The Story of the Pump, and Its Relatives

by Bernard M. Eubanks

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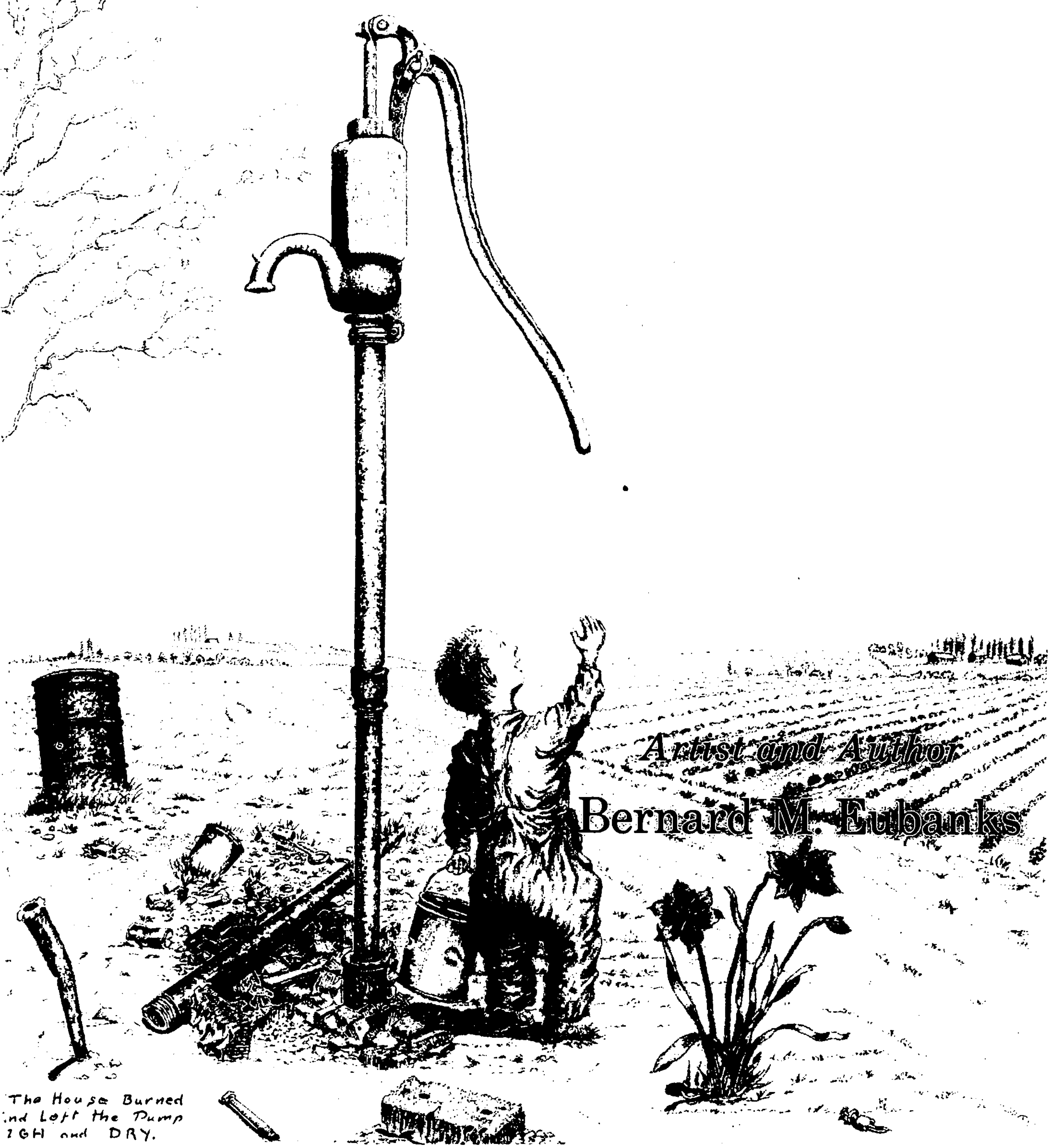

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BY BERNARD M. EUBANKS

Illustrated with drawings by the Author

a glimpse into the past.
by Bernard Eubanks.

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DEDICATION

I wish to dedicate this book to my wife Edith, who has so patiently put up with me during the almost endless hours and days of research, writing, seeking out old pumps and making the drawings.

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PREFACE

THIS IS A STORY OF WATER PUMPS

When I started it I had no idea of the magnitude of the subject, but once I got into it each interesting discovery led into another until I was completely absorbed.

A little research revealed that very little had been written about the almost forgotten hand water pump. I thought that something should be done about it. Now, more than ever, I had to find out about pumps. Wood pumps, iron pumps, any kind of old pumps. I found that there is no sharp line as to what constitutes a pump. The "line" is quite diffused and I have "broadened" it considerably to include a number of "interesting satellites" that seem to revolve around the pump.

Instead of being satisfied with the American hand pump, I became involved in the world wide history of water lifting devices. Over two years were spent in research and the subject is far from covered. In the process, I read quite a few very fine books and dug up a great many interesting and amazing "things".

I contacted one of the very old pump companies that was still in business. Sorry, they said; our records of the old company were destroyed in a fire years ago, and none of the firms personnel go back far enough to know any thing about it. Then I thought of The National Geographic; they know how to find out everything about every thing. No, they said, we have never done an article on pumps, sorry.

Then by accident, I got my first break. My son was interested in reading about, and making old furniture; antiques I guess. And there it was, in one of the library books he got right here at home. A whole chapter on wood pumps in England. Told all about how they were made, with drawings and everything. Even told how they bored holes lengthwise through the logs, and the kind of "borer" they used. Also what kind of trees they were made of and how long it took to make one.

At last I had a start. I had already made drawings of about 20 different models of old iron pumps, so I decided to see what I could find out about them. To my surprise, I found that several of the very old pump companies were still in business and that three of them were still making a few of the old iron hand water pumps in 1968, after being in the pump business for nearly 100 years.

So I began writing letters. I wrote to all of the pump companies I could get the addresses of; to several universities, libraries and historical societies around the country. The Smithsonian Institute and The Superintendant of Documents at Washington D.C. Most were very co-operative, sent me what information they had available and wished me luck in my project. Only a very few were not.

I spent a great many hours at the Oregon State Library, and looked through a lot of the old technical books, encyclopedias and old U.S. patent books. The patent office was destroyed by fire in 1836. A picture of probably the oldest pump on the patent records survived, but the written portion of the patent was destroyed in the fire. I have a picture of that pump. The patent office was again partially destroyed by fire in 1850. In all, 9,000 drawings, 7,000 models and 230 volumes were lost.

The results of my search? I obtained the histories of many of the old pump companies I had never even heard of. I got xerox copies of old records, catalogs, pictures, price lists and a few actual catalogs, not copies. Also I got references to books: some of which were written in foreign languages and not translated to English, or not available in this country.

One very old book on early mining methods in Europe was written in Latin by Georges Agricola in 1556. It was translated to English in 1910 by Herbert Hoover when he was a mining engineer at Stanford University. It gave the story of the huge wood pumps used in the mines in Europe hundreds of years ago.

I have written about pumps used in the old mining industry; in early water systems and sewer systems. Pumps made of bronze, wood and iron; windmill pumps, waterwheel pumps and hand pumps. Molasses pumps, screw pumps and lift pumps. Ancient, bellows and squeeze pumps. Pumps run by horses, oxen and camels. Rotary, reciprocating, siphon and ram pumps; pressure pumps, force, double-acting and single acting pumps. But when I came to the electric pumps, I quit.

The pictures in this book are drawings representing the history of pumps, and are an important part of this work. They represent over 1,000 hours of actual drawing time, as well as the endless hours it took to "accumulate" or seek out the subject.

SECTION I

WATER LIFTERS – OLD, OLDER, AND ANCIENT

Ancient Water Lifting Devices

The history of water lifting devices cannot be separated from the history of man and his societies because water has always been a prime necessity for his existence. Histories of societies were thus the best source of data for the study.

The first water getting gadget, of course, wasn't a real pump by any stretch of the imagination. It probably was a scoop of the hand, or a gourd on the end of a stick or vine. Some of the oldest water lifting devices on record are the scoop, noria, swape, picotah, tympanum, rope pump, hydraulic belt, shadoof, persian wheel, sakieh and some others. Most were in use 5,000 years or more ago, and some of them are still in use at the present time. When you read about pumps that go that far back in history, and read about "the wind-pump of China, used since time immemorial"[3], you get the feeling that it, the wind-pump, must really be the first one ever devised and used by man. And it may be. But other sources indicate that the 'bellows pump' is the oldest of all pumps.

However, I like to think that the 'chain pump' is the first water lifter to be called a pump. It also came from China, and believe it or not, was among the last hand water pumps cataloged for sale in this country.

THE CHAIN PUMP

The first chain pump consisted of a winch or windlass, an endless cord or rope with balls of hide or other material tied on at intervals, and pulled up through a cylinder of hollow bamboo, the lower end of which sets in a pond, pool or well. It was quite efficient and developed into a very valuable water lifter. It could be made in most any length/or size to fit the demand. The chain-pump was used extensively in ships for many, many years. One of our famous ships, the Independence, used the chain pump.

Some unbelievably huge ones were used in Europe 500 or more years ago to pump water out of mines. They are described in a book by Agricola and I will tell about them in another chapter; they are a story by themselves. The 'modern' chain pump that developed later for farm and home use is described along with the American pump.

A good many of the very old and crude water lifters continued in use for several thousand years with very little change; usually just enough to adapt it to its environment. Take the 'shadoof' for instance; its image, along with several others, is carved in stone on the walls of the huge and ancient tombs built by the Pharaohs.[5] Some of those carvings date back 5,000 or more years B.C., and many of those primitive water scoops are still in use in Asia and some other parts of the world, so they have been in constant use for a long, long time.

The shadoof consists of a long pole, pivoted in the center on a high upright support, and weighted with a counter balance on one end to offset the weight of the water in the vessel; a wicker basket lined with goat skin or some other material, which hangs on the end of a short cord. The shadoofs are all operated by manpower. They are used mostly along river banks and canals. As they lift water only 7 or 8 feet, sometimes several are needed to get the water to the top of the bank.

A traveler in Egypt about 1880 wrote, "The Nile is low, and the shadoofs were 3 deep, working day and night".[5] In 1890, another traveler wrote that the "shadoofs worked as many as 6 deep to lift water over the banks of the Nile".[11]

As of 1904 the shadoofs were still extensively used in Egypt, "myriads of them lining the banks of the Nile". Some of them were used in most countries of the world; even the United States and Mexico.[EA]

THE PERSIAN WHEEL

The history of this very ancient and interesting water lifting machine is a bit confusing. Its home seems to be in Egypt and yet it is called Persian. It may have been invented in Persia several thousand years before they ruled over Egypt in the 27th dynasty, or about 527 B.C. It certainly was in use in Egypt at least 2,000 years before that time.

The Noria, sakkia, sakieh, sagiya and some others are all referred to as the Persian Wheel. To me, the Persian wheel is the mechanical construction of the gearing system which operates the water lifters, whether it is the large noria wheel, with the baskets around the perimeter, the tympanum, the chain pump or the notorious "chain-o-pots".

Ritchie Calder's description of the Persian-wheel in 609 A.D.

"The so called Persian-Wheel, or sagiya, that is still in use in the middle east, is a familiar device for lifting water. A series of buckets attached to the perimeter of a vertical wheel, scooped up water and at the top of the turn, poured it into a sluice.

It was powered by animals, going round and round in circles, turning a toothed horizontal wheel that meshed with a toothed vertical wheel, that in turn, drove the bucket wheel. The mechanism thus depends on the invention of the gear wheel, which has been attributed probably wrong, to Archimedes, but which certainly dates to his time: 212 B.C."

Yes, he was wrong in giving Archimedes credit for the geared wheel, as it was in use more than 2,000 years before his time.

The famous Josephs Well is a good example of the Persian wheel. It is a chain-o-pots type water pump. I have described the well portion in the chapter on wells.

Volney Finch,[6] a professor of Mechanical Engineering at Stanford University, described it as the most interesting type of ancient water lifting device. He wrote that the best known pump of this kind is in Josephs Well in Cairo. It is supposed to have been built about 2500 years B.C. That is a long time ago. This device is a system of wooden gears, powered by oxen, camel or horses, whichever was available.

Josephs Well is 295 feet deep in two stages. The bottom well is 135 feet deep and the top well is 160 feet deep and offset. The top of the well is 18 to 24 feet wide at the top and tapers down. Oxen are taken to the winch at the top of the lower well by way of a spiral tunnel, dug round and round the well.

The chain-o-pots consists of an endless chain of some sort, with pots or buckets of various kinds attached to it at intervals. It works over a winch barrel with studs to prevent slipping.

It must have taken a mechanical genius to design and build it so it would work for so many years. The chain-o-pots would have to be around 300 feet long, and the weight, with the pots full of water, would be tremendous.

Here is another traveler's description of the 'Sakkieh'.

"Above Assaum, the palm groves are watered from reservoirs, filled (by sakkiehs) with water from the Nile. The sakkieh, or water wheel, is a primitive machine, consisting of 2 wheels, geared. The first set vertically to the river and slung with a chain-o-pots; the other, a horizontal cog, turned by a camel or buffalo. The pots go down empty and come up full. They are kept going perpetually. There were about 15 in a mile, and probably as many on the other bank."[5]

In this area, palm trees were used for much construction and many of these sakkias were made of palm. So many of these water lifters were used that a special group of craftsmen was employed to build them.

