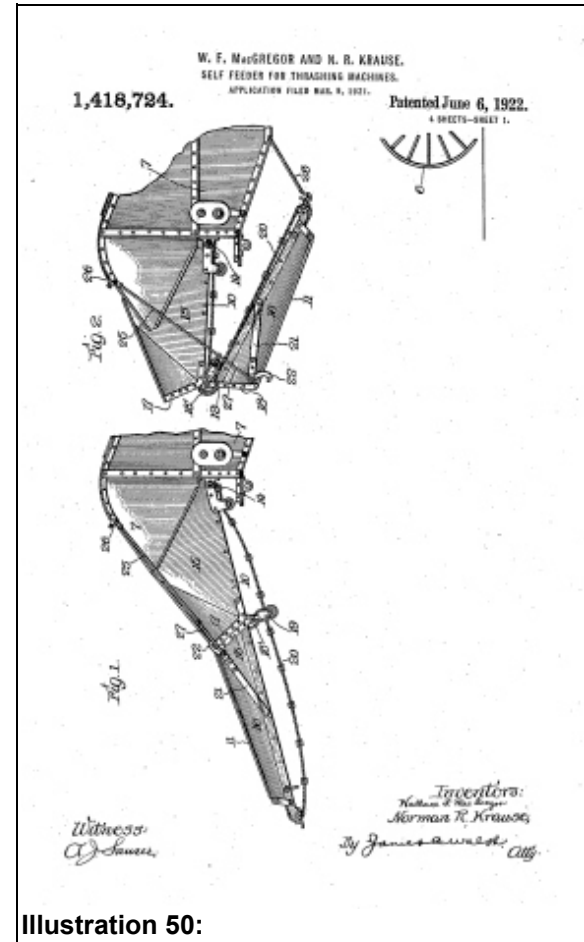


Illustration 50:

1922 patent issued to Wallace F MacGregor and Norman R Krause, "Self-Feeder for Threshing Machine", assigned to J I Case Threshing Machine Co.

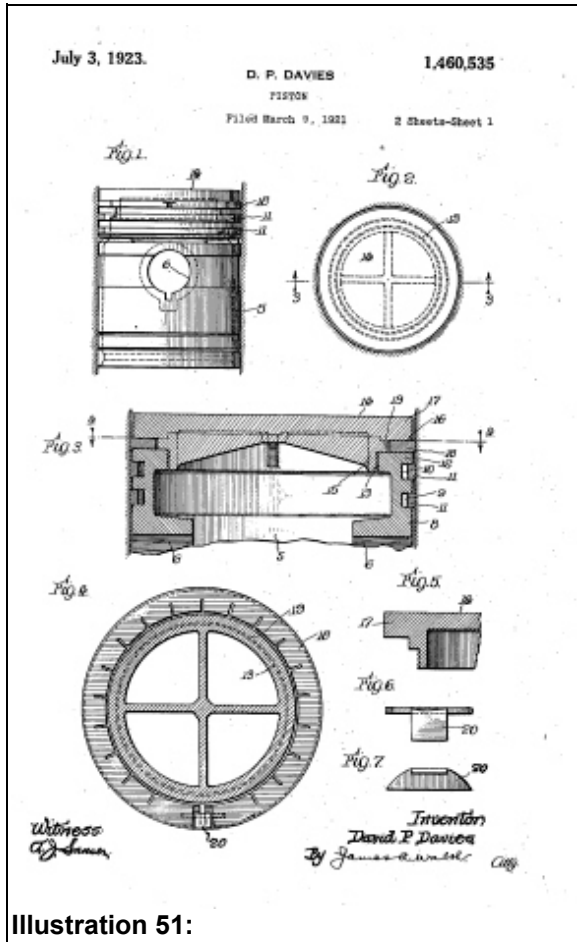


Illustration 51:

1923 Davies patent "Piston" assigned to J I Case Threshing Machine Co.

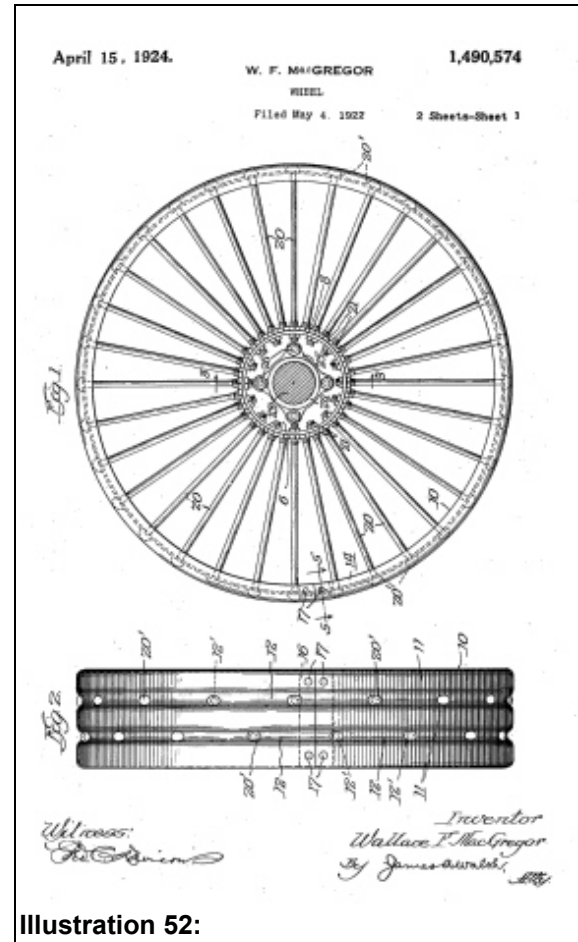


Illustration 52:

1924 patent "Wheel" issued to W F MacGregor assigned to J I Case Threshing Machine Co. With repairable construction of tires, hub and spokes.

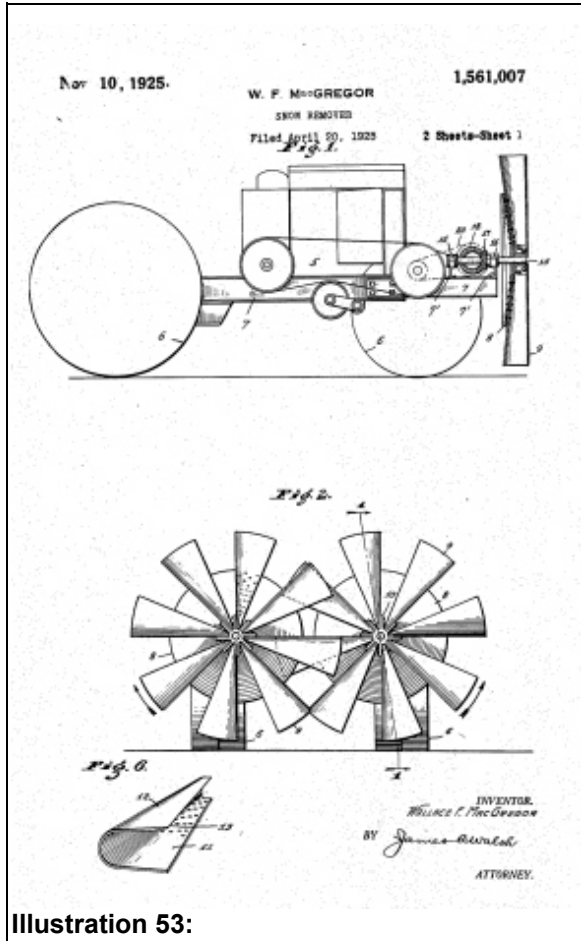


Illustration 53:

1925 patent "Snow Remover" issued to MacGregor and assigned to J I Case Threshing Machine Co.

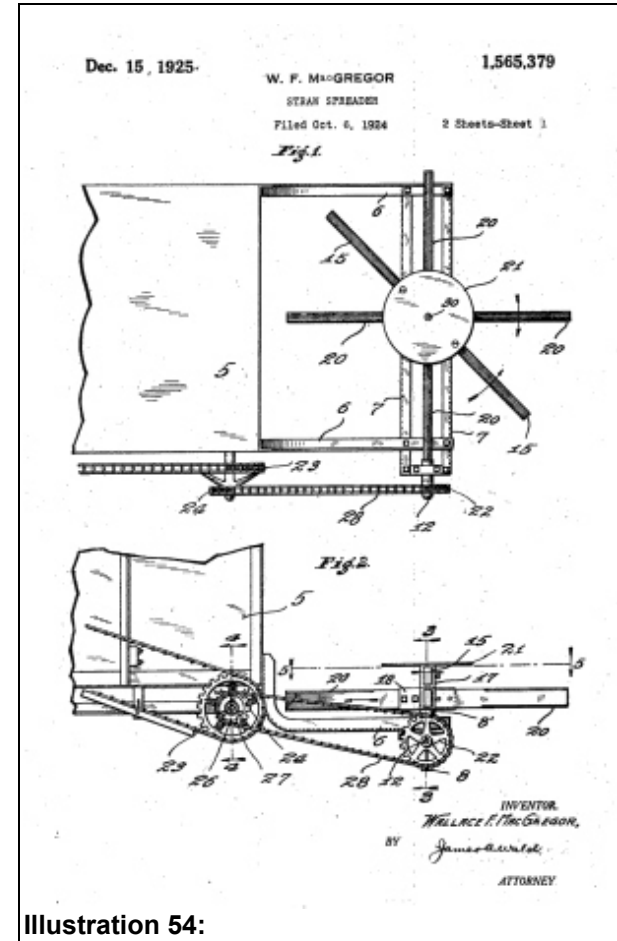


Illustration 54:

1925 patent "Straw Spreader" issued to MacGregor and assigned to J I Case Threshing Machine Co.

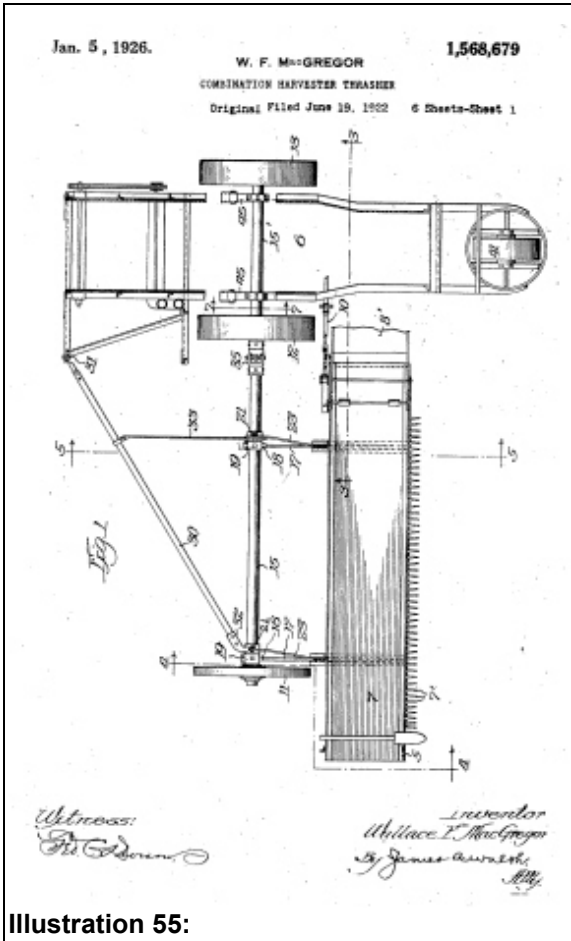


Illustration 55:

1926 patent "Combination Harvester Thrasher (reissued)" issued to MacGregor and assigned to J I Case Threshing Machine Co.

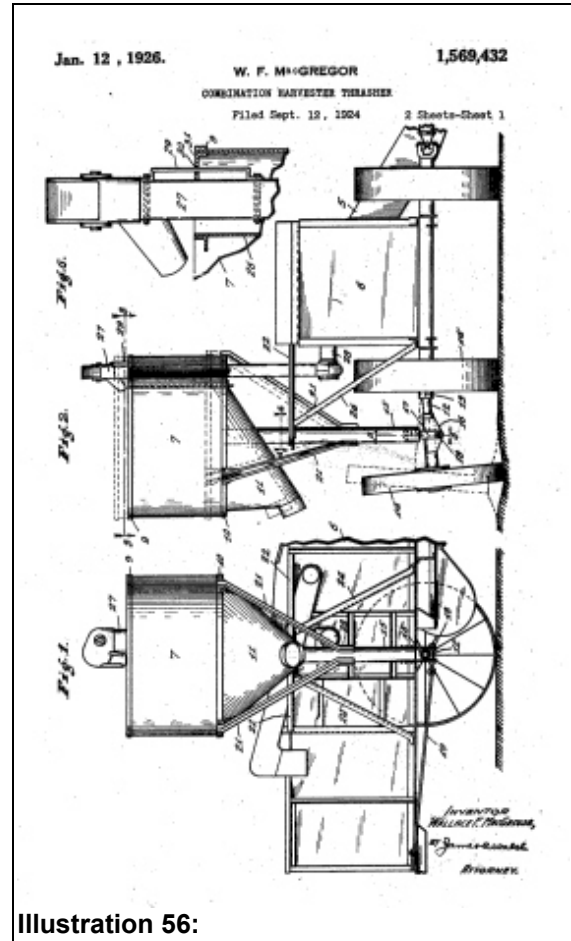


Illustration 56:

1926 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

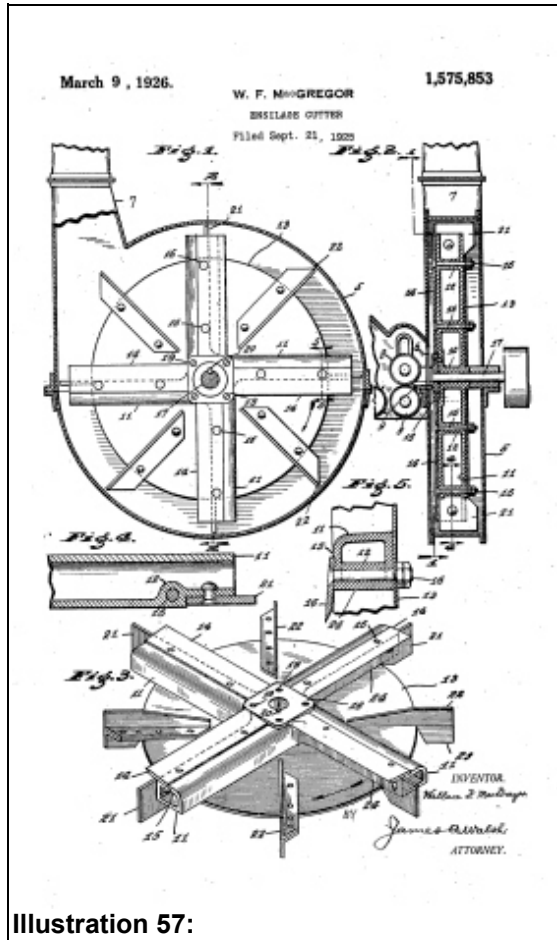


Illustration 57:

1926 patent "Ensilage Cutter" issued to MacGregor and assigned to J I Case Threshing Machine Co.