This description of a sakkia reads as if it were written by a woman, and so it was. The party was on the way up the Nile in a houseboat, or 'dehabeeya', in which they lived and usually tied up at the bank at night.

"The Sakkias creaked atrociously; their creaking over an unlimited gamut. From morn to dewey eve; from dewey eve till morn, they squeak, they squeal, they grind, they groan, they croak. Their melancoly chorous makes night hideous. Sleep was impossible; nor could we bribe the driver of one to cease till morn".[5]

The following is an interesting report from McCoan, who traveled in Egypt about 1890. It will give you some idea of the great number of water lifters used in that country. It does not include the many thousands of wells where water was drawn up by rope and bucket, nor the 'donkey-wells'.

"This supplemental or auxillary water system absorbs a large amount of human and animal labor. This consists of 3 primitive machines, called the Sakkia, or Persian-wheel, the shadoof and the 'taboot'. The first is the persian-wheel chain-o-pots. There are vast numbers all over the country which are used in wells filled with seepage from the Nile. The great cattle plague of 1864 swept away over half of the oxen and buffalo and compelled the abandonment of many of these machines. The persian-wheel was operated by one or two of these animals."

(The taboot is a variation of the sakkia, but raises water only a few feet.)

"As of 1890, the latest official return, reports the total number of sakkias at 30,084. That of shadoofs at 70,058 and taboots at 6,966. They were also using about 500 steam pumps. All of these engaged 60,000 animals and 150,000 men for about six months out of the year."[11]

Now, mind you, that was only the 'supplemental' water supply system. The main water for irrigation in Egypt came from over 8,000 miles of canals, filled by the overflow from the Nile during the high water period, starting the last of June and reaching its height in September.

Until this research, I had no idea of the vast amount of agriculture carried on in Egypt, nor the enormous number of water lifters in use there.

Some of those ancient water lifters found their way to England. Even as late as the 18th century, they were using a few of the persian-wheel type, with the large diameter wheel with the buckets around the perimeter. Some of them had the buckets attached with pivots, so the water was not dumped until the bucket was tripped by a pin at the extreme top of the turn.

THE BELLOWS PUMP

About the time we thought we had it all figured out which was the oldest pump and where it came from, we ran across this:

"The bellows pump is the oldest of all pumps. Originated at what time and by what people is unknown. It is supposed to be the outgrowth of the 'sucking tube'; when they tried to use the sucking tube too long and too big to draw by mouth, other means of 'sucking' had to be devised. Therefore, the scientists reason that the bellows pump was the next step toward a real pump."[3]

So the bellows pump is very old and was used continuously, like some of the other water lifters, for several thousand years. Even in the 1700's it was spoken of as being quite common in France and England. It was one of the pumps used extensively in the navies. One fault of this pump was that the bellows wore out quite easily and was hard to replace.

Probably I had better explain it a bit. The bellows pump didn't look much different, outwardly, than any other cylinder pump, except that the cylinder was quite a bit larger to accommodate the bellows. The bellows was used as a 'sucker' instead of the usual piston. The water was controlled by the usual type check valves. They could be made in most any required size. Some were very successful, others not. It was called 'the frictionless cylinder pump'. It was probably the forerunner of the vibrating diaphram pump. Most were hand pumps.

Some large bellows pumps, similar to the old bellows our old time blacksmiths used, were used to pump air in or out of mine shafts and tunnels. In 'Agricolas' mines the smaller ones were run by manpower and the big ones were operated by the Persian-wheel gear system, powered by horses.[1]

This chapter started to be about the ancient water lifters, and now it has come right down to our historical 'door step'. But that is the way it was with some of those things. They were ancient to start with, but were used continuously for so many years that they almost became 20th century modern. There were several reasons why so many of the old time water 'machines' remained in use so long. For one thing, they seemed to be adequate for their purpose and cheap labor. Other than human and animal power, there were waterwheels and windmills, but most of the small farmers couldn't afford to build them. (Steam power didn't become efficient until after 1800, and it was very expensive to install, also quite expensive to keep going on account of the scarcity of fuel.) So they just kept plodding along, century after century, with the shadoof, scoop, noria, paddle wheel and donkeys.

A certain historian, writing in 1841, was of the opinion that most of the hydraulic machines of the Assyrians, Babylonians, Persians and Egyptians have nearly all come down to us, and most of them have continued in use. Many have come through the Saracens, Romans, or Chinese. He also said, "That most of the water machines we have today, 1841, were identical to or modifications of those used by the 'ancients'." He also believed that a hundred years hence, or 1941, the present day pump would predominate over all others.[3] He must have meant the very efficient wood pumps which were plentiful at that time. The 'modern' cast iron pump was just then coming on the market. I guess electricity for pumps wasn't even thought of at that time.

I must mention a few more of the 'ancient' ones. They were too numerous to find out about all of them. Any conceivable method man could think of to cause suction or raise water was thought of and tried. The body, or barrel of the pump has been made in many shapes: cylinder, triangle, square and oval. Pumps have been made of wood, metal, glass and stoneware, even leather, canvas and goat skin. Some made like a bag, bellows, accordion or tube. You name it, it has been tried.

THE SCREW PUMP

The Arcamedian Screw is worthy of description, as it served an important place among water lifters. It was one of the kinds used in ships to pump the surplus water out. It seems that a bilge pump was as important to a ship, to get water out, as water was to a person. With too much water a ship could not survive, any more than a person could get along with too little.

A scientist and inventor by the name of Archimedes who lived from 287 to 212 B.C. is credited with the invention of "The endless screw to pump water out of ships." [21-3]

It consists of a spiral screw, built around a long round core. It was laid out very scientifically and geometrically so the degree of spiral was just right and continuous the full length of the core. It could be made in any desired length or size, as needed. The screw part was built up gradually on prescribed lines till it was the necessary diameter to fit in a previously built cylinder. The screw revolved in the cylinder and the water was forced to follow the spirals up to the top and out. Small ones were powered by hand, larger ones by animals or wind-mills. A few were used in Holland with their wind-mills. [21-3]

Ordinarily the 'screw' shouldn't be put in with the 'ancient' water lifters. The reason I am doing so is that I think Archimedes got his idea from the Egyptian screw, called 'cochleon'. It dates back to ancient. It was a very simple gadget, consisting of a tube wrapped spirally around a long tapered core. The difference was that the Egyptians used a hollow tube made of lead, hide, or leather, instead of a screw, and did not need a cylinder to run it through. Its largest diameter was at the bottom and was so arranged that as it was turned, the water entered the tube at the bottom, and was carried to the outlet at the top.

Although the water was carried up, it was running down all the time. Now you figure that one out. They did. The 'screws' were all operated at an angle, not perpendicular.

Another water lifter, an all-time favorite over a large part of the world, was the oxen or donkey, pulley, and bucket. It consisted simply of a rope through a pulley suspended over the well. A camel, oxen or donkey is hitched to one end of the rope and the bucket on the other. The patient animal walks away from the well to pull the bucket of water up which is emptied by an attendant, then reverses its steps to let the bucket back down again.

"Many a donkey has spent his entire lifetime, drawing water inflated goat skins from wells." [23]

THE SQUEEZE TUBE[3]

As I said before, every possible method men could think of to transfer water was thought of and tried. Now take the 'squeeze tube' for instance; called a 'compressable tubular'. It was a simple compressible tube with a check valve in the end which sets in the water. It had a paddle or board hinged to the lower end of the tube, so when it is depressed the water is squeezed up through the tube and out the nozzle at the upper end, just like a tube of extra soft tooth paste. It sits on a slant to operate and lifts water only a few feet. It didn't amount to much. Someone tried to get a patent for one in 1851 but was turned down 'for lack of novelty.'

The hollow log pump is another old timer still used in Asia and probably some other parts of the world. It is a member of the 'scoop family'. The main part is a log 15 to 30 feet long, hollowed out like a dug-out canoe with one end left open so the water can run out. The upper end rests in a drain ditch to receive the water, and the other end is lowered to dip in the pool or river. When loaded, it is raised by one or two men, assisted by a weight on one end of a counter balanced, pivoted pole.[B] It is a wonderful exerciser for the men working in shifts. Many a rice paddy is still watered by this crude method. (You will find a sketch of one in the pump drawings.)

ANCIENT WATER LIFTERS IN MINES

In the earliest days of mining, one of their greatest problems was water; whether it was lead, coal, iron or any other substance they were mining, the water had to be gotten out of the way. They used the best methods they could think of to make out of the materials they had to work with.

In 1556, Geog. Agricola wrote a book on minerals and mining in Europe. It was written in Latin and translated to English by Herbert Hoover in 1910 when he was a mining engineer at Stanford University. In this book he described the water lifters they were using and had been for hundreds of years. Those same type machines continued in use more than 200 years after his time, or until replaced by the 'steam age'.

The miners looked forward to steam pumps with great eagerness, but the first ones were cumbersome, expensive and inefficient; some of the miners were disappointed and turned back to the old methods.

Following is a description of one of the 'chain pumps' as Pryce knew it in 1778, which is more than 200 years after Agricola's time. I will tell about his amazing machines later.

"With all the adroitness of our miners, they cannot go to any considerable distance below the 'adits' before they must recourse to some contrivance for cleaning the water from their workings. During this period (1778) the rag and chain pump was not wholly discontinued, although it was falling into disfavor on account of the great expense and heavy labor involved."

According to Pryce, the rag and chain consisted of an iron chain with 'knobs of cloth,' stiffened and fenced with iron, seldom more than nine feet asunder. The chain is turned round by a wheel 2 to 3 feet in diameter, with iron spikes to enclose and keep steady the chain so that it may rise through a wooden pump 3, 4 or 5 inch bore, and from 12 to 22 feet long, and by means of the knobs, bring up with it a stream of water. These pumps, mounted on timbers across the shaft, were set in series down it, each lifting water from and to a wooden box or sump, also fitted to the side of the shaft. [19]

"The pumps were worked by manual labor, and the work was so hard that it was the cause of many deaths."

The "Pryce" system used a number of small one- or two-man pumps, one above the other in deep mines. Agricola used very long lifts, as much as 240 feet, and powered machinery. It doesn't seem possible to me that they could assemble a bored log cylinder 240 feet long and suspend it in a mine shaft. Nor to make an iron chain twice that length, to reach down and back up through the pump tube. That is quite a feat. But to use several of them in series, to go down several hundred feet, seems to me like someone's pipe dream. However, Agricola is recognized as an authority, so we will have to accept it as a wonderful accomplishment, even with 'tongue-in-cheek'.

Here is the description of another such installation.

"In Cooks Kitchen Mine, in Cornwall, a 48 foot water wheel worked three tiers of pumps of 9-inch bore. There were 4 lifts raising the water 480 feet to an 'adit', or tunnel, so it could run out by gravity." [19]

It is hard to visualize the size of this simply stated operation. A 48 foot water wheel is a pretty big one and it took a lot of water to operate it. The pumps were set at 3 levels, and the bottom one must have been near the 480 foot depth to reach the water and 'push' it up to the next pump. That is pretty deep to install wooden pumps when EACH ONE WAS CONNECTED TO THE CRANK-SHAFT ON THE WATER WHEEL AT THE SURFACE. You have to ponder a bit to realize the size of this operation, and the tremendous job to install it and keep it going.

I have some which are more complicated than that to tell you about.

AGRICOLA'S PUMPS

In describing some of Agricola's water lifters, I will try to condense his descriptions, as they are lengthy and go into much detail as if he expected you to build one.

"Where there is no water power to operate the pumps, they use the 'Persian-wheel' gear system operated by horses."

"First, they dig a chamber and erect strong timbers to keep the sides from falling in – the roof of the chamber is protected with contiguous timbers, so arranged that the horses that pull the machine can travel over it. Next they set up 16 beams, 40 feet long, and spread at the bottom, creating a circular 50 feet in diameter, tied together with timbers. Through an opening in the center of this area, there descends a vertical axle 45 feet long, which rests on and revolves in, a block laid flat on the ground. On this axle, a foot above the ground, there is fitted a horizontal wooden wheel 22 feet in diameter, with wooden teeth or gears. These teeth are arranged to mesh with and turn a second geared wheel on a horizontal axle, to which is attached a drum, over which the chain for the pump operates."

"This machine, which draws water from a shaft 240 feet deep, is powered by 32 horses; 8 of which work for 4 hours and rest for 12 hours, and the same number take their place. This kind of machine was employed at the foot of the Harz Mountains."[1]

"Further, if necessity arrives, several pumps of this kind are built for the purpose of mining one vein. At Chemnitz, in the Carpathian Mountains, there is a mine using three sets of these pumps, the lowest of which lifts water from the lowest pump to the first drains, from which it flows to the second pump, and so on until it flows away at the top.

This system of three machines of this kind is turned by 96 horses. The horses go down to the two lower machines by way of an inclined shaft that twists and turns like a screw as it gradually descends. The lowest of these machines is set in a deep place, which is 'distant from the surface of the ground, 660 feet'. [33] End of quote.[1]

One historian said that 'Josephs Well', elsewhere described, was the greatest feat of its kind ever achieved by man. I wonder if he had ever read of these huge mining operations of the 15th and 16th centuries. Of course, Josephs Well was constructed several thousand years earlier than these mine pumps.[3]

The above described horse-powered, wooden geared machines, also operated their big chain pumps and Egyptian 'chain-o-pots'. Instead of drawing the 'chain' up through the hollow log, a series of buckets was attached to it and it was drawn over a drum, which was so arranged that the chain wouldn't slip.