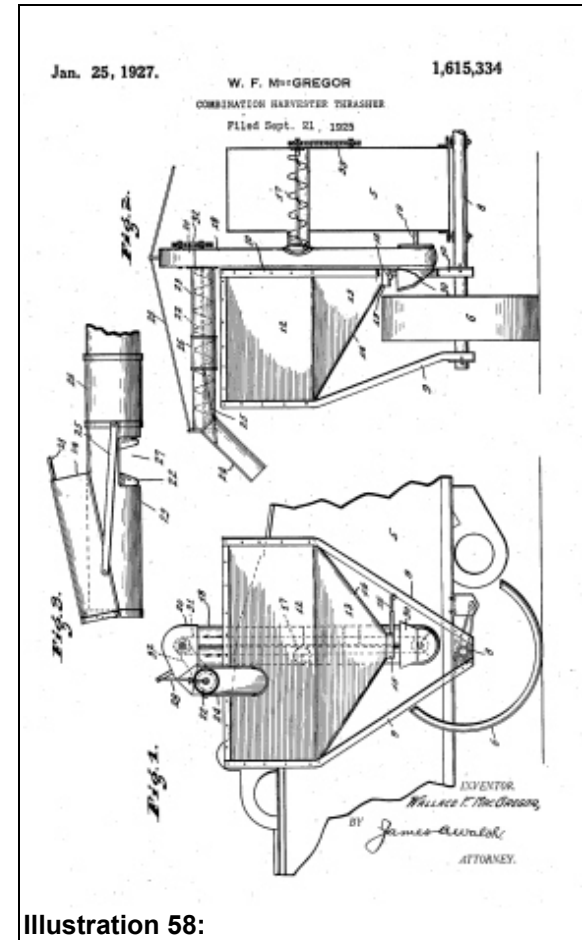


Illustration 58:

1927 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

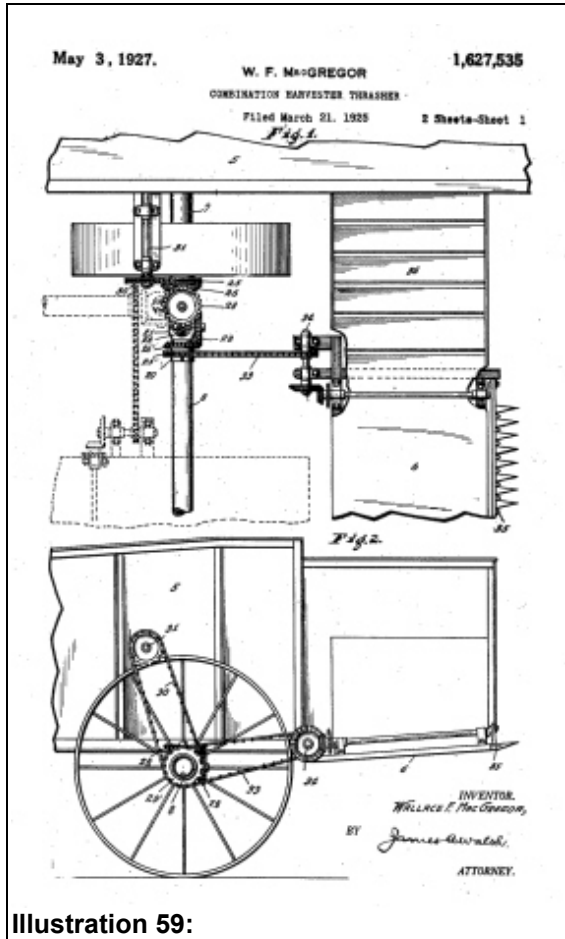


Illustration 59:

1927 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

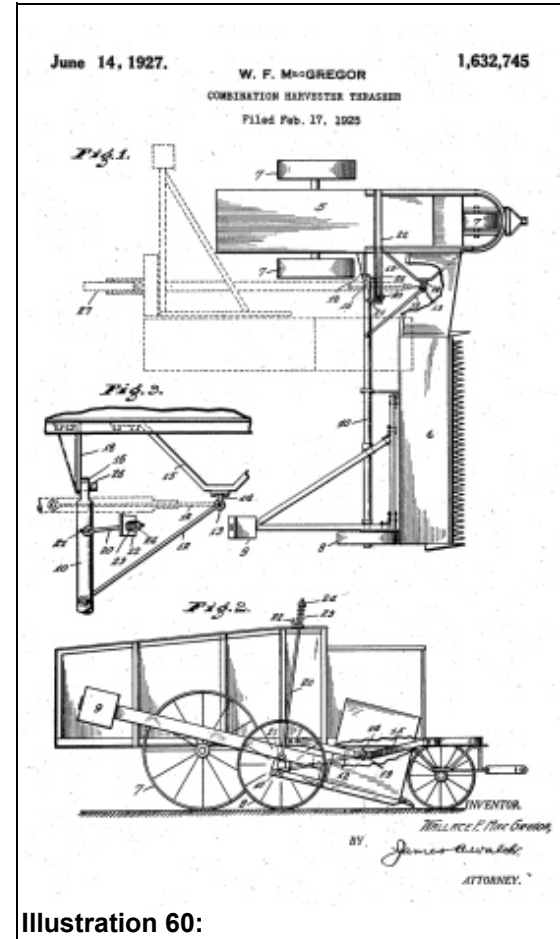


Illustration 60:

1927 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

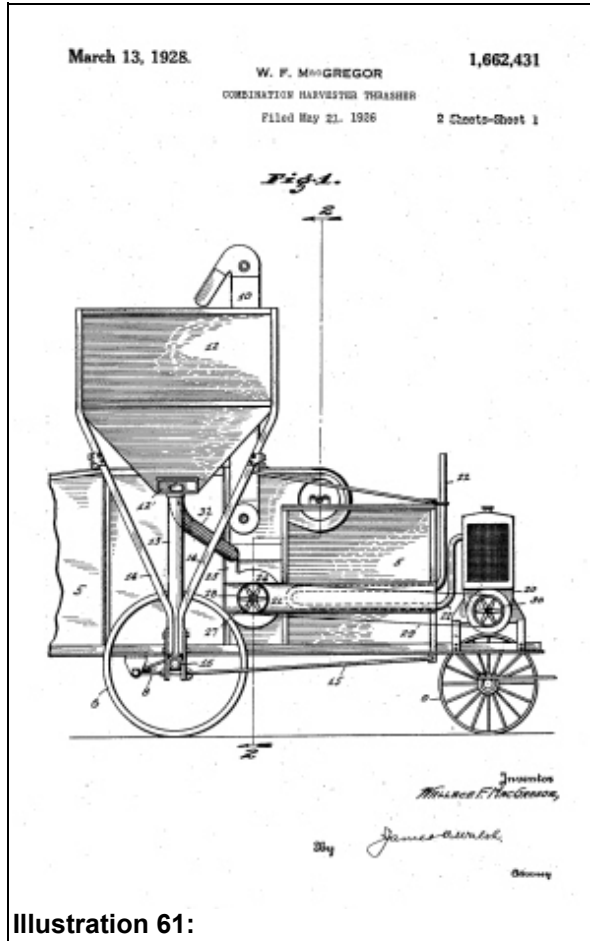


Illustration 61:

1928 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

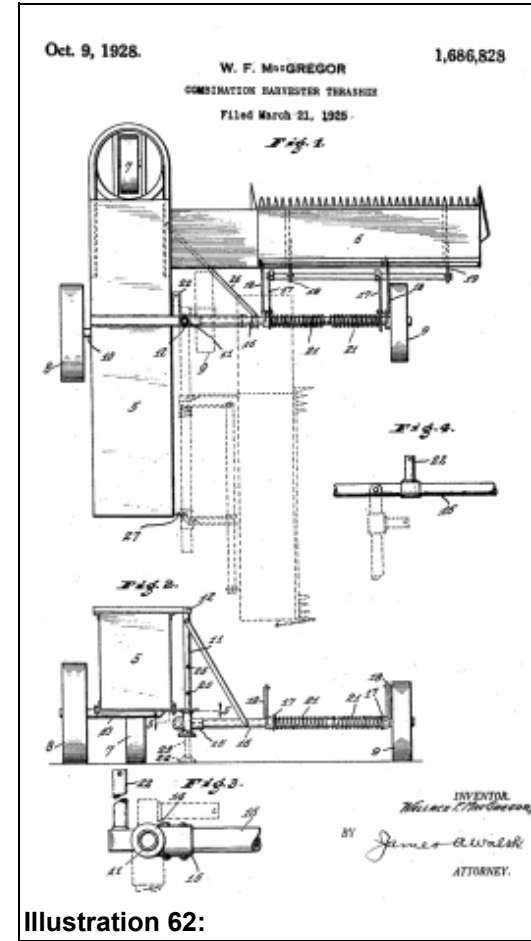


Illustration 62:

1928 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

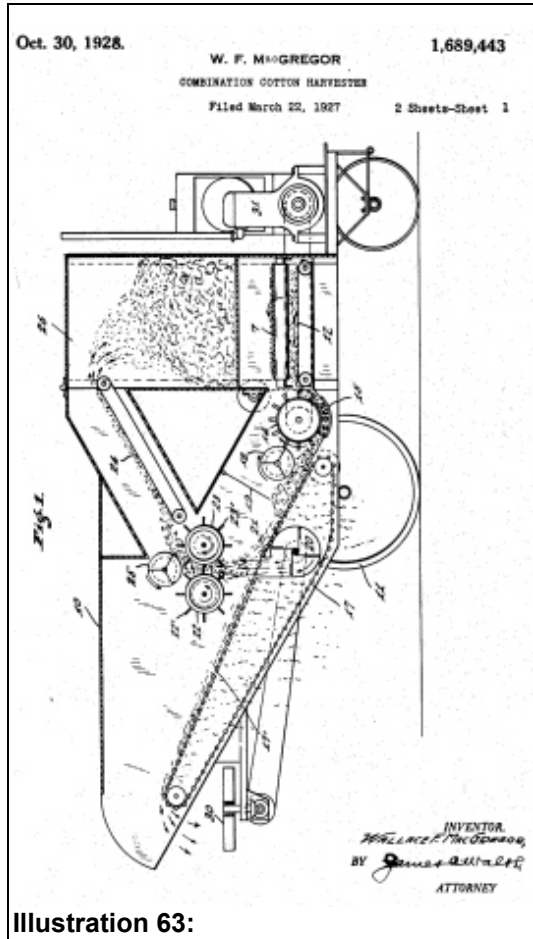


Illustration 63:

1928 patent "Combination Cotton Harvester" issued to MacGregor and assigned to J I Case Threshing Machine Co.

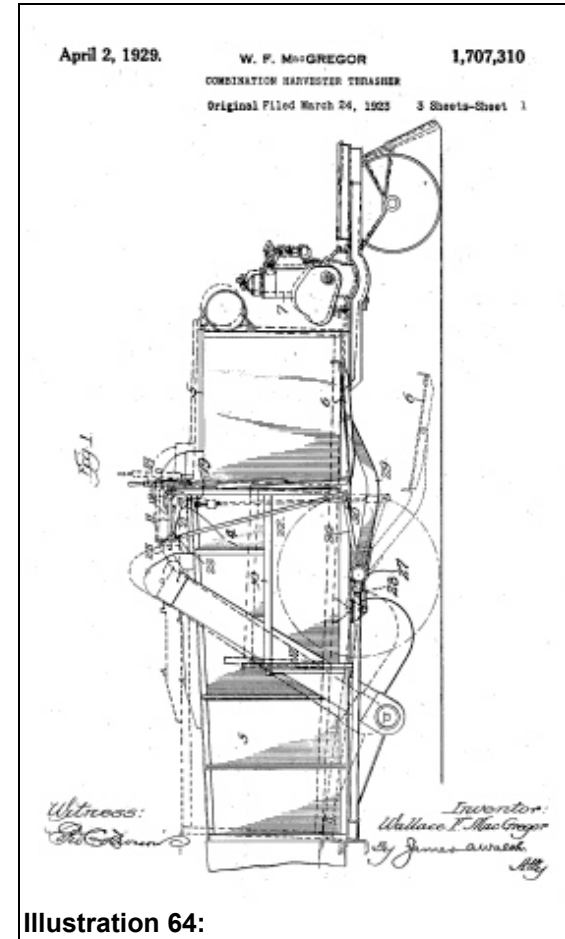


Illustration 64:

1929 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

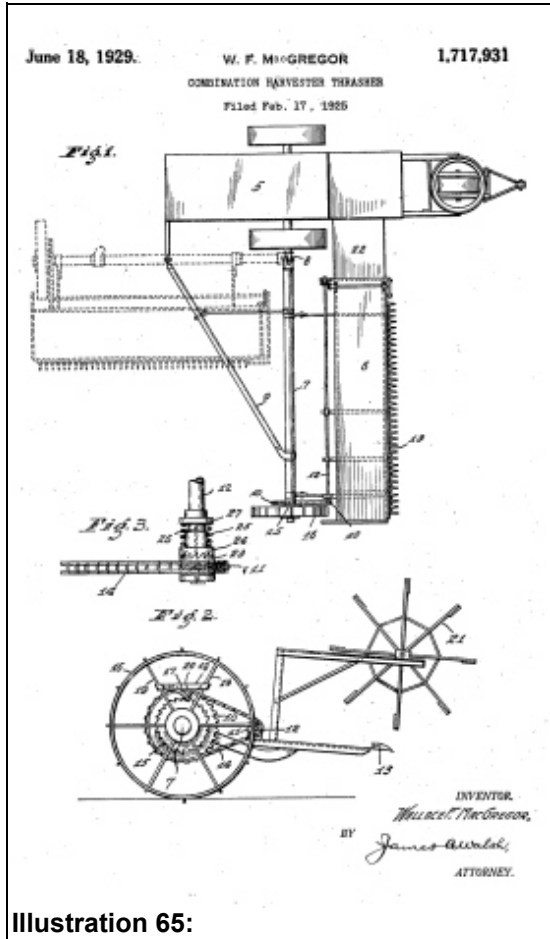


Illustration 65:

1929 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Threshing Machine Co.

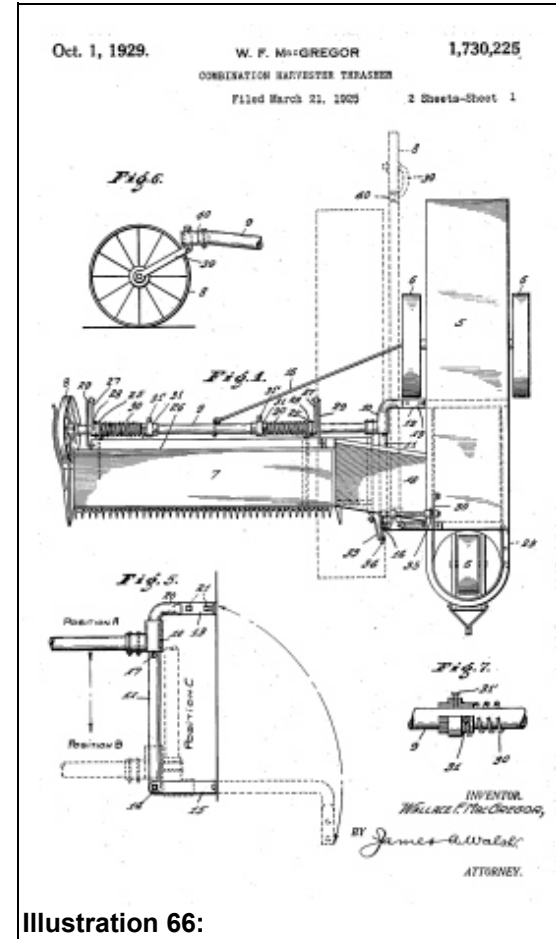


Illustration 66:

1929 patent "Combination Harvester Thrasher" issued to MacGregor and assigned to J I Case Co.

Patented Dec. 24, 1929 1,740,810

UNITED STATES PATENT OFFICE

DAVID P. DAVIES, OF RACINE, WISCONSIN, ASSIGNOR TO J. I. CASE COMPANY, OF RACINE, WISCONSIN, A CORPORATION

TRACTOR

Application filed August 3, 1928. Serial No. 257,283.

My invention relates to the type of tractors which embody a divided driving axle each section of which is connected by sprockets and chains to transmission mechanism and driven thereby, my object being to provide adjustable means for readily and independently tightening the chains to obtain efficient driving power and also for loosening such chains to remove them from the sprockets which they connect, my improvement also including means associated with the casing enclosing said driving mechanisms whereby ready access may be had to the latter and to said adjusting means, as will hereinafter more fully appear.

In the accompanying drawing, forming part hereof, Figure 1 is a horizontal sectional view of that portion of a tractor embodying my improvements, as seen when looking in the direction indicated by the arrows 1-1 in Fig. 2; Fig. 2, a longitudinal sectional view taken on the dotted line 2-2 in Fig. 1, and Fig. 3 is an elevation of a cover and bolt-locking plate which I employ.

In said drawing I have illustrated a tractor provided with a divided driving axle comprising the sections 3, 6, journaled in sliding bearing carriers, 7, each of said bearings embodying an inner hub, 8, an outer hub, 10, and a flange, 11, the latter having slotted bolt holes, 12, therein, by which they are secured to the casing 13 embodying reinforcing ribs 13', with studs, 14, said casing enclosing the transmission, differential and other mechanisms in a dust-proof manner and which is designed to contain a supply of oil for lubricating the actuating mechanisms therein.

Each axle section at its inner end is provided with a sprocket, 15, which is connected by a driving chain, 16, to a sprocket, 17, on the differential shaft, 18, which latter carries a gear, 19, meshing with a pinion, 20, on transmission shaft, 21, power being transmitted to said latter shaft by any conventional train of gears located between it and the engine (not shown) for driving the differential shaft, 18, and the chains connected thereto and to the axle sections. As it becomes necessary occasionally to tighten or loosen one or the other or both of the driving chains 16, I may readily accom-

plish such adjustment by means of the bolts 22, which are threaded into the inner hubs 9 of the carriers 7 and extend through the end of casing 13, where said bolts are in convenient position to be turned in the desired direction to either advance the carrier so that the chain may be detached or to draw such carrier rearwardly in order to tighten the chain, these movements of the carriers in longitudinal relation to the casing 13 being obtained by loosening the studs 14 which pass through the slotted holes 12 in the flange 11 of the bearing carrier, which permits ready shifting of the carrier back and forth as the bolts 22 are turned, and in which manner it will be apparent that the carriers may be independently adjusted for the purposes stated.

As indicated, the actuating mechanisms such as the transmission, differential and driving chains are contained within the casing 13 the rear end of which has an opening therein adapted to be closed by a cover plate, 23, so that when it is desired to obtain access to the interior of casing 13 for installing sprockets upon axle sections 3, 6, adjusting the bolts 22, or otherwise, this may be accomplished by removing said cover. As stated, the heads of bolts 22 lie upon the outside of casing 13 and are accessible for adjustment when cover 23 has been removed, and when such adjustment has been made the cover is replaced and secured to casing 13 by bolts passing through the holes 24 and into the casing. Said cover 23 is provided with pockets, 25, so positioned as to snugly fit the heads 22 of bolts 22, which pockets serve as means for locking the bolts and retaining them in the position to which they have been adjusted, and when the cover has been secured to the casing 13 the mechanisms therein are protected from dust and extraneous matter. In tractors of the character to which my improvement relates it is the practice to associate therewith a power take-off shaft (not shown) which passes through the interior of casing 13 and extends beyond the rear end of the tractor to be connected to an implement or machine, and for which purpose I provide a bearing, 26, in cover 23, which bearing is sealed by a closure, 27, when the tractor

Illustration 67:

1929 Davies patent 1,740,810, "Tractor", assigned to J I Case Co. With independently adjustable chain drive transmission. (Drawing not available from U S Patent Office web site.)

Patent No. 1,740,810 was issued to David P. Davies on December 24, 1929. It was assigned to J. I. Case Company. This patent application was filed on August 3, 1928. Obviously, several weeks or months were required to prepare and file the patent drawings. Before that, a substantial amount of time was required to bring the design to perfection. Thus, it seems entirely plausible that the Model L tractor design was well on its way to fruition in 1927 or 1928. The same basic design was also used in the Model C, CC, and other Case tractors of this period.

Illustration 68:

1929 Davies patent 1,740,810 assigned to J I Case Co. (Drawing copied from: "150 Years of J I Case", C H Wendel, 2005, Iola, WI.)

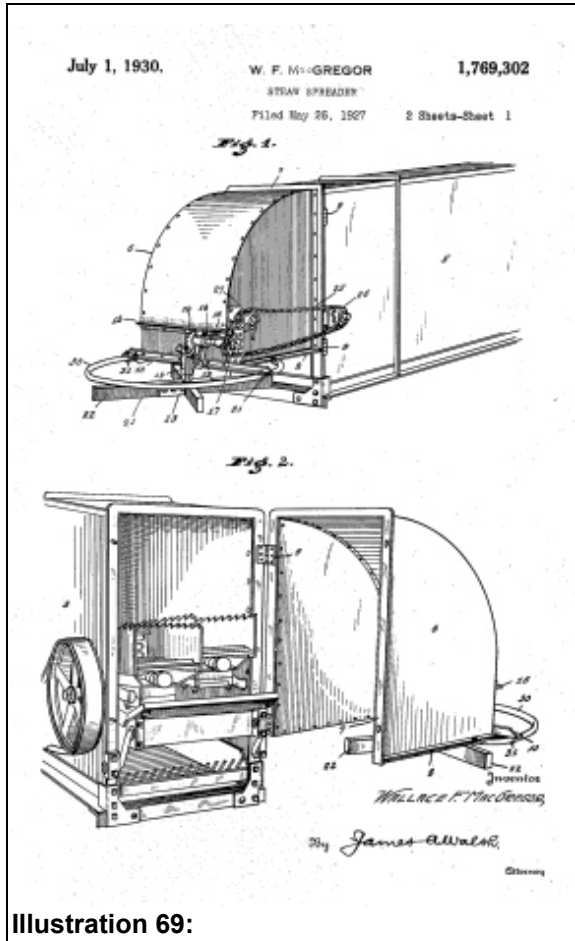


Illustration 69:

1930 patent "Straw Spreader" issued to MacGregor and assigned to J I Case Co.

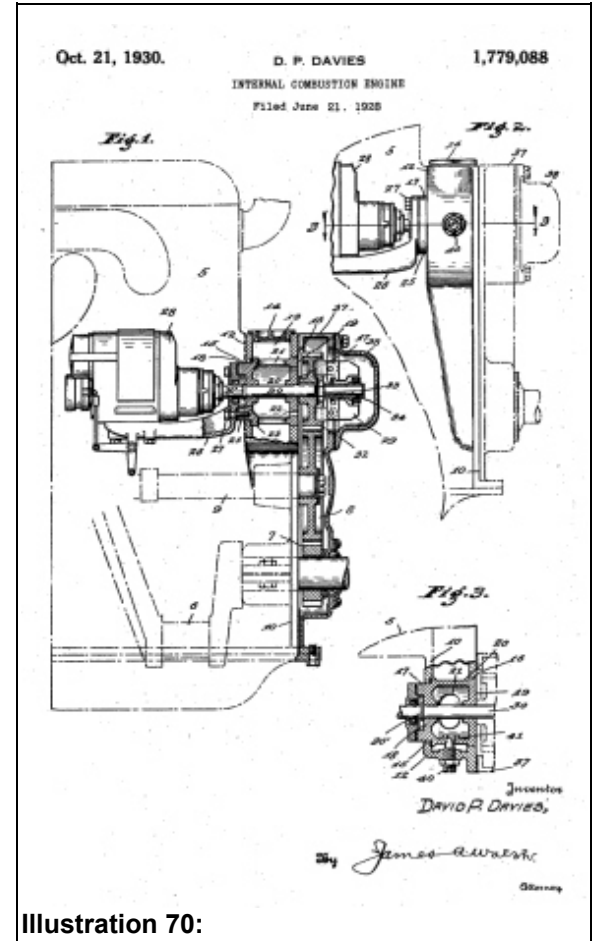


Illustration 70:

1930 patent "Internal Combustion Engine" issued to Davies and assigned to J I Case Co. (With provision for mounting magneto, governor or other auxiliary driven components.)

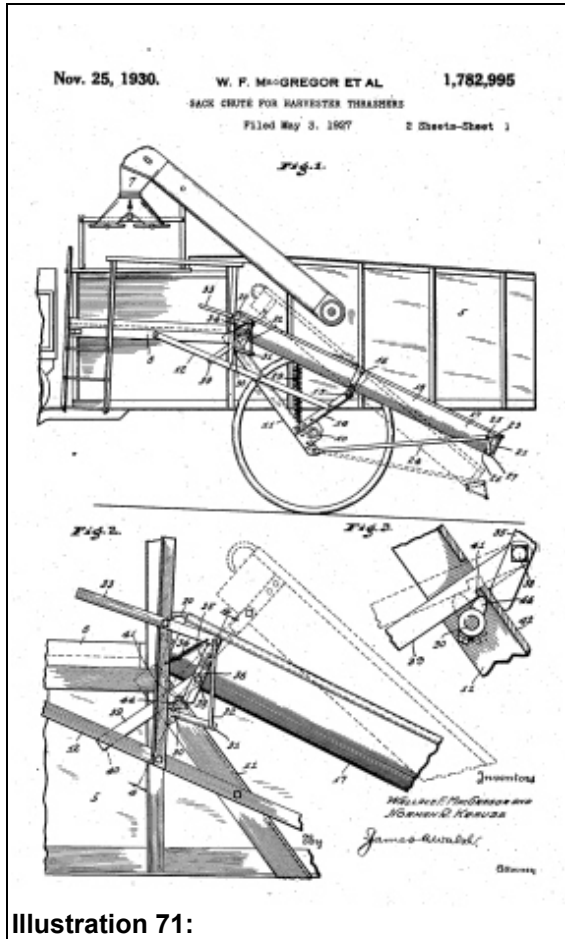


Illustration 71:

This 1930 patent issued to Wallace F MacGregor and Norman R Krause "Sack Chute for Harvester Threshers" was assigned to J I Case Co.