In another, the machine drew up huge buckets, some made of wood and some made of 'hide'. They must have been pretty large, as it took from 2 to two and a half ox hides to make a bucket. With this kind, ore and rock, as well as water was drawn out of the shaft.[1]

Wooden suction pumps, about the same as were used in 'Cooks Kitchen Mine', were also described by Agricola as "one of the principal water lifters used in the mining industry." For large volume, multiple pumps were used, powered by the geared wheels and using horses or water power. Some deep mines used several 'levels' of this kind of pumps.[1] I won't mention the number of horses he said were used in one of these mines, as it really is unbelievable.

Of course, they used a lot of one and two man log pumps, even some using dogs or men in tread mills.

About this time some one (it was described by Agricola) designed a unique 'box-force-pump'. It consisted of an air and water tight box with two well pipes extending up into it. A crank shaft goes through the box to operate two pistons that fit into the well pipes. On the end of the crank-shaft extending from the box is fitted a handle to be turned by hand. A counter balance weight is also attached to the shaft to assist in turning. At the top of this air tight box there extends a single pipe to exit the water. Through this one smaller pipe the water is expelled with considerable force, making it a *pressurized force pump.*[1] It was an excellent type small force pump for that time, about 1550, but I have not read of it being developed further.

Now that we have come to the bored log pump period, this should be a good place to tell about the domestic wood pump of England, which is the immediate forerunner of our own pump industry. I'm afraid our own hand pump story is going to sound pretty tame and insignificant after what we have been reading.

The civilized period of England started much later than that of the Middle East and of the Orient, whose bronze period began more than 3500 years B.C. (they mined iron about the same time). In England, the use of bronze began some 2000 years later, and it was about 400 B.C. before they started mining and using iron. Those metals remained scarce and expensive until the steam engine came along, so they made as many things as they could out of wood. That included pumps.

The first real pumps in England were probably made by the Romans when they ruled over England from 43 A.D. through the next four centuries. The pumps were made by boring holes lengthwise through logs and putting in a plunger, or lift-bucket, and adding a handle and spout. Some of the old augers and bits they used for boring have been found, and are in museums. They were made of iron.

THE ENGLISH WOOD PUMP

Here is the story of the English pump as described by Mr. Rose in a book he wrote in 1926.[22]

His family, and his grandparents, and many previous generations were pump makers, and the skill was handed down from father to son for 'centuries'. They were so well made that the designs and styles were changed very little in all of that time.

When an order for a pump was received, the men would go out to the wood lot and select a tree. It was cut and hauled to the shop in a wagon made especially for the purpose. Elm trees were used and they had to be just about a certain size. The pumps were usually made in 10 foot sections. The top section was squared to 10 inches at the top and tapered to 12 inches at the bottom. The next section was tapered from 12 inches to 14 inches. Wells much over twenty feet required three or more sections, and two "clack valves" were used instead of one.

The boring was done with special augers which they had developed from years of experience. They could bore the length of a ten or twelve foot log with amazing accuracy. The logs were first bored with a 2 inch hole, then the top log, which was the pumping cylinder, was reamed out to 5 inches.

They used several types, or shapes and sizes of augurs. Some short 'pod bits' for small and fairly short holes, and various shapes and sizes of reamers. Some large reamers had a hook on the end so a cord could be attached to give 'pulling power'. Others had sort of a cup or twisted end to draw shavings out.

The important one for boring 'pump holes' in long logs was two inches in diameter, and about a foot long, made like a cylinder with one side cut away. One end was tapered and twisted to a sharp point exactly in the center. One long edge or side, was sharpened for the cutting edge. When this augur bit was started straight, it maintained a true course the entire length of the log.

The 'lift bucket' or plunger was made of wood (white oak) with leather skirting and a valve. It was so well designed that it was still used in many of the pumps in this country.

A bulge was left at the top of the first section for some decorating carving and the handle hinge. A tapered hole was bored at the proper height on one side to put the spout. The spout was made a bit fancy, with an iron ring and an iron brace. The handle was sometimes made of wood and sometimes of iron, with an iron ball on the end. The hole on top was plugged with a decorative cap.

The sections were joined together with a tapered, or cone joint with a shoulder, and sealed with tallow. The men making these pumps were excellent craftsmen who took great pride in their work. It was a week's job for two men to make and install one of these pumps. They worked ten hours a day and six days a week. (That was before the days of the pickup and camper.)

The wood for the pumps was not seasoned, but made up green. They claimed they would not split or crack, as the center was bored out and they were put right in the well and were always wet.

"The manufacture of 'the Rose Pump' came 'to a trickle' with the advent of the 'lead and iron pumps' about 1880." By that time there must have been a great many pump factories in England, the same as in our country, as their population was considerable, and they got a lot of their water from wells. While the old wood pump was very efficient, it was heavy, cumbersome and hard to store. Therefore, the iron pump gradually replaced the wood. By this time, many municipal water systems were in use, which, along with the electric pump, eventually put an end to most of the old hand pumps.

THE SIPHON PUMP

You may wonder why I am including a chapter about the siphon in a book on pumps.

I am doing so for several reasons, which are obvious if you happen to know the fundamentals of this apparently simple piece of bent tubing.

First, if you look up the definition of pump, you will find that the siphon is definitely included and involved. In the times of both Gallileo and Heron, who lived about 1800 years apart, pumps were quite often referred to as siphons, and in many instances a siphon meant a pump, or even a fire engine. One wouldn't get very far writing about the history of pumps if he tried to avoid the siphon.

Heron was the principal writer on the siphon. The experiments and treatise on the siphon by him seem simple and of little importance. Actually, they are the forerunner of the steam engine, the fire engine and many other things where hydraulics and pneumatics are concerned, which greatly involves pumps.

It took a lot of clever and intelligent thinking to discover and solve the complicated action involved with it. I don't think the 'ancients' ever did solve it; they just put up with it and used it. The siphon merged right into the vacuum, air pressure and, of course, gravity. The siphon, like the pump, involves three basic natural phenomena: air-pressure, vacuum and gravity. Without the cooperation of all three, it would not work.

But it did work, sort of perpetual motion like, without any assistance, as long as the water lasts, and something didn't break 'the column of vacuum'. The air-pressure was always there to do its part, and so was the gravity.

It seems strange that the 'ancients' used this very simple gadget for so many centuries without really knowing why it worked. It was just magic, sort of, and a favorite toy of those venerable old mystics.

Some historians think they did know the 'principle on which the siphon works', else how could they have used it in so many ways as they did.

However, a couple of thousand years later, by Gallileo's time, a lot could have been forgotten, and in the 17th century, the mysteries of the siphon and vacuum had not yet been solved.

Heron said the siphon was not only used by the Ptolomies, who ruled in Egypt from 300 B.C. to about 1 B.C., but was common in the time of the Pharaohs as well, which really goes back in history.[8]

Heron also said that his writings were an accumulation of things of the ancients of his time. Anyway, the siphon is of unknown origin, which doesn't help much in pinning down the date of the first pump.

I will mention just a few of the interesting gadgets the 'ancients' used and experimented with. The Clergy, Priests, Witch-doctors, magicians, or whatever they were called at that time, used many of those gadgets to 'mystify their superstitious subjects', while the scientists were intent on scientific research.

The 'Mystics' could cause a creaky door to open or close at the wave of a hand, a fountain to flow or cease, birds to sing, or a fire to be quenched. Out of a goblet they could pour either wine or water at will. There was hardly any limit to the mystifying things they could do with the siphon. And they were all so very simple when you knew how they worked.

Most of the experimental siphons and vessels they used were made of glass. That isn't surprising, as glass working was practiced by the Egyptians at a very early period, many years before the exodus.

Glass could be made in most any shape or size, and was used extensively in siphons, PUMPS, etc. Yes, of course, they had pumps before Heron's time. Didn't Ctesibius 'invent' the pump in 275 B.C.? They used small glass pumps with check valves, plunger and all, fused into glass vessels, to put compressed air in with the water, so it, the water, could be emitted in a steady stream. A pressure pump?

The Ancients siphoned water over hills, from one valley to another. The hills must have been pretty low ones, as a siphon would not, and still won't, lift water any higher than 'any other pump'. Besides, the siphon has to discharge its water 'lower' than where it is taken in.[21]

I read where an attempt was made to take water out at the top of the siphon cycle, by the principle of the ram, and that it was partly successful. I couldn't see how it could work at all so I wrote to an engineering professor at a prominent engineering university. He gave me an intelligent and common sense answer: that water taken from near the crown of a siphon cycle, to operate a ram, would entail all kinds of practical and theoretical difficulties, but might not be impossible. On the other hand, water taken near the lower end of the discharge leg would operate a conventional ram.

I have illustrated and described the hydraulic ram elsewhere.

The water is 'sucked' up by vacuum and pulled out by gravity? Well, yes, in a way; but the gravity has to work first – to provide the vacuum; and the water isn't 'sucked' up into the vacuum, as was the belief, even as late as the 17th century. The water is 'pushed' up to fill the vacuum by that ever-persistent air-pressure. Then, of course, the gravity pulls the water on out. From then on the water column remains constant, as long as the air-pressure does the pushing, and the gravity keeps on pulling. Simple, isn't it? Or had you ever given it a thought?

The following experiment with the siphon was by Gallileo about 1640. It was conducted to help solve the problem of air-pressure and the vacuum.[15]

A siphon led over a hill 21 meters high and failed to work. It was filled with water and when unstopped at one end, the water in that end dropped to within 10 meters of the pool. When the other end was unstopped the water dropped about the same. It had Gallileo perplexed, but he credited it to the vacuum. He thought that when a certain height was reached, about 18 el (an el is .54 of a meter) the water column simply broke off, like a rope with too heavy a weight attached. He did not understand that it was the pressure of the air that held the water up.

Gallileo died about that time without solving the problem. The later scientists couldn't understand why he didn't get the 'simple fact', as he was one of the most brilliant scientists of the time.

Torrecelli was also a brilliant scientist and he carried on with some of Gallileo's studies. He is the one who finally proved that 'air-pressure' was the power that 'pushed' water up into a vacuum. That it wasn't magic after all, nor some other 'invisible something'. This brought loud objections and disagreement from his critics. He also had many backers and the air-pressure theory was soon adopted. Of course there were a lot of skeptics and hard-heads who claimed he was wrong even a hundred years later.

Torrecelli died only a couple of years after Gallileo, without establishing the actual weight of air-pressure. It was about another one hundred years before someone finally figured it out.

Here I am, getting into air-pressure and the vacuum, when I am supposed to be writing about the siphon at this time. But they just seem to fuse together, the same as they do with pumps.

Heron knew there was a vacuum and went to great lengths to prove it. He also knew the limit to which water could be lifted with it was about 30 feet. The 'Mystics' many centuries before him must have also known, as they used the siphon in their experiments of magic-deception.

After Heron's time, we don't hear much about the siphon or vacuum until Gallileo's time, or in the 1600's. That is the period when scientific research was at its height. Why the lapse of over 1600 years is sort of a mystery. It probably was during the period when 'people were kept in ignorance', and very few people outside of the church had an education; at least there was a tremendous 'communication gap'. Besides, there was considerable censorship of books, and in some countries, people had to be careful what they thought, let alone what they said or wrote.

Gallileo himself was 'severely disciplined' for his beliefs and writings. Other scientists of his time were 'reminded of a worse fate' if they followed the wrong line of scientific thinking. The Church was just about omnipotent at that time and even tried to control men's thought. [15]

In Gallileo's time, and for a great many centuries previous, it was as hard for a Jesuit to believe in the vacuum as it is for a scientific man in our time to believe in the physical reality of the rope trick.

The siphon naturally leads to the vacuum and air pressure, which was probably the most controversial mystery that confronted the scientists and philosophers for many hundreds of years. It seems to have come to a head in the 17th century, when they were trying to 'invent' the barometer. The vacuum and air pressure were the main stumbling blocks. Mercury was also an ingredient, which Gallileo suggested they use. [15]

I will have to include a few of the interesting experiments they used in trying to eliminate the mysteries attached to the siphon, air-pressure and vacuum. In our day, we take those phenomena for granted, but they really baffled the scientists of old.

Our main interest in the vacuum and air-pressure is their connection with the pump. And, believe it or not, like in the siphon, air-pressure and vacuum are two ingredients necessary to make it work. In fact, the pump, in a way, isn't much different than the siphon. As long as the pump keeps working to create a vacuum it works. If an air leak gets in to break the 'water column', or vacuum, the action ceases, and the pump refuses to bring up water.

Gallileo drew a sketch of a cylinder with a piston and demonstrated how water, in the cylinder, above the piston, was held up by a vacuum but dropped out when the vacuum was released. He also showed how much weight must be added to the piston before 'the water column' parted, or broke the vacuum. It still didn't occur to him that it was the pressure of the air that held the piston and water up in the cylinder.

Even in Gallileo's time, as in our own, brilliant men were stupid at times. They had to have simple and obvious facts pounded into their heads. (Some of the most brilliant men of our own time have made very stupid decisions concerning the good of our country. Do I need name a few?)

The following is part of a conversation between Gallileo and a fellow scientist taken from *The Two Sciences of Gallileo.*

"I have now learned the cause of a certain effect I have long wondered at and despaired of understanding. I once saw a cistern that was provided with a pump, under the mistaken impression that the water might be drawn with less effort or in greater quantity than by means of the ordinary bucket. The stock of the pump carried the 'sucker' (lift bucket) and valve in the upper part so the water was lifted by attraction, and not by push, as is the case with pumps in which the sucker is placed lower down. This pump worked perfectly as long as the water in the cistern stood above a certain level, but below this level, the pump failed to work. When I first noticed this phenomenon, I thought the machine out of order; but the workman whom I called to repair it told me the defect was not in the pump but in the water, which had fallen too low to be raised to such a height, and he added that it was not possible, either by pump or any other machine working on the principle of attraction to lift water a hair's breadth above 18 cubits; whether the pump be large or small, this is the extreme limit of lift."

That statement by Gallileo is proof that both lift and force pumps were in common use in the 17th century, and that they had pump repairmen to service them.

Gallileo continues:

"Up to this time I had been so thoughtless that, although I knew that a rope or rod of iron, if sufficiently long, would break of its own weight when held by its upper end, and it never occurred to me that the same thing would happen only more easily to a column of water. And, really, is not that thing which is attracted in a pump, a column of water, attached at the upper end, and stretched more and more, until finally a point is reached where it breaks, like a rope, on account of its excessive weight?"

"That is precisely how it works; this fixed elevation of 18 cubits is true for any quantity of water whatsoever, be the pump large or small, or even as fine as a straw. We may therefore say, by weighing the water contained in a tube, no matter what the diameter, we shall obtain the value of resistance of the vacuum in a cylinder of any solid material having a bore of this same diameter". (18 el, or cubits, is about 31½ feet.)

Von Guericke, a German scientist, was another man trying to solve those things of mystery. In 1654 he came up with the 'air-pump', and is given credit for inventing it. Boyle and Hooke improved it. The pump action was well known at that time, and I think Von Guericke only adapted it to 'pump air out of vessels', in order to create a more complete vacuum. Up to that time, in order to cause a vacuum in a barometer tube, for instance, the tube was filled with mercury and a finger held over the open end until it could be inverted, and the open end put in a vessel of mercury. When the mercury settled, the empty space left in the tube above the mercury was the vacuum. The air-pressure involved to push the mercury up constitutes the 'pressure of air'.

By the way, the 'air-pump' was considered one of the four most important inventions of the 17th century, the other three being the telescope, microscope and, of all things, the pendulum clock.

What about gravity? This same group of scientists was also plagued with the gravity problem. Newton came along a little later with his 'laws of gravity'. No, he did not see an apple fall and discover gravity. A lot had been known about it for several hundred years. Newton's mathematical brain used geometrics and figured out the 'laws of gravity scientifically.'

Having now given my excuse, or reason, for side-stepping into the interesting fringes of the siphon, vacuum, air-pressure and gravity, I will take leave of the subject, that is as far as pumps will permit me.

Torrecelli said, "It was much more fatiguing to get a book through the press than to write it". Many of his fellow writers agreed with him.

(I hope that isn't my fate. Writing is tough enough.)

WELL – WELL – WELL

This doesn't sound like a very interesting or romantic subject to write about but being closely related to pumps, it would be a grave omission not to include them. For what is the sense of making all of those pumps unless there were wells in which to use them? And the wells wouldn't be of much use either without the water lifting gadgets. Besides, from what I have been reading, I'm not sure but that the wells are not the greater achievement of the two. There must have been a very desperate need of water for the people of ancient times to dig wells 300 and 400 feet deep, many of them through rock, with the crude tools they had to use in their time.

To most people, a well is just a hole in the ground where our grandparents got water. Well, that's right, of course. It's also where their grandparents, and many previous generations, obtained water for domestic and farm use. That includes a large share of the many millions of people who ever lived, which goes back to the earliest of human beings. I don't think they ever made enough pumps to go around.

There have been thousands of wells dug – hundreds of thousands; yes, millions of wells have been dug during the life of man on this earth. Even the most ancient of people could not get along without water, and a good many of them have died when they could not get water when they needed it. Thousands more have died when they got too much when they didn't want it.

Very few of the people who have written about their travels in foreign countries have much to say about the wells. If they are mentioned at all they are usually passed over as of little importance. However, by reading and research, a little at a time, a lot of interesting facts and stories are learned about wells.

If properly searched out and written up, it would make a large and interesting book.

Many a romance has started when two young people met at the town well to draw water. Isaac met Rebecca 'by way of the well'. It became one of the famous wells of history, "Jacob's Well'. Also, that's where Jesus 'met the woman of Samaria'.

Jacob's Well is located halfway between Jerusalem and Nazareth. It was originally dug 150 feet deep, through solid rock and was 9 feet across. Ewbank wrote in 1841 that Jacob's Well was 109 feet deep.[3]

As of 1906, it was "filled with debris until only 75 feet deep and no longer usable." [EA] And by 1947, it had apparently been cleaned out and restored, as this statement in the National Geographic would indicate: "A Greek Orthodox Church is built over the well and shelters it", and "A Monk lowers a candle to show the depth of the well". [23]

Nearly all of the millions of wells used some kind of water lifter. Jacob's Well used a windlass, with a rope or chain and a bucket.

According to Ewbank, the Romans "dug wells in every city they conquered." That was a lot of cities and a very large number of wells. The Roman Empire was founded by Romulus about 800 B.C., and over a span of over 1200 years, its influence was extended to a lot of cities and people. While they were in France they dug a well that became known as "the Saints Well" because the Romans used it to "throw martyrs in."

A historian said, "Joseph's Well is the most remarkable thing of its kind ever to be made by man." It is located in the Citadel high on a bluff overlooking Cairo, Egypt. This citadel is in the western end of the Mocottom Range.

The well is supposed to have been built about 5000 years ago or about the time Pharaoh Menes was said to have founded Memphis, later known as Cairo. The three great pyramids were built about the same time.

I also read from another source that Mene's dynasty was guessed at as being from 5000 to 3623 B.C., and that Memphis was founded in the third dynasty, or about 4449 B.C., and that the great pyramid was built about 3300 B.C.[5]

Whichever it was, that was a long time ago and if Joseph's Well water works was really built at that time, it was indeed a wonderful achievement.

I have read about Joseph's Well in several different technical works and other writings. Volney Finch, in my estimation, gave the most interesting version and description of it.[6]

Joseph's Well uses the Persian Wheel type of water lifter, with the loose toothed wooden gears, and the 'chain-o-pots'. It is described more fully in the chapter on Ancient Water Lifters.

In China there are many wells of large dimension, and some are as deep as 1800 feet. Some of them are even lined with marble.

When they dug those very deep wells they needed some way to get out the dirt and rock when digging, and also the water to use when the well was finished. So a very clever Chinese (they were the world's most clever people) designed the 'Fusee', and at the same time invented the windlass. And some careless historian thought that Archimedes invented it about 325 B.C.

Do you know what a FUSEE is? You do? You're wrong; it is not the lighting end on a Chinese fire-cracker. The fusee is nothing more or less than a long, tapered windlass. That tapered part did the trick. Like so many of our most notable inventions, it is so simple the inventor often feels stupid for not thinking of it sooner.

(The fusee was also used in ancient clock works.)

You can readily see how it works. The rope is wound on the small end of the drum when the rope or chain is extended to the bottom of the well where the weight of the load plus that of the long rope is greatest. As the crank is turned and the load drawn up, the rope works toward the large end of the drum where the leverage is less, but the weight is also less, and the speed of haul-up is greatly increased.

The reason for not using a small diameter drum, not tapered, is because of the haul-up speed. To wind up a bucket of water from 1800 feet down using a 4-inch windlass would be a pretty slow job. (I wonder how the 'ancients' made strong rope that long, and what it was made of.)

From 1800 feet down in the earth certainly is a long way to draw or pull up a workman, a bucket of earth or a pail of water. That brings a question to my mind. How large or strong must a chain or rope be to bring up, say, 200 pounds of weight?

Gallileo's cronies or contemporaries, about 1640, agreed that any kind of chain or cord would break of its own weight if suspended far enough. Also, that a cord of 2 inches in diameter would not extend a bit farther, or longer, without breaking of its own weight than one a quarter inch or even one of one-eighth inch (made of the same material, of course).[15]

So there would be no object in using a rope any larger or stronger than is necessary to support its own weight of 1800 feet plus the load weight of 200 pounds, and a few pounds of 'safety leeway'.

Any cord larger than necessary would only add to the already heavy load to 'fusee up'. How people ever made cord that long and strong 3000 years and more ago is a bit amazing to me. The ancient Chinese apparently had very good scientific minds in order to figure some of those things out. By 'trial and error', do you suppose?

In Paris, in the 1840's, the people were seven years in digging a well 1800 feet deep. They hit artesian pressure and got lots of water, which shot about 120 feet into the air.

About twenty years later they dug another well of 1920 feet and also got lots of water in it, too. It also must have been artesian, but the article didn't say.

Here are some interesting 'tid-bits' about wells I will merely mention. They are mostly quotes from books and articles written by travelers and historians, and show the kind of comment usually made about wells.

Numerous wells of extreme antiquity are still to be seen in Egypt.

Many wells were left flush with the ground to conceal them from their enemies.

In the lower Mississippi Valley, ancient wells have been discovered that date back before the time of the Indians.[23] (I wonder what kind of pumps they used?)

In 1868, in Absynnia, the British army used 'tube wells' one to three inches in diameter, 'driven' not more than 1800 feet deep.

The article did not say whether or not they were artesian. If they were, there was no problem. If the water had to be pumped, they did have problems.

Cast iron pumps were in use at that time that would lift water up to 300 feet. But 1800 feet is a different story.

The water contained in 1800 feet of 3-inch well pipe, at 3 plus pounds per foot, is about 5400 pounds. When added to 1800 feet of ¾-inch pump rod at one and one-half pounds a foot, comes up to over 8000 pounds to pump out of the well. At a 1-to-10 handle leverage ratio, well, 800 pounds is still a lot of pumping weight to contend with. I guess I'm not scientist enough to figure it out. They must have been artesian wells.

When Britain took over Hindustan, about 1800, there were 50,000 wells in one district. If one ventured out at night, he ran a good chance of falling into one [3]

"Armies on the march, dug lots of wells". In 885 B.C., the Assyrian, Tukula Ninutri the 11, dug 470 wells in the dry bed of the Tartara River. The river had gone underground and water was close to the surface.

In some of the dry climates (and other places) water was sold as a commodity.

Each person going to a well to draw water took his own rope and bucket.

"There were many fine wells in Pompeii, one in every house".

"Wars have been won and lost on account of water".

I read that in ancient Greece wells were very numerous and that, in the opinion of the Ancient Greeks, wells, and the device to raise water from them, were among the first inventions.

Does Pliny (52 A.D.) disagree with the above statement? According to him "previous to the arrival of the Egyptians in Greece, they (the Greeks) were unacquainted with wells and pumps".

This is probably a good place to tell about "the Wells of Argus". I have been unable to find out a great deal about those famous wells except that they were dug by Danus in 1485 B.C. Danus was a brother of Ramsees the 2nd, who was ruler of Egypt at that time and reigned during the period the Israelites were in Egypt.

The wells of Argus are located on the coast of Meloponesus. Pliny figured that the Egyptian chain-o-pots were used as pumps because "the Greeks were unacquainted with wells and pumps before the arrival of the Egyptians".[EA]

I think Pliny was probably wrong in saying that the Greeks didn't know about such things at that time. But I guess the historical record will have to speak for itself.

I don't know where Ewbank, writing in 1841, got his information but he wrote: "When the discovery of metals, which took place in the 7th generation from the first pair, according to Moses, the depth of wells could no longer be arrested by rock. And that there were wells dug through solid rock before the commencement of history".

"Some of the wells were very deep and they had adequate methods of getting the water."

"In the ancient middle east lands, water was the most necessary thing for their existence. Therefore, in no other parts of the world, even in modern times (1850) has more science been evinced, or mechanical skill been displayed in penetrating the earth, than is exhibited in some of the ancient wells of the East".[3]

It makes one think that we have been vastly underestimating the skill and intelligence of our remote ancestors.

(I wonder if there was a Eubanks amongst them?)

I have read that bronze was made prior to 3500 B.C. and that iron was reduced from ore by smelting before that time.

It looks as if there is no way of telling exactly when suitable tools for digging through rock were first used.[1]

I might make a comment here that some of the 'achievements' credited to ancient man are hard to believe. If they are not true, or fact, they should not be put in encyclopedias, histories, technical and scientific works as such. However, some latitude must be given, because most of this type of writings were originally in some foreign language or hiroglyphics, etc. Sometimes translations are difficult and not always accurate. In my brief excursion in research I have noticed a number of discrepancies.

I have taken my information from reliable sources as much as possible, and have tried to keep a record of references. Even then, I have probably made some errors.

The following are a few more odds and ends about wells you don't run across every day that I think are worth mention.

Absynnia: "here we found the ground intersected with dykes supplied with water by those simple machines, the shadoof and sakkieh, so common throughout Arabia and Egypt. There were ancient aqueducts, cisterns and numerous wells in places".[18]

This is where "great quantities of gold were brought down from the hills".

Absynnia – Ethiopia, is also where Solomon was supposed to have had his fabulous but elusive gold mines. He worked thousands of slaves to death in amassing his huge fortune of over 4 million pounds of the yellow stuff.

I have made several attempts to learn exactly where those famous mines were located, but so far without success. A friend located and purchased a book on Solomon's Mines which he sent me. It turned out to be fiction, apparently based on rumors about the mine.

Most ancient wells uncovered by modern excavation in the Near East are in the cities. They were well made and kept in good repair. As the level of cities rose, due to destruction and rebuilding on the same site, the walls of the wells were being continually added to. In Mesopotamia, excavations revealed as many as 26 cities built on the debris of one another throughout the ages.[3-23]

Wells could become pretty deep by that method, as many of them were originally dug over 300 feet deep.