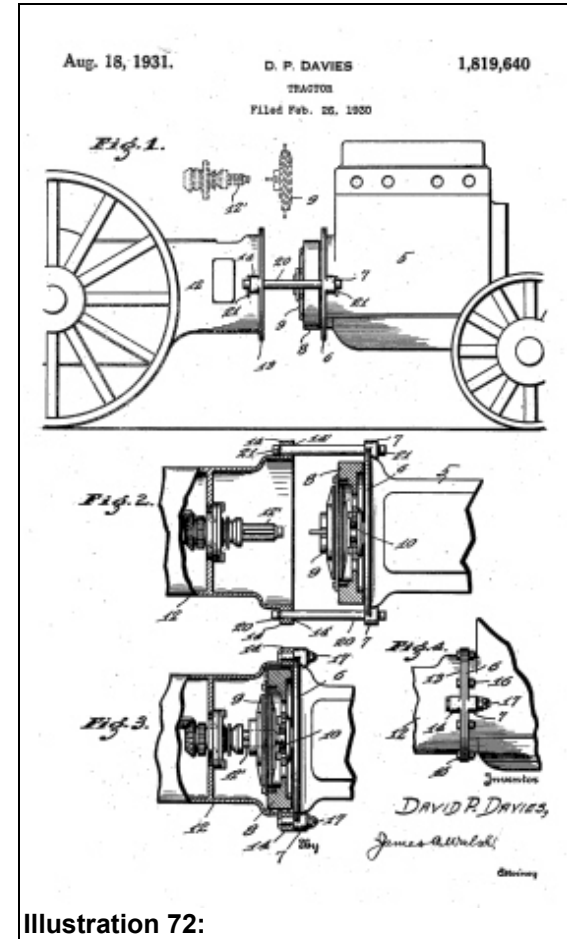


Illustration 72:

This 1931 patent issued to Davies for "Tractor" was assigned to J I Case Co.

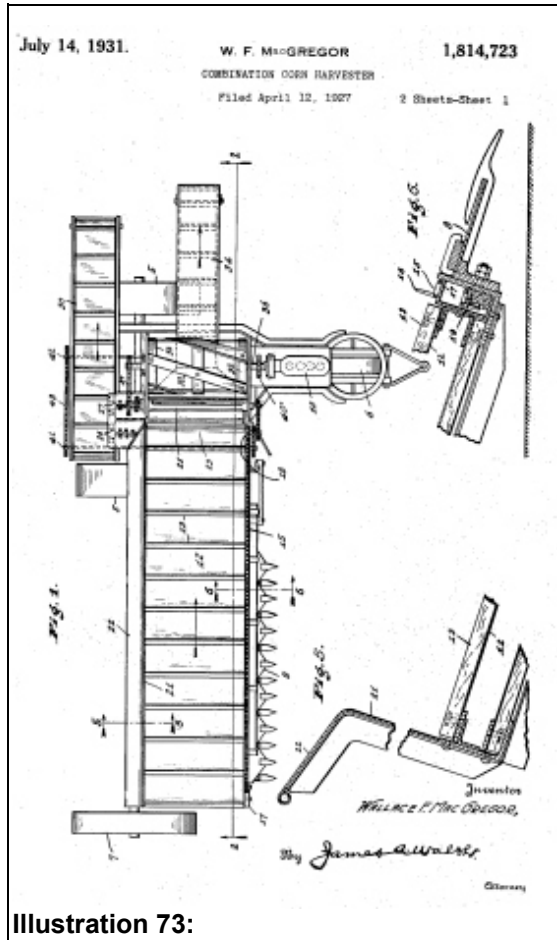


Illustration 73:

This 1931 MacGregor patent Combination Corn Harvester was assigned to J I Case Co.

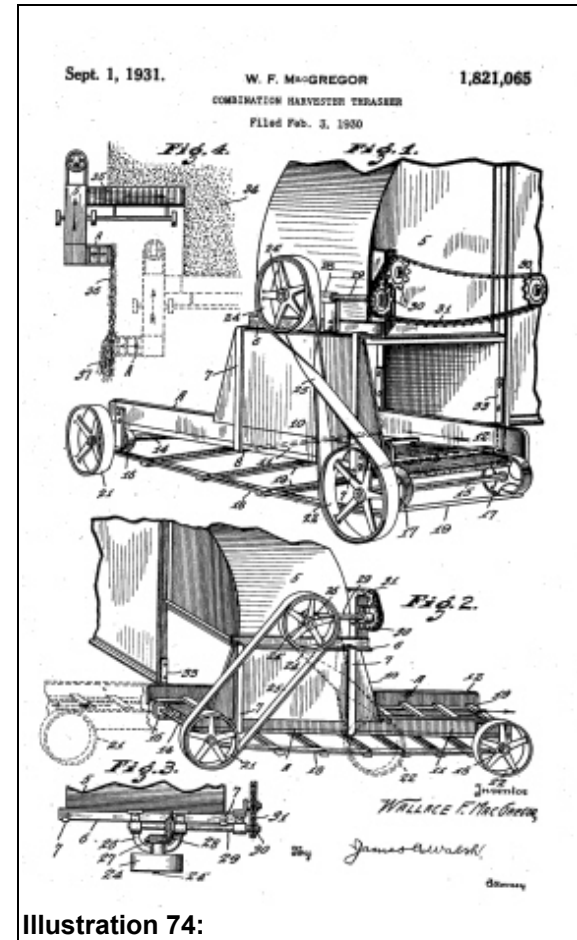


Illustration 74:

This 1931 MacGregor patent Combination Harvester Thrasher was assigned to J I Case Co. A straw wind-rowing device.

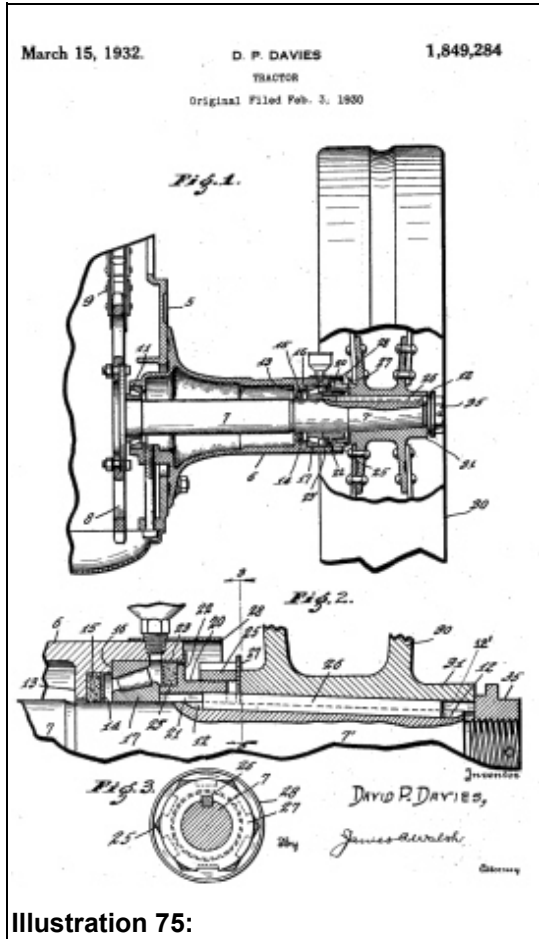


Illustration 75:

This 1932 Davies patent "Tractor" was assigned to J I Case Co.

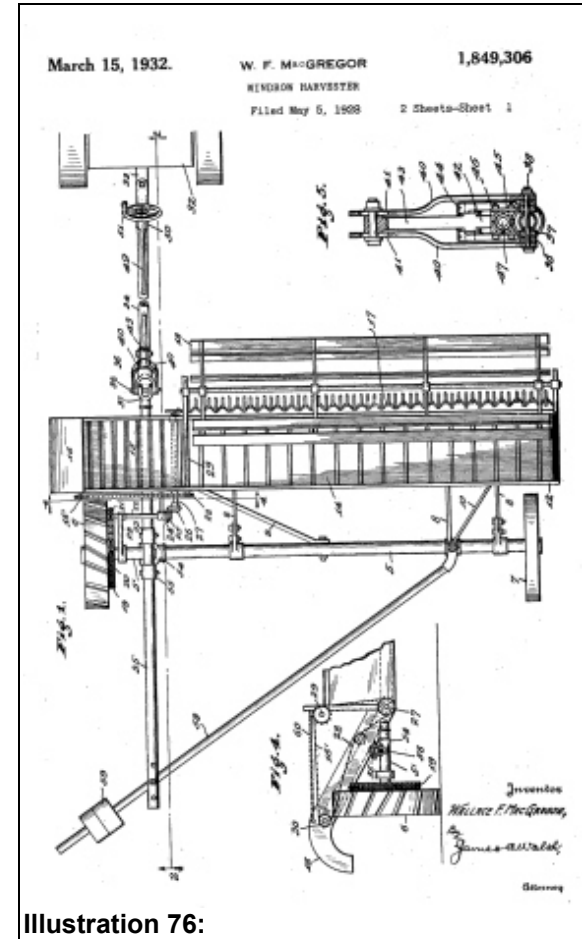


Illustration 76:

This 1932 MacGregor patent "Windrow Harvester" was assigned to J I Case Co.

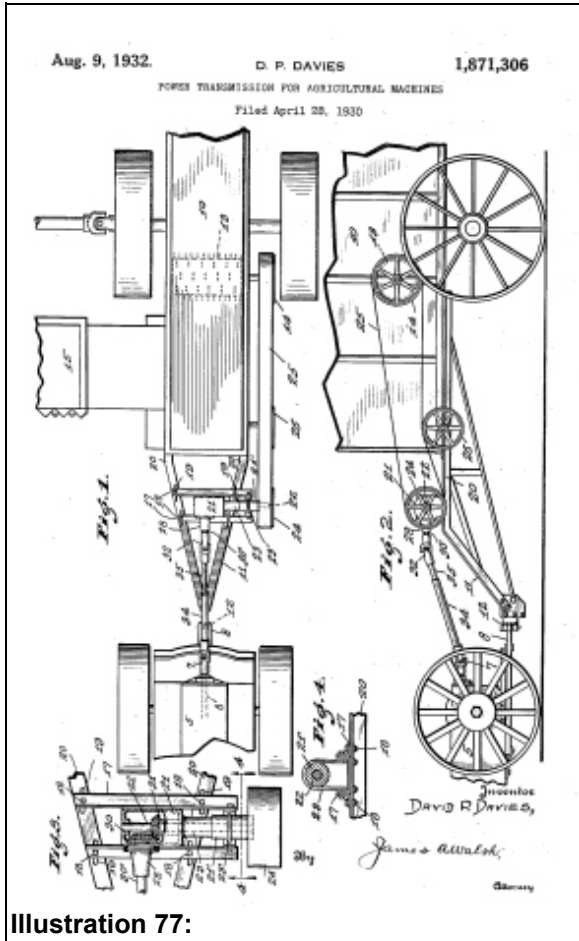


Illustration 77:

This 1932 Davies patent "Power Transmission for Agricultural Machines" was assigned to J I Case Co.

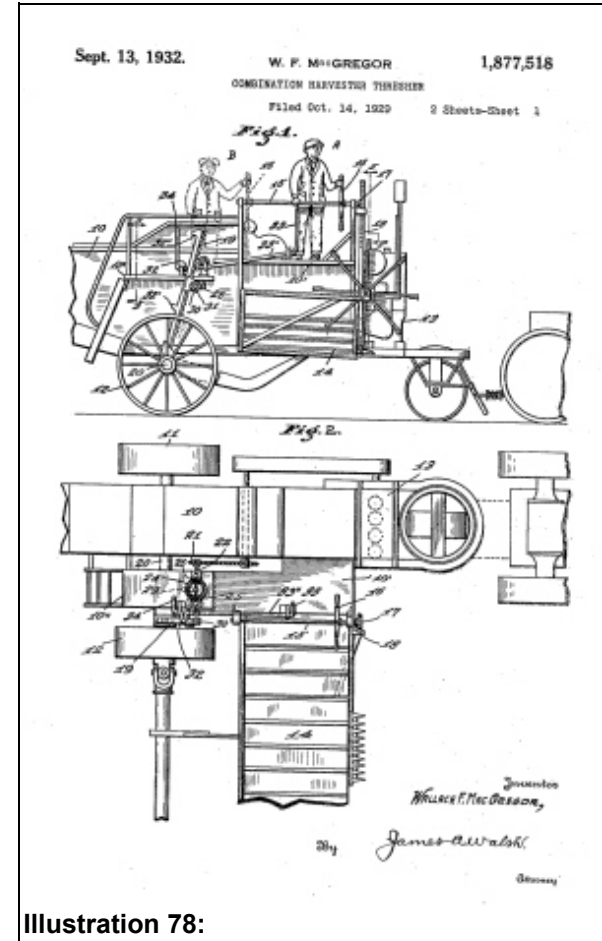


Illustration 78:

This 1932 MacGregor patent "Combination Harvester Thresher" was assigned to J I Case Co.