Herodotas wrote in the 5th century B.C. "Every one drinketh water from his own well".[3]

I have run across quite a few statements which indicate that a large number of permanently located people in the long ago had their own water supply. Also, that a good many cities had complete water systems. Vast quantities of lead pipe have been dug up in excavations. Pompeii was named as one.

Near Touggourt in Algeria is the underground river, Oued R'ir. There the French sank 'hundreds' of wells. They were artesian so they did not have to expend their energy pumping water. The French seemed to have had the habit of digging wells where the water came out by itself.[23]

Well worship was practiced by many people throughout the ages from ancient Nineva on. Greeks, Mohammedans, Persians, even French, English and Scotsmen. They all had their share of 'well worshippers'. As late as the 17th century, some Scotch people were making 'pilgrimages to wells'. Many wells were considered Holy Wells. Most people considered well worship to be "a superstition of pagan origin".

Should it be a superstition to visit wells, hold ceremonies, and consider them sacred when the completion of a well was a major achievement and of vital necessity of life? It seems to me that it is more like having an old time 'house warming' when all the neighbors get together to celebrate the completion or building of a house.

TUNNEL WELLS OR KANATS

These are an ingenious type of well dug or built two, three or more thousand years ago. No pumps or water lifters were needed; the water just ran out by gravity. No, they were not artesan. The well had to be dug or located much higher than where the water was to be used.

It works this way. When a suitable place is selected a well is dug to determine the water table or level. Then a survey is made and a tunnel is dug with the proper slope to intersect the well where the water will run out.

The tunnels are dug just large enough for one man to work. Vertical shafts are dug to the tunnel at intervals for ventilation and to remove the dirt. Vitruvius says the "air shafts are to be one 'actus' apart." That was 120 feet.

This was another eye-opener. I had never heard of 'kanats' until this research, even though there were a lot of them used. They were very common from the western end of the Atlas range in Morocco eastward across North Africa. They were also used in northern Syria, Arabia and Iran. Some of them were very long and vented with numerous shafts.

The earliest kanat on record is at Nineva. It was built about 800 B.C., which is the time Romulus founded the Roman Empire. I wonder if he could have had the water system installed.

I could not find who built the kanats of Teheran, or when. The latter probably takes the record for that type of water supply. When Teheran was a city of 275,000 population, it was supplied with water by 36 of these 'kanats' from 8 to 16 miles long. It must have been quite a feat to dig that many miles of one man tunnels. I wonder what wages the Union Bosses demanded in those days.

Where to dig.

Would you like to know how those old-timers, the 'ancients', could tell where to dig a well with a fair chance of getting water? That is, before the time of the 'water-witch'? I wonder who invented, discovered or contrived the water-witch in the first place? But let's not go into that.

Vitruvius says the way to locate underground water is as follows: early in the morning, lie down on the ground with your chin touching the earth, and scan the horizon very carefully; if you see a mist rising, ever so slight, go to that place and dig a hole a few feet deep. In this hole place a bowl of brass or copper, inverted. Next morning, if there are droplets of water condensed on the inside of the bowl, there is water not a great distance beneath. Sounds sensible, doesn't it? And I'll bet it works.

Of course, they used other methods, too. The one they probably used the most was to just start digging and dig deeper and deeper until they got water, or didn't. That may be the reason why some wells are so very deep.

You would think the diggers would suffocate when they got down a couple hundred feet. Those old timers thought of that, too, probably, after losing a couple thousand workmen on account of foul air.

I'll let Vitruvius tell you about it.[21]

" —— but if there are no springs from which to construct aqueducts, it is necessary to dig wells.

"Now in the digging of wells, we must not disdain reflection, but must devote much acuteness and skill to the consideration of the natural principle of things, because the earth contains many various substances in itself; for, like everything else, it is composed of 4 elements. In the first place, it is in itself earthy and of moisture it contains springs of water; also heat, which produces sulphur, alum and asphalt; and, finally, it contains great currents of air, which, coming up in a pregnant state through the porous fissures to the place where wells are being dug, and finding men engaged in digging there, stop up the breath of life in their nostrils, by the strength of the exhalation. So that those who do not quickly escape from the spot, are killed there.

"To guard against this, we must proceed as follows. Let down a lighted lamp and if it keeps on burning, a man may make the descent without danger. But if the lamp is put out by the strength of the exhalation, then dig air shafts beside the well, to the right and left; thus the vapors will be carried off by the air shaft as if by the nostrils. When these are finished and we come to the water, then a wall is built around the well, without stopping up the vein." End of quote.

I could have told it in fewer and simpler words, but Vitruvius, in his quaint manner, makes it sound more scientific and important.

ANCIENT PIPE – WOOD and LEAD

I wouldn't think of writing about ancient pumps and wells without connecting them with pipe. Since it is the old ones we are concerned with, the pipe must also be old.

When I researched the ancient writings to determine what material the old pipe was made of, I came up with the answer: wood and lead. There was a certain amount of bamboo used as pipe, but if we don't take that into account, the first pipe used to any great extent was made of lead.

There is no way of telling when lead pipe was first used to conduct water but it dates back a long, long way. There were periods in history when pipe was made of ceramics, glass, terra-cotta, leather, hide and even intestines of animals, and probably a few other things. But the market was never flooded with them.

People were using lead more than 2,000 years before the time of Christ. Although copper, bronze, tin and iron were known and used long before that time, those metals were too valuable and scarce to use for pipe to conduct water. Besides, at that time no one know how to make them into pipe. Lead was plentiful and easy to work, so they made pipe out of lead, lots of it.[1]

First I will tell how it was made; then we will go into the quantity.[21]

The lead was beat and rolled out into sheets 10 feet long. It was then rolled into pipe and "soldered". As simple as that. The size of the pipe was measured in flat sheet form. The width was measured in 'digits'. A digit was 72 hundreds of our inch. If a pipe was called a 'hundred', it meant that the sheet of lead was 100 digits wide before being rolled into pipe. It would be about 22 inches in diameter and weigh about 1200 pounds per ten foot length. A fifty was a sheet 50 digits wide before rolling, and should weigh about 600 pounds. The sizes decrease, 15, -10, -5 digits. A 5 digit pipe would be about 1 inch in diameter by 10 feet long and weigh about 60 pounds depending on the thickness of the lead. It must have been quite thick to weigh that much.

To lay a pipe line, the joints were butted together lengthwise and soldered by melting the lead.

Now to give you some idea of the vast amount of lead that was supposed to have been used. I said supposed, because the amount was so amazing it is hard to believe.

The water was conducted from the main reservoir to reservoirs within the walls of the city. "A reservoir should be built every 24,000 feet, so if a break in a pipe occurs, it will not waste all of the water, and will be easier to fix."

This information on lead pipe was taken from Vitruvius. He was a Roman architect, engineer, inventor, etc., who lived about 100 B.C. He wrote on such subjects as hydraulics, water systems, wells, aqueducts, siphon, pumps and many other things. His writings are very interesting.

If they laid very many pipe lines like that, using 'hundreds' weighing 1200 pounds every ten feet, they would use – Mm, let me figure here a minute – well, you figure it out.

I wonder where that much lead could have possible come from; and that was over 2,000 years ago, mind you.

The larger pipes were to bring water to the cities and the smaller ones, fives, tens, etc., were for distributing it to homes, businesses and elsewhere as needed. Sometimes three reservoirs were built inside the city walls for public baths, city fountains, home use and some for reserve.

People used water through lead pipe for hundreds of years in spite of warnings by the scientists of lead poisoning. At that time there wasn't anything else they could use even if they were going to get lead poisoning.

Once in a while, when looking up information about pumps, wells and such, I run across interesting items such as the following: "All ancient pipe yet discovered, was made of sheet lead, rolled and soldered".

In Cordova, Italy, lead pipe was used in water works in the 9th century. For 'ages', Constantinople was supplied with water through lead pipe.

"Cato, a Roman, the red-haired, tight-fisted administrator of public works, sewers and water works of Sardinia about 150 B.C. increased his austerity; he caused the pipes that brought public water to their homes to be cut." That is just another statement to show the use of municipal sewer and water systems in the times of the Romans.

Vast quantities of lead pipe have been found in ancient cities. A great many tons of it was found in Pompeii alone when that city was excavated from the volcanic ash that buried it when Vesuvius erupted in 79 A. D. The excavations took place over a period of several years, mostly in the late 1800's. When the pipe was recovered the Neopolitan Government sold it for old metal. From that time on very little lead pipe was used, as it was replaced by iron.

By the year 1236, they were using some lead pipe as water mains in London. I don't know what method was used to make it but it was another 300 years, or 1539, before they came up with 'an improved method of making lead pipe CAST in short pieces and soldered together.' It seems that progress along that line was pretty slow, as it was about another 250 years before they were able to make 'drawn' lead pipe.[19]

England continued to use a lot of lead pipe, and by 1790 they had developed a practical method of making 'drawn' pipe, whereby while the lead was still hot, it was drawn through, or squeezed through a machine. By this method, if the pipe was not too large, it could be made in a continuous length. The method was quickly adopted in Europe and the United States where lead pipe was in much demand at that time.

The earliest date I have read of the use of lead pipe in England was for the water mains in London in the year of 1236. When lead pipe took over from wood, or the wood replaced the lead, is hard to say. They must have been used simultaneously for many years. Probably in the Middle East where suitable trees to make wood pipe were scarce, and a lot of pipe was needed, lead was used almost exclusively until replaced by iron. While in England and Europe there was a plentiful supply of good wood pipe trees, they were still boring logs to make pumps and wood pipe in the last of the 19th century.

"WHEN LONDON BURNED"[C] in 1666, the year after 'the great plague', "they cut the hollow elm pipes to get a quicker water supply, and so wasted much of the New River water, brought from the Springs of Chadwell, in Islington". A distance of 38 MILES north of London. (The water system was installed in 1605.)

That is a tremendous amount of wood pipe to be bored by hand and I wonder if they had some sort of machine to do it with. I haven't seen any machine being mentioned in books I have read, and cuts of such operations I have seen show the boring being done by hand.

"About 1750 in London, wooden mains of elm with a 10-inch hole, were used to distribute water".

Germany also must have been using a large amount of wood pipe about that time as they invented "an automatic log boring machine to bore holes through logs, for pumps and pipe". It was powered by waterwheel. It has a complicated gearing system, turning the auger to bore the hole as the log was advanced on a carriage. According to the sketch of it, if the machine was well made, and I'll bet it was, it could have been quite efficient for that time.[19]

Elm seemed to be the most popular tree for wood pumps and pipe, and they were lucky to have plenty of it available.

When I first heard that the English, in the 19th century, made wood pumps and pipe by boring holes lengthwise through logs, I wondered how they ever bored them so long and straight. By a little research I learned that they had been doing it for centuries, and also learned the kinds of augers they used and the method of doing it. Then I soon found that the Romans used similar augers for ship-building and for various other purposes.

So, very likely the huge log pumps used in the mines about that time were made by the Romans, probably in the first or second century. They used the very same type of auger. It was described along with the English wood pump, in Agricolas mining pumps and in another book or two. Recently I ran across a set of the old pod bits. They had been hammered out by a blacksmith, and were a bit crude, but they seem to do a very good job of boring.

In the early 16th century the great expansion of the iron industry in Europe began. Skills and progress in the working of metals advanced very slowly. The cost of iron was still too much for common use so it was mostly used in luxury goods and armaments. Wood remained the basic material for construction wherever it could be used. Metal being used only where great strength was needed.

Agricola's description of the drive chain and buckets of his mining pumps represents the most extensive use of iron in the sixteenth century. That would suggest that there was quite a lot of mining going on at that time. They had been using small amounts of iron for several centuries. [19]

About 1750 was the beginning of the use of cast iron pressure pipe in Europe on a large scale. In 1790 in Edinburgh wood pipe was replaced by cast iron 7 to 10 inches in diameter. In the late 17th century "the famous waterworks of Marley, France", used 15 miles of iron pipe ranging from 1¾ inches to 30 inches in diameter. The pipe was made in one-meter joints. That probably was one of the first large scale uses of iron pipe. (This amazing water pumping plant I have described elsewhere.)

Apparently, when a satisfactory method for making iron pipe was worked out, it was put to general use. It also cost a lot of money so wood pipe continued to be made and used even late in the 19th century.

In 1873 water was brought to Virginia City, Nevada, from Marlette Lake, 30 miles away in the Sierras. Part of that distance, wrought iron pipe, 11½ inches in diameter was used. The pressure ran as high as 800 pounds per square inch. It was THE HIGHEST PRESSURE TO BE USED IN A PIPE IN THE WORLD at that time.[19]

On August 28, 1928, employees of the Chicopee, Mass., water department uncovered sections of wooden conduit which must have been laid at least 80 years previous. The conduit was in sections of about seven feet with a bore about 4 inches and still appeared serviceable.[19]

There are many instances where bored log pipe has been found in excavating, which shows that it was used extensively in our own country in colonial days, and even later.

In 1969, in Taft, Oregon, wooden mains were being replaced by iron. However, this was not the "bored" type. It was made of long strips of cedar or redwood fastened together and wrapped spirally with about 6 gauge wire, then heavily tarred. That makes an excellent pipe and lasts for many years. A great deal of it was used on the Pacific Coast when the west was being settled.

But we are now getting into the iron pipe age, and our only interest in iron pipe is when the wood pipe surrendered to it. So this is the end of my 'pipe yarn'.