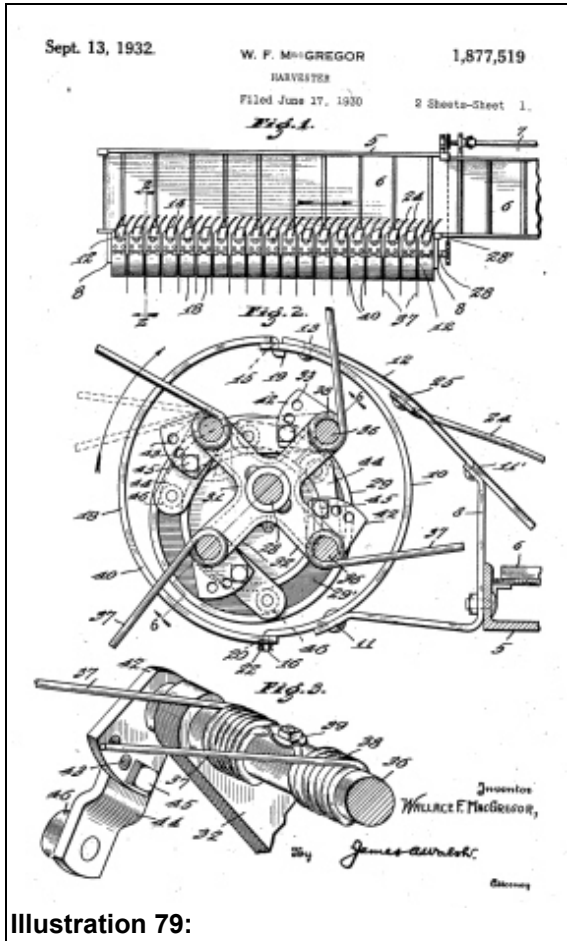


Illustration 79:

This 1932 MacGregor patent "Harvester" was assigned to J I Case Co.

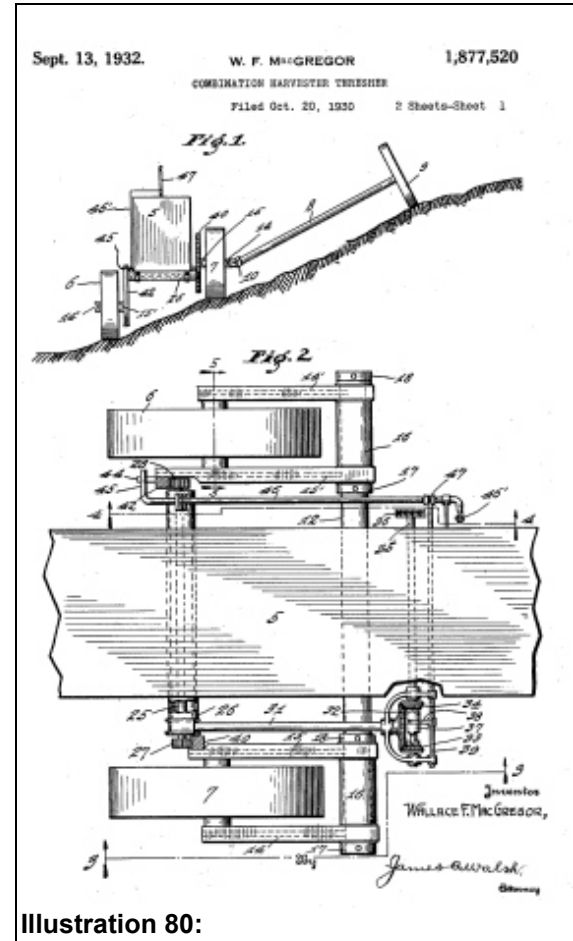


Illustration 80:

This 1932 MacGregor patent "Combination Harvester Thresher" was assigned to J I Case Co.

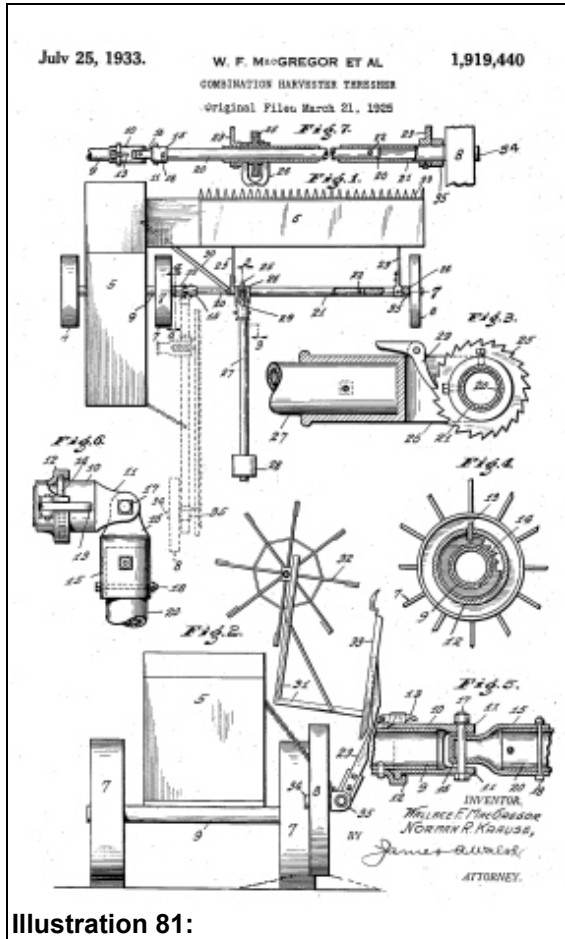


Illustration 81:

This 1933 patent issued to MacGregor and Krause for Combination Harvester Thresher and assigned to J I Case Co.

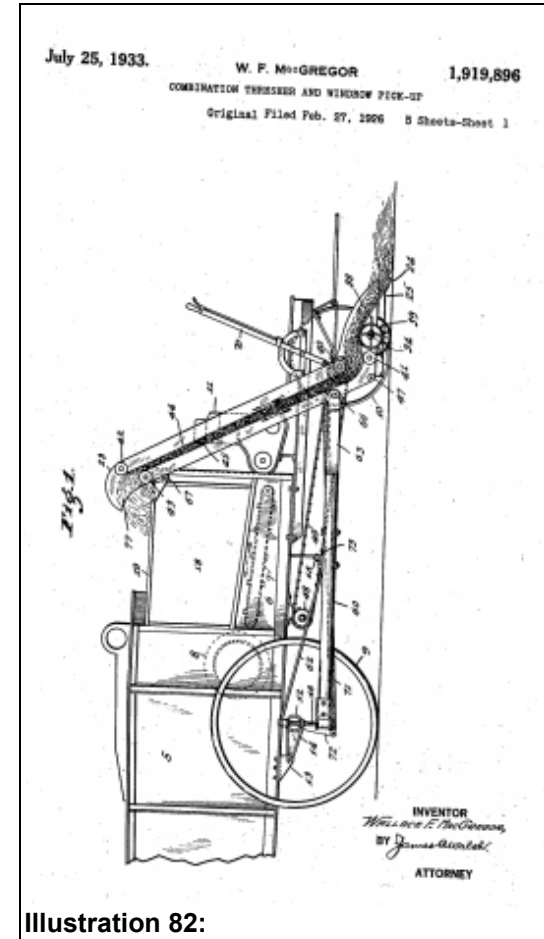


Illustration 82:

This 1933 patent issued to MacGregor for Combination Thresher and Windrow Pickup and assigned to J I Case Co.

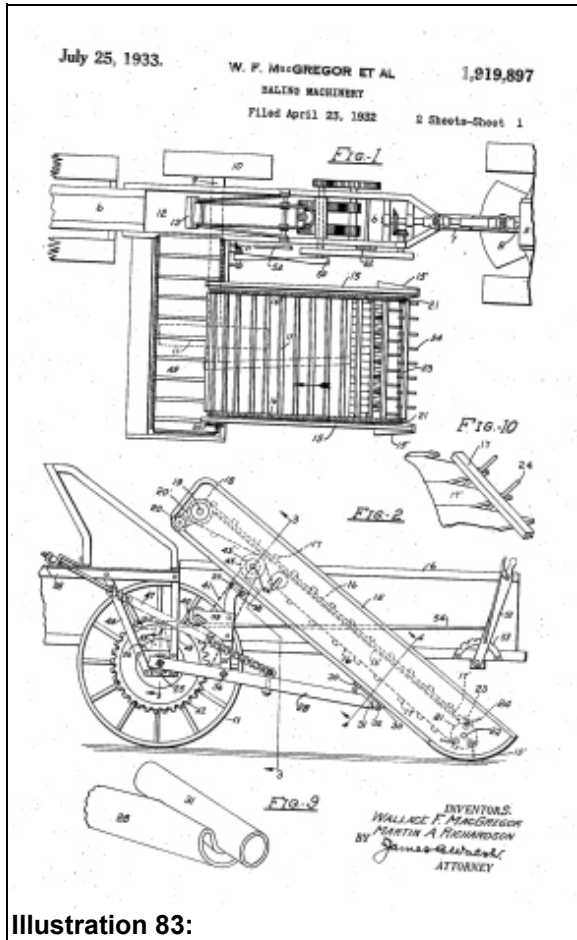


Illustration 83:

This 1933 patent was issued to MacGregor and Martin A Richardson and assigned to J I Case Co. (Baling Machine)

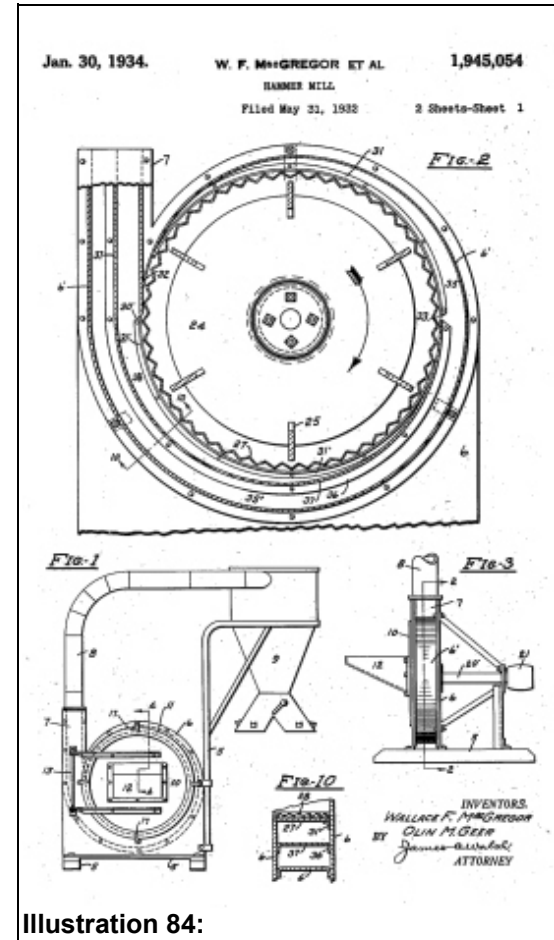


Illustration 84:

This 1934 patent was issued to MacGregor and Olin M Geer and assigned to J I Case Co. (Hammer-mill)

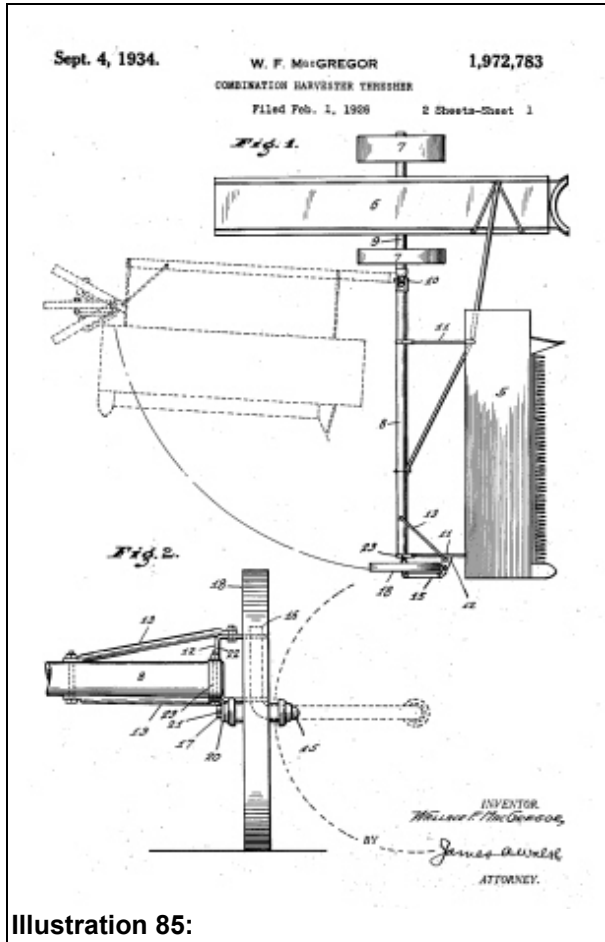


Illustration 85:

This 1934 MacGregor patent Combination Harvester Thresher was assigned to J I Case Co.

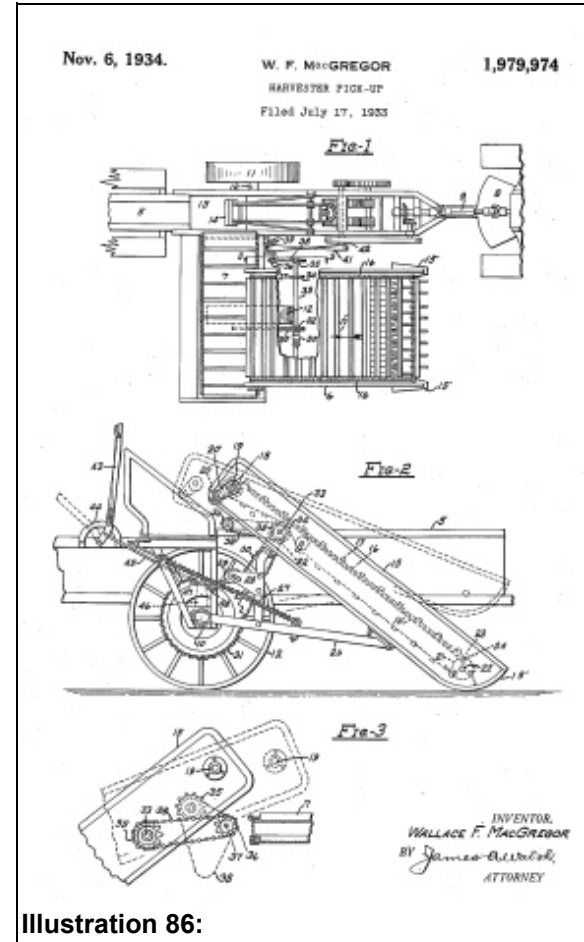


Illustration 86:

This 1934 MacGregor patent Harvester Pickup was assigned to J I Case Co.

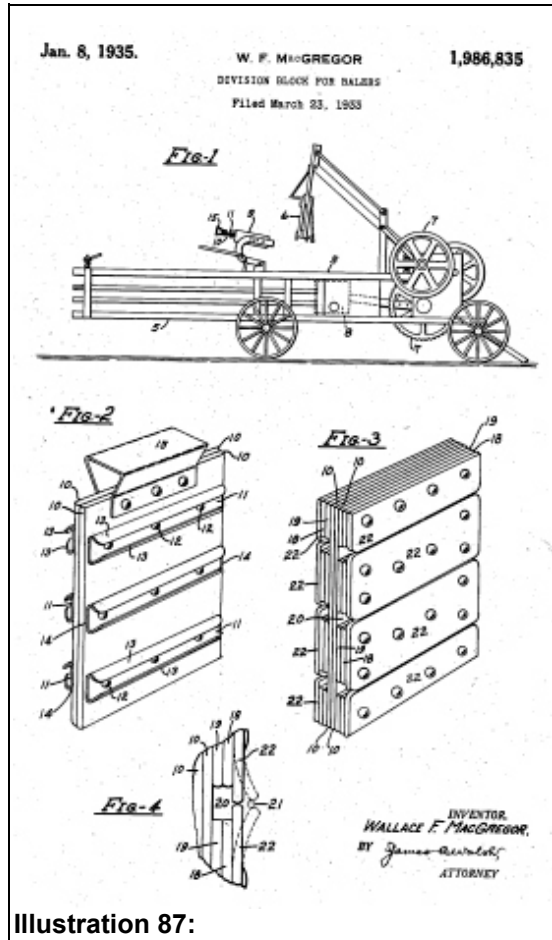


Illustration 87:

This 1935 MacGregor patent, Division Block for Balers, was assigned J I Case Co.

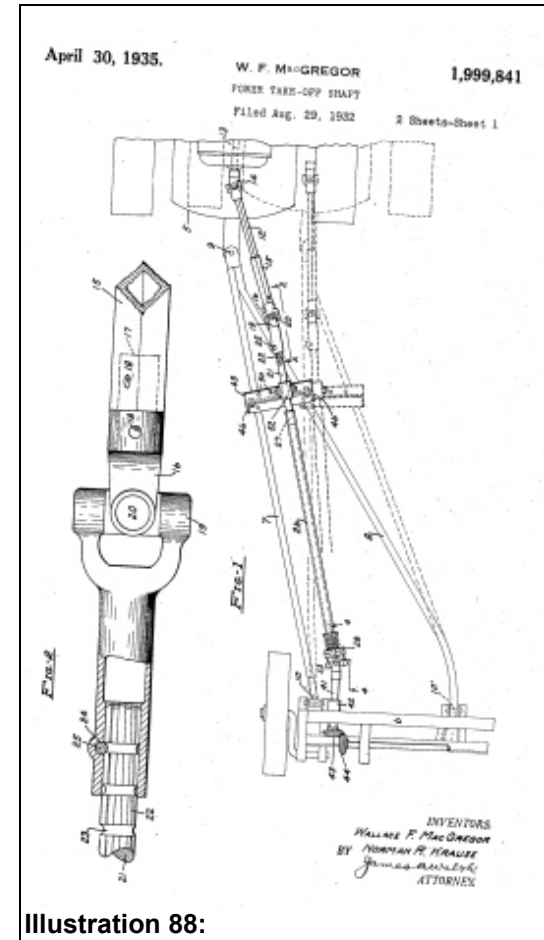
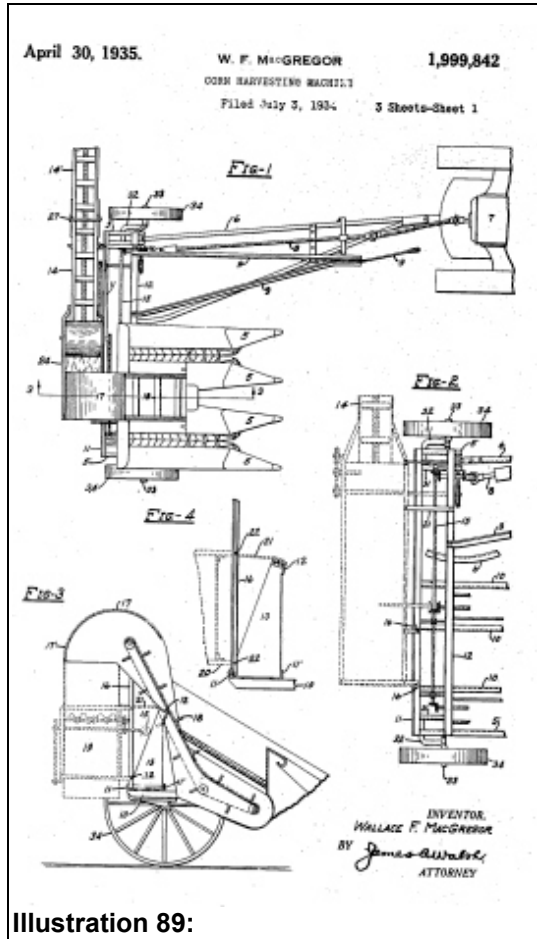
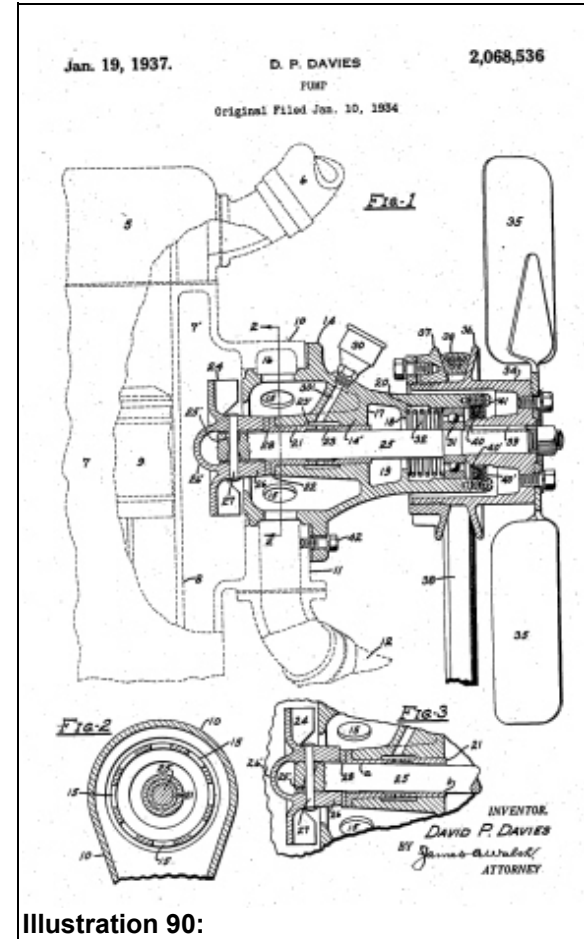


Illustration 88:

This 1935 MacGregor patent, Power Take-Off Shaft, was assigned to J I Case Co.



This 1935 MacGregor patent, Corn Harvesting Machine, was assigned to J I Case Co.



This 1937 Davies patent, Pump, was assigned to J I Case Co.

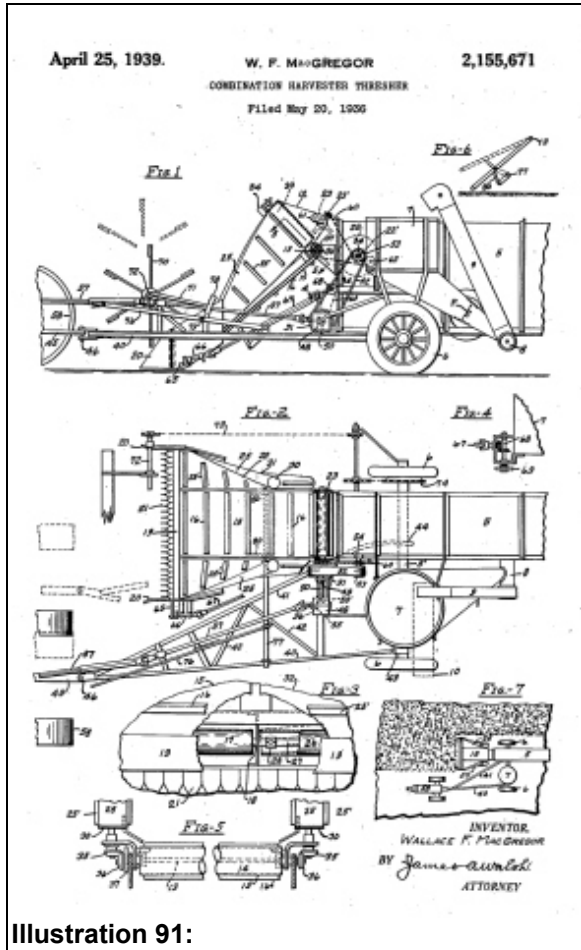


Illustration 91:

This 1939 patent, Combination Harvester Thresher, was assigned to J I Case Co.

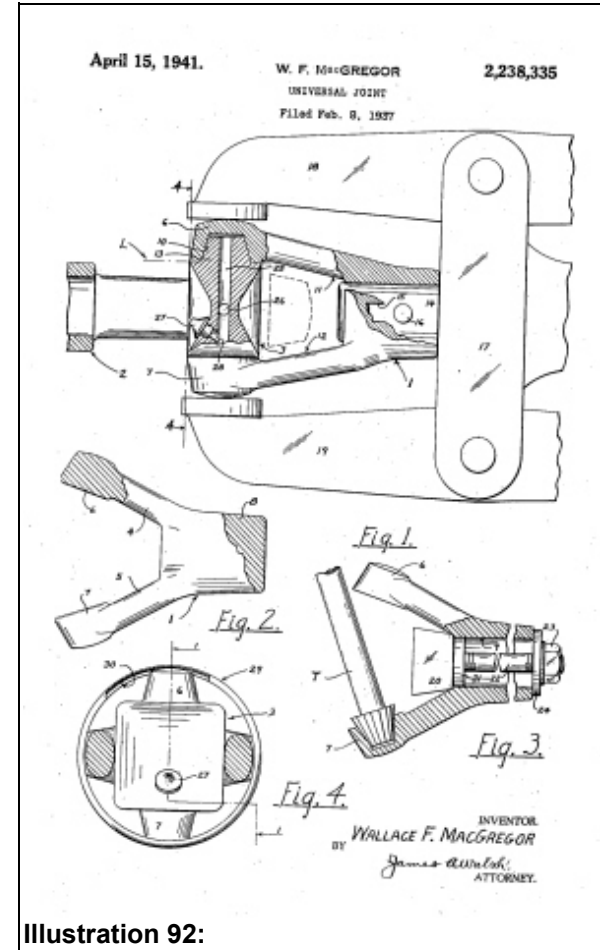


Illustration 92:

This 1941 patent, Universal Joint, was assigned to J I Case Co.

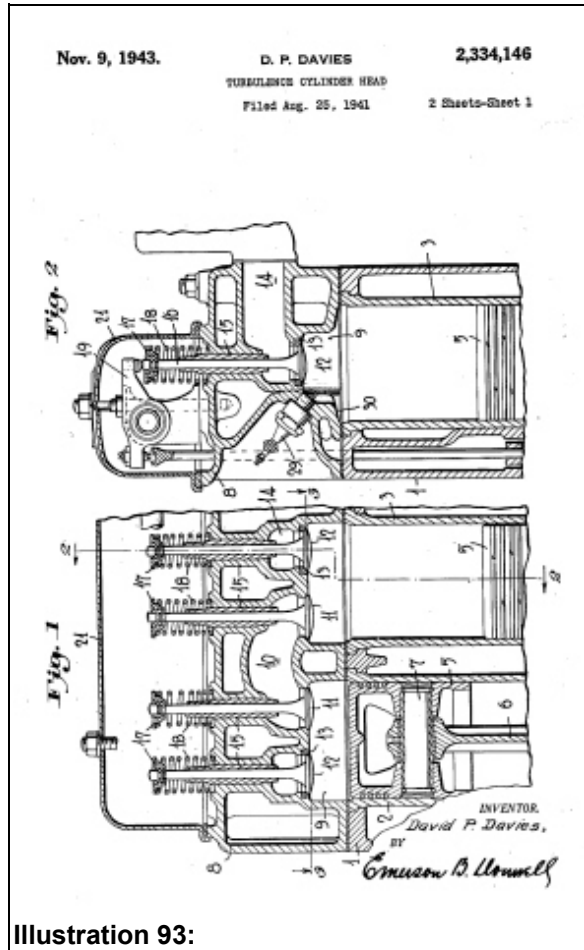


Illustration 93:

This 1943 Davies patent, Turbulence Cylinder Head, was assigned to J I Case Co.