THE CHAIN PUMP

The 'Domestic' chain pump is a vastly different thing than the huge old timers made of bored logs used by the mining industry and powered by the Persian-wheel gearing system using as many as 8 horses at a time. I have already written about them, so now I will tell you about what I call the 'small domestic chain pump,' which was used so much here at home.

They were very popular in this country for a good many years, say about 125, and no wonder. They were very efficient, simple, neat looking and easy to work.

The chain-pump originated in China at a very early date and was introduced in this country with our earliest pumps. The first company we have any record of making them here was W & B Douglass, who started making pumps in 1832. In one of their catalogs they stated that "letters patent were just received for recent improvements in the article" and "the most perfect arrangement of the kind now in use". Both statements referred to the chain-pump and indicated former use of it.

Eventually there were quite a few companies making chain pumps. They were all very much alike so I will just give a general description of them. You can also refer to my drawing of one. Their use was a bit limited as they were good only for shallow wells. In wells of 40 feet deep or more, the 'chain' got too long and heavy for easy operation. Some chain pumps were made especially to set on the drain board near the sink in the kitchen. The pump had to be set directly over the well, as they would not draw water 'horizontally' as would the suction pump.

The chain-pump could be as sanitary as the other kind, as the chain could go down through a pipe as well as draw the water up through the pipe. Both pipes could be sealed where they go through the cover well.

These pumps were made in various sizes; one using pipe as small as one inch, set on the drain board in the kitchen or on the porch, would produce a steady stream of water sufficient for any kitchen use.

For garden use and watering stock, a 3- or 4-inch chain-pump set in an open well would supply a surprising amount of water, simply by turning the crank. They were so efficient, I often wonder why more of them were not used.

The chain pump was one of the very first water lifters to be called a pump several thousand years ago and, believe it or not, was one of the last hand water pumps offered for sale being advertised in a 1923 hardware store catalog.

Ladies of the kitchen, how would you like to trade your automatic dishwasher and garbage disposal for one of these very neat, compact 'chain-pumps' right on your own drain board, next to the kitchen sink?

There was a time, maybe in your great grandmothers', when the lady of the house was proud of her latest modern kitchen gadget. Imagine, turning a crank to get instant water right in your own sink. No longer would you have to run out on the back stoop to draw a bucket of water from the well.

WINDMILL PUMPS, OLD and OLDER

Less than 50 years ago windmills were a sight so common in our country that few people paid attention to them.

Like many other things, windmills came along when they were badly needed, served their purpose, and graduatlly faded away. Outside of a few scattered around the country in museums and historical societies which will be preserved, all that will soon remain of them will be but a small page in some history book.

Our windmill-pump is a good example of the old adage: "Necessity is the mother of invention". When our early settlers took up farms, especially on the prairies and some of the drier parts of the country, they needed water.

A farmer could dig wells alright, by a lot of hard work, and he could draw up some water with a rope and bucket or a hand pump. But if he needed very much water, say to irrigate an acre of spuds or a patch of beans, well, he couldn't just stand there and pump water all day. He probably didn't even have enough kids to do it.

The wind was always blowing, so some ingenious mind invented the windmill; they already had the pump. It soon became so popular that manufacturing windmills became a very large business.

Windmills as we know them are very closely related to pumps; in fact, a good many windmills actually are a pump, or at least a part of a pump. Many of them are attached to a pump in such a manner that the pump cannot be used without the mill.

The Chinese, in the long long ago, were very likely the first people to use the windmill to pump water. Not long ago I read a brief mention of "the wind-pump of China, used since time immemorial".[3] It is said that the pump was an exact copy of a double acting pump, similar to ones used in recent centuries. The wind-pump is said to have been used for many centuries.

Presuming that it actually was a wind-mill, there is no use trying to look any farther back in history for the first windmill; and if the pump part was as indicated, it at least was a very early use of the cylinder pump.

Sometimes it is impossible to get actual dates of things; especially if it concerns China or Persia, and I guess it doesn't really matter much. The reading of some ancient things seems more like historical rumor than fact, or something that really happened.

Is it just rumor that "about 400 B.C. in India, water was raised by a contrivance worked by the wind?" Or that Heron invented the windmill about 100 B.C.? Beckman thought windmills never were used to any great extent in the East.

Most windmills have been vertical. Yet it seems that at one time in the misty past, there was such a thing as a horizontal windmill in use. It is said to have originated in Northeast Persia, or Northeast of Persia, then taken to China. Could it have been the early Chinese wind-pump? Or was it a type of mill used later. It could have been used successfully for a thousand years or more, and still be lost in antiquity. I have never read any more about it, so perhaps it served its purpose and faded away.

After the Chinese wind-pump, it is a long jump to the time we hear of windmills being used in the Middle East. It was by McCoan. He wrote in 1880, that "as he approached Alexandria, he could see the 'antiquated windmills of Alexandria' ". When I read that, I thought perhaps I had run across some more water lifters. They turned out to be grain grinders instead. I did learn some interesting facts, however. There were 37 of them, and they must have been of pretty good size. Those 37 windmills, along with 127 *horses* operated and 27 steam powered mills, ground the grain that made the bread for that part of Egypt. At that same time, Cairo had 575 flour mills, ALL OPERATED BY HORSES, very likely using the Persian-wheel wooden gear system. Apparently the burros, camels and oxen did not have all of that type chores to do.

In a story, *On The Trail Of King Solomon's Mines* (which were found at Ezion, Aquaba, in 1928 I think), the writer made the remark: "nearby stands a windmill, long unused".[23] This verifies the fact that they were used in that part of the world. There was no mention, but in that area it must have been for pumping water. It could have been a modern American mill, as they were sold all over the world by 1900.

Very likely it was an old Dutch type mill; we very seldom hear of them being used in the Middle East countries, but they were. By the way, those mines turned out to be Solomon's copper mines. (His gold mines are still missing.)

Even Russia had some of the big windmills; many had their substructure built underground, probably on account of the extreme cold. Some of them were crude looking, the outsides being covered with undressed vertical boards. Windmill vanes were covered with various materials, even boards.[19]

Denmark, Sweden, Germany, France – most countries had their share of the big old time windmill. Some were graceful and dainty looking, like the French Sommiers, for instance.

Others were just windmills. They were used in a lot of countries, but when one speaks or writes of them, they naturally think of the Dutch Mill of Holland, as that is its traditional home. In fact, before I looked up the story of the Old Dutch Mill, it was my impression that they were not used much outside of a certain western European area. I thought Holland had a monopoly on them.

A few are still used in Spain for drainage purposes, using the Egyptian chain-o-pots as the water lifter.

Do you recall the quaint old story, *Don Quixote,* by Cervantes? When he spied the windmills – "Behold there; 30 or 40 monstrous giants". Being fresh from a tavern, and chivalrous, he challenged them to a duel. In the subsequent charge on his trusty steed, Rosinante, he broke his lance by the impact, and was knocked out.

I recently saw a picture of those mills, and they look to be in very good condition in spite of Don Quixote's famous duel, which took place in 1600. Those famous windmills are preserved as a National Monument. Of course they are in Spain and, by the way, they are water pumps.

The first extensive use of windmills to pump water that I have any knowledge of was in Holland, Belgium and nearby countries. In Holland they were used by the hundreds for land drainage purposes, as many as 900 working at one time. Of course they were used for other things too. They had their share of grain grinders, and some were used to power sawmills.

In 1634 some of the Dutch started using the Archimedian Screw as pumps, run by the mills. They were quite efficient; one screw would lift water higher than two wheels, or 17 feet.

Even after most of the water was pumped over the dykes many mills were kept turning water wheels that scooped water up from the pools and dumped it into the canals to run back to the ocean. The steam engine replaced a lot of them, but quite a few remain in use to this day.

A few of the old Dutch mills have been preserved at Alblasserdam for sentimental reasons. As late as 1962 there was a group of 16 of the large Polder Mills still pumping for drainage. Some of the larger Polder mills would pump as much as 2,000 cubic feet of water per minute. That is a lot of water for a windmill, and there was no mention of the kind of pump used. By 1800 the steam pumpers were using some very large steel cylinders in pumps, so there is no reason why the windmills could not use the same kind of cylinder-piston pumps as large as the mill could handle.

In Belgium, windmills were used principally for grinding grain. Some to pump water for home and farm use, and as Belgium had quite a bit of low land, the drainage was taken care of by windmill pumps.

When I was in Belgium during the war in 1918, many of the fine old mills had been destroyed by shell fire, but I saw several of them still intact and still working after the Germans had retreated. I have a snapshot of my Army buddy standing beside one, and he looks very tiny as compared to its huge size.

Windmills were introduced into England in the 12th or possibly the 11th century, and quite a few years before they were used in the countries across the channel. England was a great windmill country, having around 10,000 in use at their zenith, a century or more ago, and just before the steam engine started replacing them.

Most of England's mills were for grinding grain, but quite a few ran various kinds of machinery. The sawmill was one of their favorites. Apparently pumping water was not; an English writer on windmills said that many of the old Dutch mills were nothing but water pumps, and lacked the wonderful old corn milling machinery, without which a mill is only half a mill.[7]

The English were wonderful craftsmen and built some very fine windmills. Unless you have studied their construction or observed their workings first hand, you can have no idea of the great skill and craftsmanship it took to build them. The huge wooden gears, and the large grinding stones, which were fitted very precisely to grind grain into flour. The clever control methods they used and how they are made so they can be kept facing into the wind. They can be easily destroyed by gale winds that occasionally blow unless they are properly made.

Some of the mills are so large that whole families sometimes live in them. I will not describe one in detail (you may refer to my drawing of one on page 72). Certainly, some of those wonderful old historicals should be preserved as monuments to an age of ingenuity. I read that in 1942 in Holland, the Department of Education and Sciences have "forbidden the demolition of any mill, or alter its use, unless it is wholly made of metal". I think that by now England has also taken measures to preserve some of her old mills.

THE DUTCH MILL COMES TO AMERICA

The old Dutch mill migrated to America in the early 1600s along with pumps and people. Likewise the English Tower mill. The main ones were built on Long Island, N.Y., probably by the Dutch, as that was the New Amsterdam area settled by them. The mills were used for the usual purpose: grinding grain, pumping water, running sawmills and several other kinds of machinery.

This is also when the Egyptian Chain-o-Pots came here. Yes, those most ancient of water lifters were used briefly in our country in the 17th century.

THE INTERMEDIATE MILL

Before I get involved with our modern windmill, I would like to tell you a bit about the intermediate windmill, which I only recently learned about.

When Dana made his interesting hide voyage to California in 1835 there was very little settlement around the San Francisco Bay area, except natives and hide hunters. When he returned there in 1860 for a visit, it was still gold fever days and everything was bustling with excitement and business. After making a tour of the interior, Dana wrote: "The air is clear and very hot, and the ground perfectly dry; windmills, to raise water for artificial irrigation of small patches were seen all over the landscape, while we travel through miles of dust".

In my search to find out what kind of mills they were, I learned that at one time, there were some crude type wooden vane windmills being made. To bring them around the horn in sailboats would be slow and expensive. A little investigation revealed that in 1860 there were two windmill factories in California, one in Sacramento and one at San Francisco.[41] Which probably accounted for the numerous windmills mentioned by Dana. By 1875 there were so many windmills in the San Joaquim Valley pumping water that Stockton was called 'The Windmill City'.

The Stockton Public Library sent me the following list of mills and people connected with them:[35] The Storm King, by Lissenden; Gain Twist Mill, by Davis; C. A. Farge; The Althouse; The Regulator, by Shaw Plow Co.; the Adams Mill; The Tempest, by Marsters; Abbott Windmills and Pumps, and The Relief Mill. So by that time, the entire area must have been flooded with windmill pumps.

Writing letters and asking questions has failed to reveal just what kind of mills they were. I don't think our modern steel mill was in use as early as 1860. It must have been the 'intermediate' mill, sort of a link between the old Dutch mill and our modern steel one.

I have seen several crude drawings of them in such books as History of Manufacturers. They are also shown and priced in an 1875 catalog.

They are pictured as having from 40 to 100 or more vanes made of boards, tapered from the perimeter toward the center. They were mounted on a framework made of iron. In one kind, the slant of the vanes was controlled or furled by a governor, according to the wind velocity. In another, the rudder was also made of boards, and could be turned parallel to the wind by manual means.

The size, or diameter, of those machines varied from 8 to 20 and some even as large as 50 feet. The prices as listed were from $90 to $450.

About 1875, Mr. Pierce, of the Pierce Well Co., listed the horse power of his mills as follows: An 8-foot mill – one half horse power. 10-foot mill at one horse power. The 14-foot mill at two and ~~1~~0-foot one at 5 horse power.[75]
20

Our modern steel windmill, now nearly extinct, began its boom period when the cast iron pump became plentiful and popular. By 1880 most of the cast iron pump manufacturers were well established, and many of the iron pumps from then on, except the pitcher pump and some other lift pumps, were equipped with a windmill rod, which was merely an extension on the pump plunger rod, so it could be attached to the windmill pump rod.

The pump handle, when needed for hand pumping, could be attached to the plunger rod with a pin and cotter key or a bolt.

By the turn of the century (1900), our entire country was dotted with windmills hitched to pumps. Very few of the modern steel mills were used for any other purpose than to pump water. Their use was not restricted to the farm, either. In most of our cities and towns, windmills were usually in view, perched on top of a wood or metal tower, most of which embraced a wood or steel tank to store the water for household use, or to water the stock or irrigate the family garden.

How do the pump rods work up and down through the tanks without the water running out? It puzzled me for a long time. Finally I took a close look. Very simple. A pipe, large enough for the pump rod to work freely through it, runs right through the tank. Packing nuts at each end of the pipe seal it against leakage.