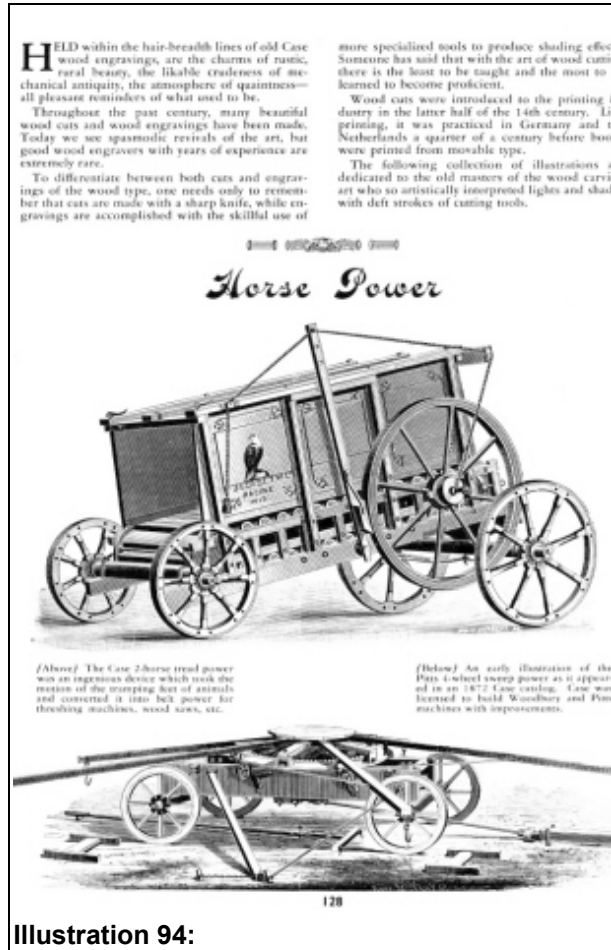


Illustration 94:

J I Case Threshing Machine Co. advertisement for treadmill and sweep type horse power machines.¹⁴

¹⁴ Floyd Clymer's *Album of Historical Steam Traction Engines and Threshing Equipment No. 1*, 1949, page 128.

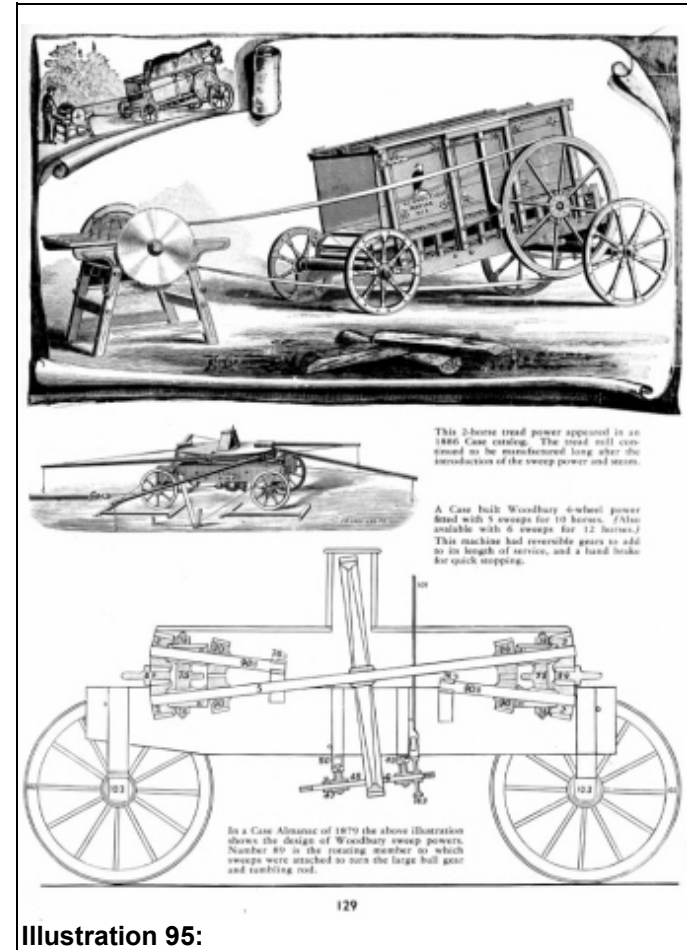


Illustration 95:

J I Case Threshing Machine Co. advertisement for treadmill and sweep type horse power machines.¹⁵

¹⁵ *Ibid.*, page 129.

May 1, 1883. THE FARM AND FIRESIDE.

The Steel Wonder Horse Machine
A horse machine as the greatest of its kind. It is made of steel and is the only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

B-KEEPERS
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

Perkins Steel Mills
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

STEEL TOWERS
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

10 CENTS
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

Dr. Thompson's Eye-Water
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

ONE PAIR FREE
BATES' RHEUMATIC FOOT DRAFTS
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

HARNESS AND BUCKLE—FREE OFFER.
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

ARE YOU LOOKING FOR A FIRST-CLASS HORSE POWER.
Tread Power and Saw Frame, SWINGING STACKER, Band Cutter and Self-Power, SAW MILL.

What Can't Pull Out?
Why the Non-pull-out
Now on the Jan. Book Filled Watch Cases, made by the Keystone Watch Case Company, Philadelphia. It protects the Watch from the pick-pocket, and prevents it from dropping. Can only be had with cases stamped with this trade mark.

SAVE MONEY
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

STEEL MILL
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

EVERY FARMER DO HIS OWN THRESHING.
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

Before You Buy a New Harness OR BUCKLE
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

Dr. Thompson's Eye-Water
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

ONE PAIR FREE
BATES' RHEUMATIC FOOT DRAFTS
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

HARNESS AND BUCKLE—FREE OFFER.
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

All ads appearing in this Album are, of course, void. They are not reproduced for the purpose of selling merchandise. These ads are interesting because of the changes in advertising methods over a period of years.

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Illustration 96: 1893 advertisement including J I Case T M Co.¹⁶

A. B. FARQUHAR, YORK

Farquhar's Ajax Traction Engine
The only one of its kind that will run on any kind of ground. It is the only one that will run on any kind of ground. It is the only one that will run on any kind of ground.

FARQUHAR-DINGEE HORSE POWER

Dimensions and Price List "AJAX" TRACTION ENGINES

Model	Price	Value	Weight	Capacity	Power
Model A	\$100.00	\$150.00	1000 lbs.	100 gal.	10 H.P.
Model B	\$150.00	\$200.00	1500 lbs.	150 gal.	15 H.P.
Model C	\$200.00	\$250.00	2000 lbs.	200 gal.	20 H.P.
Model D	\$250.00	\$300.00	2500 lbs.	250 gal.	25 H.P.
Model E	\$300.00	\$350.00	3000 lbs.	300 gal.	30 H.P.
Model F	\$350.00	\$400.00	3500 lbs.	350 gal.	35 H.P.
Model G	\$400.00	\$450.00	4000 lbs.	400 gal.	40 H.P.
Model H	\$450.00	\$500.00	4500 lbs.	450 gal.	45 H.P.
Model I	\$500.00	\$550.00	5000 lbs.	500 gal.	50 H.P.
Model J	\$550.00	\$600.00	5500 lbs.	550 gal.	55 H.P.
Model K	\$600.00	\$650.00	6000 lbs.	600 gal.	60 H.P.
Model L	\$650.00	\$700.00	6500 lbs.	650 gal.	65 H.P.
Model M	\$700.00	\$750.00	7000 lbs.	700 gal.	70 H.P.
Model N	\$750.00	\$800.00	7500 lbs.	750 gal.	75 H.P.
Model O	\$800.00	\$850.00	8000 lbs.	800 gal.	80 H.P.
Model P	\$850.00	\$900.00	8500 lbs.	850 gal.	85 H.P.
Model Q	\$900.00	\$950.00	9000 lbs.	900 gal.	90 H.P.
Model R	\$950.00	\$1000.00	9500 lbs.	950 gal.	95 H.P.
Model S	\$1000.00	\$1050.00	10000 lbs.	1000 gal.	100 H.P.

Illustrations from Farquhar 1887-88 catalog.

Illustration 97:

1887-1888 catalog of Farquhar and Dingee.¹⁷

¹⁶ Ibid., page 27.

¹⁷ Ibid., page 20.

A Few Thoughts:

- If you have followed down through these patents in chronological order I think you'll begin to see the gradual progression of wheat harvesting equipment development.
- Starting with rudimentary grain threshing machines using horses for power either by treadmill or sweep type devices and progressing into steam powered, belt driven threshers.
- Threshers then developed into combined harvester-threshers with ground drive wheel power and pulled either by multi-horse teams or steam traction engines. These were large, cumbersome machines and could require up to 40 horses to pull them.
- Next these combined harvester threshers are powered by self contained internal combustion engines and pulled by steam traction engines.
- Next, the smaller gas powered tractors are used to pull the combines.
- Then the power take off of the pulling tractor is used to drive the combine.
- This is followed by a change in the combine to a smaller version that has the cutting portion (harvester) centered in front of the threshing portion to make a more compact unit.

Although not shown in this time span, the next development is the self propelled combines of today.¹⁸

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¹⁸See Appendix, W. F. MacGregor paper.

Appendix-

The Combined Harvester-Thresher

By W. F. MacGregor

Mem. A. S. A. E.

Chief Engineer

J. I. Case Threshing Machine Company ⁽¹⁹⁾

The idea of combining the operations of cutting and threshing grain so that both are done at the same time by one machine is not new. On the contrary, it seems to have occurred to at least one individual nearly one hundred years ago. The U. S. patent office shows a patent of a combined harvester and thresher as early as August 8, 1828. Briggs and Carpenter patented another February 6, 1836, claiming the principle of the ground drive. Moore and Hascall of Kalamazoo, Michigan, patented a machine on June 28, 1836, which seems to have had many of the elements of success. Probably had the inventors lived on the Pacific coast where crops and weather are more favorable, it would have been made a complete success. But they were attempting to introduce, not only a new machine, but a new harvesting method in a territory where it was thought that the grain must be stacked and go through the "sweat" before being fit to thresh. It was quite an undertaking in itself to introduce the idea of threshing immediately after cutting

at a time before even shock threshing had become popular. We find other patents on harvester threshers on March 16 and May 14, 1841, and June 25, 1845. R. L. Ardrey, in his book "American Agricultural Implements" published in 1894, says, "The invention of the main features of this machine was recorded in the patent office before any hand-raking reaper had been made practical for the market, and it seemed at first as though it would come into general use."

Up to this time the men whose vision was sufficiently clear to enable them to see beyond their own generation had all lived in America, but in 1845 a man named Ridley in far-off Australia appears to have grasped the same general idea. His machine attracted considerable attention at the time, and the English papers were not particularly pleased to be told that machines embodying the same principles had not only been patented, but had been built and used in the United States prior to this time. Ridley's machine did not cut off the heads with some straw by a reciprocating sickle cutting against the non-reciprocating guards in the manner of all American grain harvesting machinery so familiar to us. Instead of a cutting sickle, this Australian harvester had a comb which, upon coming into contact with the standing grain, allowed the straw to slip through until the head was caught and stripped off. This stripper principle is very old; in fact, it forms the important part of the oldest grain harvester of which we have any record. It is found on the machine made and used by the Gauls in the first century.

Some years after Ridley's time the stripper type harvester-threshers became very popular in Australia. The comb was improved by mounting a "rippling" cylinder above it to aid in loosening the kernels from the head and to help to prevent choking. In the operation of this machine the cob

¹⁹ Paper presented at the meeting of the Farm Power and Machinery Division of the American Society of Agricultural Engineers, Chicago, December 3, 1924.

of the head and some of the chaff is left on the straw, so that in order to produce clean grain it is only necessary to blow out the light chaff. This method thus greatly simplified the subsequent operations, as no separating from the straw was necessary and there was no straw to handle. The Australian machine, of which the "Sunshine" is the best known example, is comparatively simple. It is ground driven and has been made in the smaller sizes: 5, 6, 8 and 10-foot cut. It carries a grain box holding a few bushels. When this is full the machine is stopped while the grain is run into sacks. The Australian stripper has been of enormous benefit to the farmers of that country where conditions are favorable for its use. During the last forty years thousands of them have been sold there. When tried in other countries, however, it has not been very successful. When tried in the Argentine and in California where much of the ground was looser, the grain was either pulled up by the roots or too much grain was left in the heads.

But while this machine was being developed in Australia from Ridley's time on, inventors in our own country were making progress with the sickle type of harvester-thresher. In the '60's several patents were granted to men in the middle west and a few to residents of California and Oregon. The first California "combine" appears to have been built by D. C. Matteson, at Stockton in 1867. In the '70's several men on the Pacific coast seem to have realized the possibilities, and these ideas crystallized into actual machines, so that in the '80's the combine had been proven practical in the field. In 1887 there were several of them scattered through central and northern California. About 1890 at least three companies - Houser & Haines, Best and Holt - were in a position to make as many machines as the market might require. Six or seven years later they had

become common in California and their use had spread to Washington, Oregon and Idaho. These machines were equipped with bagging platforms, the grain being run into sacks which were sewed up as the outfit moved along. The sacks were then dumped off in groups of three or four and afterwards gathered up.

These early machines were all large, cutting a swath of from 16 to 30 feet wide or even wider, weighing from ten to fifteen tons and requiring from 18 to 40 horses or mules to pull them. An idea of the size of these machines and how it sometimes impressed the purchaser may be had from the following incident: In 1892 a salesman had obtained an order from a farmer on the Snake River in Washington. The harvester was shipped by steamboat and when it arrived the farmer refused to accept it, saying he did not expect to get a whole lumber yard. The manufacturers were obliged to unload and operate it the first season. Thirty-six horses were required to pull it on the farmer's land, instead of twenty, as he had been told, but he paid for it and used it successfully many years thereafter. Thus were the machines introduced into new territories.

One of the serious obstacles encountered when the combined harvester-thresher was first introduced in the state of Washington was the difficulty at satisfactorily accomplishing the cleaning and separating while the machine traveled over the steep hills and was tilted to somewhat severe angles as it went along. But the situation was met by the introduction of the leveling device which is now used on all machines operating in the hills. These "hills", as the natives call them, are more like mountains, and some of them are so steep that a bag of wheat dropped off from the machine will roll down hill. The rain often

washes deep gullies in the hill sides so that the machines encounter rough going and are subjected to severe strains. All of the side-hill machines were pulled by horses and nearly all still are, for many of the hills are too steep for tractors. However, as some of the early builders of combines also built steam traction engines, it is only natural that in the more level places these large machines should be sold for steam power, and this was done as early as the early 90's. A few years later an auxiliary steam engine was mounted on the combine, receiving its steam from the boiler of the tractor. This was the first deviation from the ground drive which had been used on all former types.