Being unsuccessful in my attempt to find out exactly how many hand water pumps were made in this country (I had to make an estimate), I made no attempt on the windmill. My guess is that a million would be but a good start. I read that in the 1930s something like 100,000 a year were being made, and that fifteen or more factories were working at it. At the peak of their production there probably were one hundred or more factories making windmills for pumps. There are still a few who make them and many are shipped to foreign countries where electricity is scarce. The Mast-Foos Company said in one of their advertisements in 1908, "Our pumps and WINDMILLS are sold all over the world, and are still the best on earth".

There are still a few farmers who keep windmill pumps as a standby, or auxiliary water supplier in case the electricity does not get there. When it does fail, it usually is at a critical time. A sad incident of this kind happened in Malheur County in Oregon in the hot dry summer of 1969. A large herd of cattle died for lack of water, when an automatically operated electric pump failed. If there had been a few of these old reliable wind pumps scattered around the range, the disaster would have been averted.

A drawing of a modern windmill pump is shown in the book. It still keeps busy, whenever the wind blows, even a little, pumping water for pastured horses. In our former home in Salem, Oregon, our water was supplied by one of them, and when we sold in 1940, the windmill water system was still doing its job.

Here is a bit of interesting information about modern windmill research. Since the 1920s several countries have been experimenting with windmills of various designs and sizes, mostly for the purpose of generating electricity. Many kinds and sizes have been and are being tried. Some very large ones, 200 feet or more wing spread, others odd shaped and weird looking. A few practical machines have been made which generate electricity quite economically. I don't think any have been put in production commercially. One called The Wind Turbine is a United States project.[7]

One farmer I talked to said that windmill-pumps will never be entirely out of use. I wonder if this is what he had in mind.

Some day, when oil reserves are used up, water power has reached its limit and nuclear power plants are outlawed, windmills will come into their own, and produce most of the nation's power, thereby, again, pumping our water.

Now that the old windmills and towers are about gone, a few people are looking for them as antiques. Some install them just for old times sake, and others use them on which to mount a television antenna. (Would you say that our old water pumping windmill had gone modern and was now pumping T.V. pictures?)

Windmills in America is an excellent subject for some ambitious person with a fair amount of drawing ability, to research and write about. I have looked into it with my pump research, just enough to realize how interesting a subject it is. It would make a good sized book all by itself. I have gathered much more information than I am using.

There have been more types of windmills made and used than you can imagine. The modern steel mill is a precisely made machine. The gear mechanism runs in a crankcase of oil the same as an automobile engine. Some of the other working parts are automatically greased, so as to require a minimum of service.

Some windmill manufacturers have sent me catalogs and service manuals explaining their construction in detail.

Since writing the chapter on windmills I have received from The Prairie Historical Society, Madison, So. Dakota, information about some of the mills used around the Dakotas by the early settlers. The Historical has accumulated a few of the Dempster mills and about 20 old Monitor mills.

Some of those mills are the old WOOD VANE type. They are quite large and are made with 80 or 90 vanes made of wood. They have a direct drive action to the pump.

Some of them are used as entrance signs for The PRAIRIE VILLAGE MUSEUM CITY.

Several persons, at different times, when viewing my drawings, have mentioned the large wood vane windmills used in the Dakotas. They stated that the vanes "furled" or FOLDED FORWARD, when the wind became too strong, or to keep them from turning. The pictures of the mills in the Prairie Village brochure appear to substantiate that fact, as one seems to be partially folded forward.

THE STEAM PUMP

The steam engine pump had its beginnings in the long, long ago. Heron[8] started it about 150 B.C. The steam engine, like the pump, had a long intermission. Heron's steam engine consisted of a glass ball on two pivots, one of which contained a tube to admit steam from a boiler or vessel where steam was generated by a fire under the boiler. The steam venting from the sphere through bent tubes caused it to revolve with great speed. It was really a toy but was termed a steam engine and was actually the forerunner of the steam engine we knew which gradually developed from it, although it took nearly 2,000 years to accomplish.

I wouldn't have gone into the steam engine except that it played such an important role with pumps. I will just give some fundamentals and leave the steam story to the Newcomen Society.

It was developed especially to provide a better power source for pumping water out of mines. Of course the 'city managers' around the 17th century were anxious to get steam pumps for fire fighting purposes.

Part of the following information on the experiments and developing of the steam pump is from Beckmans History of Inventions.[2]

The first experiments on the steam engine on record, after Heron's, was by DeCaus about 1600. The next one we hear of was an Italian named Branca, in 1629 .

Then in 1663, The Marquis of Worcester in his "Century of Inventions" describes an apparatus for raising water by the "expansion of steam alone". He did not mention the name of anyone connected with it, but said, "I have seen water run like a constant stream 40 feet high."

Papin, a Frenchman, seems to be next on the list. His idea was the first using a piston in a cylinder: using steam, air pressure and the vacuum. (Sounds like a suction pump.) That was in 1688, shortly after the successful experiments of Gallileo and Torricelli with the vacuum and air-pressure. His engine was crude and too slow.

The first actual working steam engine was by Savery, an Englishman. In 1698 he was issued a patent for a steam engine to raise water. It was used especially to pump water out of mines. It turned out to be dangerous, wasteful and inefficient and soon fell into disuse.

Now that the steam pump had got a start, several people began working on it. In 1705 Tom Newcomen and John Cawley patented one they called an 'atmospheric engine'. It was quite an improvement over the other engines but required a 'cock boy' to open and close valves, in order to control the steam and air to keep it running. The cock boy also had to 'stoke' the boiler to keep up steam. This machine also was used mostly to pump water out of mines.

So far, fire fighter pumps were not getting very much attention. Of course that kind had to be portable, which was way beyond their comprehension at that time. The fire fighters were wise to wait until the cost of experimenting was over anyway.

Finally, James Watt came into the picture. His main improvement was to inject the steam directly into the cylinder, alternately, above and below the piston to get double action and power. That seemed to do the trick. His patent was issued June 5, 1769. One hundred and sixty nine years after DeCaus started his first experiments.

In 1775 Watt was given a twenty-five year extension on his patent rights in consideration of his achievement. However, it was nearly 75 more years before the steam engine reached general use and perfection.

The steam pump gave the mining industry a badly needed shot in the arm and a great many huge steam pumps were installed in mines and quite a few abandoned ones were reopened.

From that time on things progressed pretty fast, and no one could vision the wonderful results to come from the perfection of the steam engine, although it took another 100 years to reach its zenith.

The era of immense steam ships – the thundering trains that criss-crossed our continent and the thousands of steam threshing machines, are but a few. One important role the steam engine played was to replace hundreds of water-wheels which were operating huge pumping plants for municipal water systems.

How about the fire-fighter pump? Yes, they finally made it, but not until the latter half of the 19th century. Some excellent portable steam pumpers were eventually developed, but the steam was used only for pumping the water. The first 'pumpers' were 'pulled to the fire' by men. That was too slow and unsatisfactory, so horses had to be resorted to.

I remember the days when the smoke belcher came thundering down the street, pulled by two huge, energetic dapply gray horses, the firemen trying desperately to get up enough steam to operate the pumps by the time they got to the fire.

It is sad that after all the years of research, trial and error, failures and finally success, the life span of the romanticized steam engine and pump was only about 100 years.

About 1890 the internal combustion gas engine began to emerge. Also, about the same time, thanks to The Pelton Wheel, that wonderful newcomer, electricity, was about to burst out to brighten the world, run our industry and pump our water. The latter has been with us now only about 80 years. I wonder when its time will expire?

WATER: To Get It and Get Rid of It . . .

Municipal water as well as electricity cooperated in a plot to try to eliminate the old hand water pump.

When people first gathered in villages for mutual protection and sociability, the sewage problem didn't worry them very much. When I was in a certain country during the war of 1918, I saw raw sewage running free along curbings and in gullies. Quite often, houses and barns were built as a unit. The family used the upper floor and the livestock – horses, cows, pigs and chickens – billeted beneath. The 'barn-yard scrapings' and other sewage was gathered frequently and taken to the fields as fertilizer. Of course, the well and pump wasn't far away and sometimes things got to be a 'mess'.

Wine was the national drink, naturally. We Yanks were warned not to drink any water unless it was 'chlorinated', and when away from 'billets' we had 'the pill' to put in our water. Come to think of it, no wonder so many of 'our boys' became winos. (Many a Yank didn't get the hint quick enough, when someone yelled "en-garde-vous" from an upstairs window.)

All of the above is to show the reason why municipal water and sewer systems eventually became a necessity. Most original sewer systems dumped raw sewage directly into rivers for convenience. But when 'pollution-control' came (and it isn't a new idea), it became necessary to *pump* it to higher elevations so it could drain farther away or to treatment plants.

That meant pumps. Not just little old 'hand-squirt pumps', but pumps that could handle large volume. I am describing one such pumping plant under "pump odds & ends".

As for municipal water supply, or systems, it is the old ones we are concerned with. Before the time of the electric pump.

There have been a good many different methods used to supply water to people gathered in communities. Some of them have been crude, inefficient and inadequate.

Let us start with the city of Suez. For centuries its only water supply was from a couple of scanty, brackish springs about 'two camel hours' from the city. Some water was even brought from Cairo by camel back, a distance of about 90 miles. When the railroad was built in 1856 connecting Cairo and Suez, water was brought in by train. Eventually, about 1870, as near as I can find out, a 'fresh-water canal' was built and pumps installed. For the first time in its very long history, Suez had plenty of fresh water.[11]

In some of the 'desert' countries a great deal of their water was transported in 'water-skins'. Many a goat has 'donated' his skin, usually unwillingly, to make water bags. The chief or main export of Souakim, a Red Sea port, was water skins made from goat hides.

In Kuwait City there is a large, I would call it HUGE, sea water distilling plant. I read that it provides thirty million gallons of distilled water a day. That is a lot of water. And that it is hauled to the city in trucks and pumped to storage tanks on top of houses for use.[23] In

1960 they found a 'vast underground reservoir' and the water from it is used as a supplementary supply.

Germany seemed to progress pretty fast with their water systems. In 1770 they had 140 "Central Water Works" and by 1867 many large towns had modern, municipal owned water systems. The type of pumps they used was not mentioned. By that time, probably steam pumps.[19]

When city owned water systems first began to be used a few of the cities or towns were fortunate enough to have 'gravity flow' for pressure.

However, a good many of them had to depend on pumps. The cities that were located on rivers that were not too badly polluted used 'waterwheel pumps'. A huge pumping plant of this kind was installed in the River Thames, near London Bridge. It was built in 1581 and was the first of many water supply systems to eventually be installed for London.

An illustration showed it as consisting of one huge waterwheel which operated several batteries of pumps. This one water wheel system pumped nearly 4 million gallons of water a day out of the Thames River.

In later years when ships became large and numerous, navigation was hindered for lack of water below the pumps. The system was abandoned in 1822. In the meantime several other water systems were installed for the city. The long "New River Aqueduct" was one; it was finished in 1613. By 1848 London was supplied with water by nine water works plants.

In England many towns and industries got their water from wells or 'bore holes' in the chalk beds and sand beds. So many holes were dug in some areas that they were continually being deepened as the water table became lower.

When the steam engine was invented about 1800, it greatly simplified the lifting of water from wells. Because 'reciprocating' pumps of 'large dimensions' were available, many wells were dug with open shafts of 15 feet or more in diameter. Lots of small deep 'bore-holes' were used where underground pressure pushed the water up to where the pump could get it.

In 1860 'Harvey & Co. of Hayle' built a pump with a "112" inch cylinder using a ten foot stroke, for the Southwark & Vauxhall Water Works (Co.).

A lot of those huge pumps were used for the London water supply. They were made in various sizes: 60, 70, 80 and 90 inches in diameter. Those were pretty big pumps for that day and age and some of them were still being made in the early 1900s. They were operated by steam, of course, as that was quite a while before electricity was used.

It is hard to imagine a pump with a cylinder about 9 feet across. One would think that a pump as large as that with plenty of power to operate would 'suck water' from hundreds of feet down in the earth. But there is one thing that suction pumps have in common. A huge powerful one will not suck or draw water a bit higher than a small back yard hand pump 2 inches in diameter or more than one of the old fashioned wooden ones with a 5 inch bore and a 10 inch stroke. There are some things in nature that man cannot overcome.

By the late 1800s most cities in England and Europe had city owned water 'suppliers' obtained by buying out private plants which had become very inadequate.

MUNICIPAL WATER SYSTEMS IN THE USA

In the late 1700s and early 1800s, our cities or communities began to realize that they had to have some sort of water distributing system. Most of them had very interesting beginnings and are on record some place or other if you care to take the trouble to look them up. I want to tell you about a few that I have looked up. It shows the kinds of pumps and pipe they used and where they got the water. The distributing of the water is another story.

A 'municipal' water system was started in Philadelphia about 1800. The 'steam engine' was a new thing and people were anxious to try it out. A pumping plant was set up on the Schuykill River using 'force-pumps' operated by a steam engine. A wooden pipe line using 'bored logs' was laid to the city to carry the water. It apparently worked very well as they used it quite a few years.

The cost of operating the 'steam engine' proved to be too much so they decided to try water-wheel power for the pump.

The 'new plant' which consisted of three water wheels, was put in operation about 1822. They apparently had been using wooden pumps as quote "iron pumps were substituted for wood". The record also shows that 5 extra pumps were made in case they were needed. No size of the pumps was given. The principal 'change' of the pump was to use iron instead of wood for the cylinder.