About 1912 the first internal-combustion-motor-driven harvesters made their appearance in Washington. On the ground driven machine the speed of the thresher depends on the rate of travel, and this is quite objectionable as a constant speed is more essential to the successful operation of a thresher than it is to other harvesting machinery. Then too, in case the machine is choked it is a serious matter as there is a long passageway through the machine that may require cleaning out. Moreover, the machine must be driven out into the stubble in order to run it and avoid feeding more grain into it. These first motors were so heavy as to offset the reduction in draft due to wheel traction and resulted in requiring about as many horses as before. Nevertheless, the fact that the thresher ran continually, regardless of whether the machine was traveling or standing still, and at a speed not dependent on the rate of travel, improved the work of the thresher and constituted a real step in advance in the art.

The self-propelled combined harvester-thresher appeared about twelve years ago, and for about five years seemed to

gain considerable popularity. However, the large engine and the expensive transmission parts added so much to the expense that the machine was too costly for the popular demand. It is not logical from an economical standpoint to duplicate the propelling apparatus on machines used only a few weeks each year, when the majority of the buyers already have tractors capable of pulling them.

We have now commented upon the development of the Australian harvester-thresher, which in its typical form is a light, horse-drawn, ground-driven machine of the stripper type with about an 8-foot cut. We have also commented upon the California type of machine, which in its typical form is a heavy horse or power-drawn, motor-driven machine with complete cutting, threshing and separating mechanism, cutting a swath of about 24 feet. Thus in two widely separated localities two radically different machines have developed during the last fifty years. Both are well suited for the conditions prevailing in the places where they were produced. For some time it was popularly supposed that it was possible to use combines only in the comparatively restricted localities of this country such as California, Washington and Oregon, where the harvest season is quite sure to be dry and the straw is so stiff that it stands up and carries the heads for weeks after it has ripened without shattering. Many writers on the subject have expressed this opinion.

But a machine that makes such a great saving in labor and expense cannot be kept in the background by an erroneous popular belief. Those who studied the situation could see possibilities. Over twenty years ago one of our large western implement concerns began the development of a medium sized machine which would meet general

conditions better than the large California type. Since that time many experimenters have built and tried out machines in various parts of the country. Many have worked on the idea of threshing from the shock or windrow, and although such a process does not properly fall within the scope of this paper, it is mentioned to show the tendency toward a cheaper method of handling and threshing grain.

Every year since the first California combine was put to work in about 1867 the territory in which this machine is used has widened. About 1917 it received a great impetus, partly because of scarcity and high cost of labor during the war. Its use spread rapidly after being introduced in Western Kansas through that entire semi-arid belt including the Panhandle of Texas, Western Oklahoma, Eastern Colorado and Western Nebraska. The report of the Kansas State Board of Agriculture shows 2796 machines in use in that state in 1923. But they are also being used to a lesser extent in many other states. American machines have been sent in large numbers to the Argentine and some to Australia and other foreign countries. It seems that the Argentine farmers have been very quick to grasp the advantages of this method of harvesting and have outdistanced our own farmers in the rapidity with which they have accepted the new machine. The spreading of the combine area has been so rapid that our old idea of its sale confined to certain limited territory has required revision; so that we are now wondering where the limits-if indeed there are any-may be.

The present demand seems to be for a lightweight, medium-sized machine cutting a swath from 12 feet to a rod wide. It should be engine-driven and adapted to be pulled by tractor or horses. It is highly important that it be

thoroughly reliable, with ample capacity to function properly under the most adverse conditions. It should be capable of handling not only wheat, but rye, oats, barley, speltz, alfalfa, the kafir corn family, soy beans, and several other crops as well. No agricultural machine is operated under as high mental tension as is the combine. If the user happens to live in the hail belt, a delay in operating of a few hours will mean a great loss should a storm come. The combine cannot start cutting as soon as a binder, and not quite as soon as a header. but when the wheat is ready for "combining", the grower is properly anxious to have the crop cut and the grain in the elevator in the least possible time. Delay may mean that the wheat will lodge, making the cutting more difficult and resulting in some loss; it may mean that the weeds will develop so rapidly as to render more difficult the cleaning and separating operations and increase the likelihood of the grain heating from the pieces of green weeds which cannot be taken out; it may mean that the grasshoppers will eat many of the straws off, allowing the heads to fall on the ground where they are lost.

Thus, when the crop is ready the combine must cut and keep cutting until the crop is all secured and out of danger.

Let us compare for a moment the use of the combine with other methods of harvesting. Most of the grain crops of this country are and have for many years been cut with binders. This means that the grain must be handled at least three times-that is, shocked, then pitched onto a wagon and pitched off onto the stack or into the threshing machine. Each handling means lifting the entire amount of straw and grain by human muscle, and the number of handlings varies from a minimum of three up to about seven in some cases of stacked grain. In binding, the cost of the twine is also a

considerable item. On the contrary, the combine puts the grain into the wagon or motor truck without the necessity of lifting by hand even an ounce of either straw or grain. I know of a case where a farmer, with the aid of his wife driving a motor truck and his 13-year-old son driving the tractor, put his entire crop of 450 acres of wheat into the elevator in a nearby village in less than two weeks time. Compare this with the crew of men and horses and machinery necessary to harvest 450 acres of wheat by any other method you may choose; that is, head and thresh from the barges; bind and shock and thresh from the shock; head and stack or bind and stack and then thresh. In short, there is about as much labor required in cooking for the crew needed in any other method as there is in doing the entire job with the combine.

To sum up the advantages of the "combine" method of harvesting, we may enumerate them as follows:

1. It lessens the expense of harvesting and threshing. It is sufficiently accurate for the purposes of this paper to say that the running expenses of the combine amount to about one dollar per acre as against four dollars per acre by other methods.

2. It greatly reduces the number of men and horses required. Other methods in the wheat belt require armies of men from outside and more horses than are required for other farming operations. The combine requires little or no extra men or horses.

3. It simplifies financing the harvest, as it is unnecessary to borrow money to pay for men and teams. When the crop is ripe it may be sold as fast as cut, thus moving the crop faster than by other methods.

4. It saves the fertility of the soil by returning the straw,

evenly spread, to the land. It avoids the waste of ground by straw piles, which continue to increase in number year by year where the ordinary threshing machine is used.

5. It entirely disposes of the crop and clears the land at once so that it is immediately ready for the preparation and planting of the succeeding crop in good time for fall rains. I recall a case where a tractor that had pulled a combine, finishing the cutting in the forenoon, was put to work in the afternoon of that same day, disking and seeding the new crop.

6. It handles light crops at a minimum expense, netting a profit on yields that would not pay for harvesting by other methods. It allows wheat to be grown on land too poor or too dry to be otherwise profitable.

7. The combine makes the grain grower independent of outside help and enables him to handle larger acreage than he otherwise could.

Having duly considered the advantages, it is now proper to consider the objections. The usual ones urged are; (1) excessive waste; (2) wheat too damp to keep; (3) spreading weed seeds back onto the land, and (4) straw not available for stock.

With respect to waste, my investigations lead me to believe that waste in the thresher of a modern combine properly operated will not ordinarily exceed what has been termed the "unavoidable waste" of one-half of one per cent. On the other hand it avoids the great waste of other methods. The binder wastes some grain each time a bundle is tied and some is wasted each time-from three to seven-that bundle is handled thereafter. The header method also wastes in various ways. When the grain is shocked there is

waste around each shock, and when stacked there is more waste, especially at the tops and bottoms. In one case where a careful test was made to compare the heading and combine methods on a half section, the quarter cut with the combine showed a yield of three bushels per acre more than the quarter which was cut with the header and stacker. I feel that the item "waste" should appear in the list of advantages of the combine and not in the list of objections.

The second objection-damp wheat-is a somewhat more real one, but perhaps not unsurmountable. It has been claimed that the combine could not function in a rainy harvest, but there is now evidence to the contrary. In 1923 in some sections of the Southwest the rains started in about two weeks before the time for the usual beginning of the harvest and continued for several weeks. This so delayed the harvest, regardless of the method, that before much of the grain was cut the weeds had grown to a volume rivaling and sometimes greatly exceeding the volume of the wheat straw. Under such conditions stacking was out of the question, and bundle grain even rotted in the shock. Here the combine showed that it was equal to the occasion, for it went into fields that appeared to be all weeds and got the wheat. Of course, the wheat contained pieces of green weeds to an extent that would not let it be stored in bulk, but it certainly was easier to keep the comparatively small bulk of threshed wheat from spoiling than to try and preserve the entire crop of wheat straw and green weeds.

I feel that there is no damp wheat problem so far as the combine's ability to get the wheat out of the heads is concerned. The damp wheat problem begins where the combine leaves off. We know grain will keep in sacks, or spread on the ground, or if continually moved, when it will

not keep in bulk in the granary or elevator.

Many of you are familiar with the experiments made at Ripon, Wisconsin, in drying stacks of grain by passing air currents through them. It seems reasonable that very damp grain can be kept from spoiling by elevating it and allowing it to fall through a blast of air repeating the process as many times as may be necessary. It is at least conceivable that some means will be devised for drying wheat in granary and elevator. When this is done one of the largest obstacles in the way of the general adoption of the combine will have been overcome.

It has been stated that in some sections the grain does not ripen evenly enough to allow the use of the combine. This situation has been met to some extent in California by selecting varieties which will stand for some time after ripening without shattering, so that the green patches can ripen and all be in condition to "combine" at one time. We have seen many examples of the development of varieties or strains of grain to meet certain conditions. It is not quite possible to develop non-shattering varieties with straw stiff enough to carry it until the entire field is ripe. When this is done and the damp grain problem is solved, the combine's field at once is extended to include nearly all of the grain growing territory.

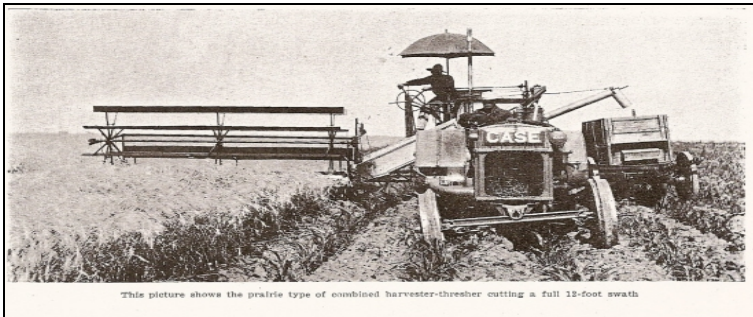
The third objection mentioned was the spreading of weed seeds. Although there is much to be said on both sides of this question it will be only briefly mentioned here. The bulk of the weed seeds are either too green to grow at the time the combine cuts them, or so ripe that they are already shattered, and the fact that the field is cleared at once allows disking to destroy those left in the stubble. The land on which combines have been used for several years does

not appear to be more foul with weeds than land harvested by other means.

The fourth objection, the straw from the combine not being available for stock, is not present in the territory growing grain exclusively, but becomes of great importance in the mixed farming districts. It can be partly met by equipping the combine with a straw dump and gathering up the straw afterwards.

In conclusion, I feel that (1) the use of the combine is not likely to become general in the immediate future, but it is quite certain to continue spreading to new fields; (2) that the engineers have the situation fairly well in hand so far as meeting present requirements are concerned and that as new requirements arise they will be met by the production of suitable machines, and (3) that at present more can be accomplished to aid this desirable method of harvesting by devising means of caring for damp grain and by developing varieties of grain suitable for its use.

In any event, we may rest assured that a machine which saves as much labor and expense as the combine does, will continue to be used in larger and ever larger numbers, regardless of a favorable or unfavorable attitude on our part.



This picture shows the prairie type of combined harvester-thresher cutting a full 12-foot swath

Discussion

Mr. Aspinwall : The Society is greatly indebted to Mr. MacGregor for the paper he has presented, because I know that it took a lot of work to prepare a paper of that kind. It is probably the first paper that has gone into details on the history of the development of the harvester-thresher, and it should be preserved by those interested in this line of machinery.

The cost of harvesting with the combine, considering present prices for labor and expense of all kinds, is about 5 cents a bushel, where the crop is average, as against 15 to 18 cents a bushel for the thresherman's charge alone for the regular thresher, to say nothing about the other work of cutting, handling, hauling, etc., and in the saving of grain you can figure about 10 per cent. If the crop is a 30-bushel crop it will save 3 bushels per acre over the old method of harvesting-about 10 per cent more of the crop will reach the sack through the harvester-thresher than it will in the case of the old method of harvesting and regular threshing. That has been proven time and time again, so that a combine should pay for itself in a short time. It will pay for itself in one year. if you cut enough acres; with the ordinary-sized farm it will pay for itself in a very short time. in the saving of the grain and expense in harvesting.

The use of the machine is spreading all the time. It started. of course. in California. They start the machine about the tenth of May in Southern California. and it is in continual use until about October. in the extreme Northwest. It is used extensively in Northern Texas (the Pan-Handle),

Kansas and Colorado. It has now worked its way into western Nebraska, and in time I am quite sure it will find its way into western South and North Dakota. as well as all the territory west from there. or wherever it is a semi-arid district. Whenever the grain really matures or nearly matures on the stalk it will eventually be used.

It is bound to come east too. Farmers are buying them who don't plan on using them every year. They use the harvester-thresher in the dry years. and in wet years they will use their binders or headers. We have a farmer in southwestern Missouri who uses one of those machines. He has a farm located on high ground; he bought the machine four years ago and has used it every year since. Those farmers who have land where the grain matures on the stalk, where the soil conditions are such that it maintains a good stand and ripens on the stalk, and they who are willing to wait and run the risk of storms, can harvest with the harvester-thresher seven years out of ten.



The Story of Pioneer J I Case Engineers.

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