The city was growing rapidly and by 1840 they were using 6 water wheels which proved to be more efficient and economical than steam. Each wheel was 15 feet long and 16 feet high, or in diameter. Each wheel operated one pump of 16 inch bore and about a 4 foot stroke. They were geared for 14 strokes per minute. They soon installed a few other pumps using a 5 foot 10 inch stroke and geared a little slower, or 11 strokes per minute. The pumps were 'double-acting' dumping the water twice each stroke.

It was a very efficient plant and was claimed to be "probably the most skillfully made plant of its kind in the U.S.A. (or the whole world), being very quiet, efficient and smooth, with very little leakage".[3] Who would want to be bothered with steam when water wheels worked so well.

NEW YORK'S WATER SYSTEM

The history or beginning of New York's water supply is quite interesting, and mostly told in 'dates'.

The Dutch settled in N.Y. in 1614 and called it New Amsterdam. Any earlier settlers around there may have had a few crude wooden pumps of their own, but the Dutch brought their own and I doubt if there is any record of what they were like. Probably just plain wooden pumps.

Anyway, England took over in 1664 and named the place New York. They probably used some of the wells and pumps the Dutch were using and built some more of their own. Now for some records I was able to get. In 1675 there was an order 'to repair the wells, as formerly'. You notice there was NO mention of pumps. Then in 1700 there was a reference to drawing water: "ones living in the neighborhood, or adjacent to 'The Kings Farm' may have use of the *wells* built there." They must pay a charge or be denied 'from drawing water there'. Still there was no mention of pumps. Again in 1702-22 there were notices to 'dig some wells and fill up others' but no evidence of pumps.

Then in 1741 there was an order – "To mend and keep in order, the PUBLIC WELLS AND PUMPS in the City". So, by 1741, the city of New York, still under control of the British, maintained public wells and pumps. The kind of pumps used was not mentioned, but at that time wooden pumps were still 'taken-for-granted'. By then there were many private wells and pumps in use and 'could be kept in working order by public expense if they were available for public use'.

In 1774 an order was approved to build a reservoir, enlarge THE WELL, and convey the water through the streets 'through wooden pipes' which were bored logs I presume, as that was the kind mostly used at that time.

Thus New York City started its first real municipal water system in 1774. The war came along and the project had to be postponed. Work on it was resumed in 1797 and the plant which was then built lasted for many years.

They used 4 "double acting force pumps" powered by HORSES. The water was sucked 25 feet and 'forced' 40 feet higher to a reservoir. In 1804, the pumps were replaced by two double acting ones of 15 inch bore and a 4 foot stroke. One of Watts steam engines was installed, replacing the horse. New York City's first real municipal water system was started in 1797 using horses to power the pumps and wooden mains to distribute the water.

I read an account in a technical work stating that N.Y. "started a municipal water system in the 1830's and that in 1883 it was necessary to put in a much larger system."

By 1860 all but four of the 16 largest cities in the U.S. had 'public water systems'.

THE CHICAGO WATER SYSTEM

Following is a bit about the origin of the Chicago water system. The information is taken from The Journal of the American Water Works Assn. of 1928. It is a 35 page account of the early distribution system.[9]

It doesn't say much about the kind of pumps they used but shows the extensive use of wood pipes. Following is a direct copy shortened.

"The town of Chicago was incorporated in 1833 and the City of Chicago was incorporated in 1837. The earliest effort on record to provide a public water supply was in 1834, when the Board of Trustees paid $95.00 for the digging of a well. As is the case of 'other town pumps' (they must have been putting in pumps, too) of that period, it was necessary for the citizens to come to the well for water. It was soon realized that Lake Michigan was the most suitable source of water supply and for some years lake water was distributed to the householders by means of water carts." In 1840, a 25 foot square by 8 foot deep iron reservoir was built and a 25 H.P. pumping engine was installed. (Steam, I presume.)

The water was distributed through WOODEN MAINS, these being logs bored out 5 inches in diameter for the main lines and 3 inches for the subordinate lines. (Wood pipe was so common in those days that no one bothered to tell us what kind of boring machine was used.) The wood lines supplied the part of the City south of the Chicago River and the north side was still supplied by the water carts. The private system was taken over by the city in 1851. The first municipally owned pumping system was built in 1867. The water was taken from 600 feet out in the lake through a 30 inch wooden pipe (built up pipe).

The water was 'distributed' through *cast iron pipe* from three reservoirs. One reservoir was badly damaged by the GREAT FIRE in 1871 and about *15,000* 'lead service pipes were melted' (that caused them a lot of trouble).

By 1900 the Chicago Water System was using 11 main pumping stations with a daily capacity of 1,500 million gallons.

Isn't that a tremendous amount of water? I wonder what it must be today, with their huge population.

Complete details of the building and maintenance was given but the little I have written is sufficient for the purpose of this book.

THE LOST CTESIBIUS PUMP

What became of the Ctesibius pump during the 2000 year interval between its original invention and its rediscovery or re-invention about 1830? It was not entirely lost, as I have seen it mentioned occasionally in books I have read. For instance, in Gallileo: in 1642 he consulted a pump maker, who assured him that a pump would lift water only so high, etc.

What really puzzles me, though, is why it wasn't developed to practical use long before it was. But then, maybe it isn't so strange after all, when we consider the 'communication gap'. People have to learn things by word of mouth or by reading what someone has written about a subject. Communications got a serious setback when the 275,000 volume library at Alexandria was destroyed.[3] Heron was from that city, and it was about 150 B.C. when he wrote about the inventions and discoveries of Ctesibius and other scientists. That was about one hundred years before the destruction of the library, and no doubt much of his works were lost at that time. And after his time, there were several hundred years of censorship of writings and publications.

This description of the Ctesibius Pump was written by Vitruvius who took it from Heron's work about 150 B.C.[8]:

"Two bronze cylinders – set a little way apart, and there is a pipe connected with each – the two running up, like prongs of a fork, side by side, to a vessel which is between the cylinders. Two valves fitted over the upper vents of the pipes, which stop up the vent holes, and keep what has been forced up by pressure into the vessel, from going down again.

Over the vessel a cowel is adjusted, like an inverted funnel with vent pipe at top. Valves are inserted in the cylinders, beneath the lower vents of the pipes, and over the openings in the bottom of the cylinders.

Pistons, smoothly turned, rubbed with oil and inserted from above into the cyliners, work with their rods and levers, upon the air and water in the cylinders, and, as the valves stop up the openings, force and drive the water, by repeated pressure and expansion, through the vents of the pipes into the vessel, from which the cowel receives the inflated currents, and force them up through the pipe at the top; and so water can be supplied for a fountain from a reservoir at a lower level".[3]

Could that be where our 'modern' pump makers got the know-how to make pumps?

Our first cast iron pumps made in the 1830s were so much like the Ctesibius pump that I think they must have studied the old ones.

One of the first things they thought of was fire fighting pumps. Douglass, the first iron pump maker, made one mounted on a tank, with handles and wheels like a wheelbarrow. There is a drawing of one on page 50. Downs and Goulds also built one similar as one of their first pumps.

About that same time, Cowing was working on his famous large hand pumpers on wheels, which required several men to pull and to operate the pumps. The real beginning of our wonderful fire fighting engines.

From about 1850 on, the pump business developed very fast, and a lot of factories sprang up to keep up with the ever increasing demand for pumps of all kinds. How does our 'modern' 19th century pumps compare with the Ctesibius pump? On page 46 is a drawing of a Douglass pump made about 1840. It is a 'double-barrel' pump with an air chamber between the two cylinders. On the same page is a sketch of one of Ctesibius' pumps. You will observe that it, too, has two pumping cylinders with an air chamber between. Quite a similarity, don't you think, for over 2,000 years of progress?

The main difference is in the valve arrangement. The Ctesibius pump has no valves in the pistons. The water is sucked up into the cylinder on the up-stroke, and pushed out on the down-stroke.

The Douglass pump uses valves in the pistons, and the water is both sucked in and pushed out on the up-stroke. However, some of our pumps use the same kind of piston, with no valve, as the Ctesibius pump.

Ctesibius also made a single cylinder pump with an air chamber set to one side, very much like one of McDonald's, made about 1856 (see drawing). Several other companies made similar ones.

The single cylinder pump with the air chamber set on top was the arrangement most of our pump makers finally adopted. Once the principle of the piston-cylinder pump was established, it has stayed with us to the present day. Of course, there have been a good many variations and successful off-shoots: the ram, the rotary and, of course, the large variety of electric pumps, which we don't count.

How about the 'lifting power' of the ancient Ctesibius pump as compared to our modern 20th century pumps? It may be a bit hard to believe, but in spite of 2,000 years of pump 'improvement' and a couple thousand patents later, and the almost perfect suckers or lift buckets that have been developed, the suction of reciprocating pumps of today will not suck water a bit higher than the ancient ones. That distance is about 33 feet at sea level and less as altitude increases. Of course you pump men know the reason, but some people will have trouble believing that statement.

In Germany in the 15th century, building restrictions in cities were imposed because they had no adequate fire fighting pumps. Thatched roofs were prohibited and the height of buildings regulated.

About 1520 the building restrictions were relaxed, as they had a 'fire engine'! Then in 1657, over a hundred years later, they had a fire engine and hooks and ladders. The engine was pumped by 28 men and pulled by two horses, so it must have been a pretty husky machine. It would throw water 80 to 100 feet in the air through a 1 inch nozzle.[2]

The next date mentioned in Beckman's book was 1769. It was in Hamburg, Germany, a Neuberts Engine threw 11½ cubic feet of water to a height of 62 feet. The height of buildings was then limited to '60 or 70 feet'.

The French were also working on fire engine pumps and developed a good one in 1699, and by 1722 had 30 of them called 'Royal Engines'. They were really quite poor – they used 'sucking and forcing pumps, and the water came out by squirts'.

By 1725 the French had fire engines using the air-compression chamber that would throw a steady stream. It was presumably invented by Mariotte, a Frenchman, I think. By then they were using leather hose, which was flexible and a big help in handling the water.

The French and Germans, as well as the English, were working very hard to improve their pumps. They knew of the Ctesibius pump, had the cylinder, and knew how the suction and force pump worked. I cannot understand why it took so many years to make them efficient.

However, a few scientists and mechanics were working on the problem. Sir Sam Moreland was one. He invented and built a very simple and effective pump. He was an Englishman but he did not get his pump ready in time for the big London fire. It probably would not have saved the city anyway. Moreland worked on his pump for 12 years, and finally, in 1675, the hi-pressure Moreland pump was ready for use.[2]

The Moreland Pump is a very powerful, hi-pressure force pump. The cylinder is made long and strong in order to withstand the pressure when the long heavy plunger is 'dropped' in the cylinder to force the water out. It has no air chamber to absorb the shock.

The plunger was made of brass and very closely fitted into the cylinder. It was filled with lead to make it heavy and otherwise weighted when needed. It had a check valve in the bottom of the cylinder and one in the outlet pipe to control the water.

The pump was operated by raising the plunger and letting it drop by gravity. Small ones were worked by hand. Larger ones were run by horse power, water wheel or any other available power. Later it was used very successfully with the steam engine. It was quite often installed in pairs.

Moreland pumps were used in the York Building in London. They were also installed in Windsor, and could throw water higher than the castle.

The Moreland Pump was considered the most valuable improvement in the force pump for many years.

CONTINUOUS FLOW PUMPS

It is not my intention to try to establish who designed and made the first pumps to give a steady flow of water.

A statement in the history of Myers that in the early 1870s they "designed and made" a pump that would "deliver a steady flow of water, instead of in spurts, AS DID OTHER PUMPS OF THAT TIME".[71]

If I interpret it correctly, Myers thought they had designed the first pump to accomplish the 'steady flow'. That steady flow business was a very important factor in the history and development of the pump and the pump makers, and deserves a little study and comment.

Sometimes a thing can be old and forgotten, then be 're-discovered' as if it were a completely new idea. I will start way back and mention a few of the steady flow pumps that I have read about in my research.

First, I think, was 'Heron's Fountain'. It was very ancient and was a self-contained apparatus which emitted a steady stream of water, straight up, as long as the water in the vessel lasted, and the petcock was open. It was called "the oldest pressure engine known".

The first real pump that we know anything about, that gave a steady flow, was the "Ctesibius Pump" about 250 B.C. It was a two-cylinder, double-acting pump with an air chamber, thus providing a steady flow. It is described more fully elsewhere.

Of course, the 'screw' pump, the chain pump and one described by Agricola in 1556, a two-cylinder piston pressure pump, all gave steady flow water. I know those are not the kinds Myers had in mind.

Douglass, our first cast iron pump maker, made two cylinder compression pumps.

Then Downs, later Goulds, started making cast iron pumps in 1845. Just when they started making compression or two cylinder ones, I don't know, but surely before 1870.

Biggs came along in 1850 but he made only wood pumps. If anyone every made wood pumps with a steady flow, they put the information where I couldn't find it. It could have been done very easily and I see no reason why some wood pump makers didn't do it.

In 1856, McDonald got into iron pumps and made a lot of air-compression pumps. In 1866, Levi Gould of San Jose, California, was issued a patent for 'a double acting pump which would throw a steady stream without the use of the air chamber'. Ever since Myers introduced his 'steady flow' pump, the major number of iron pumps have been made on that principle.

HYDRAULIC RAM

Do you know what a ram is? A hydraulic ram, that is? If you don't I will tell you about it. If you do, I am going to tell you about it anyway, because you probably don't know any more about it than I did before I looked up the interesting history of it.

The 'ram' is an ingenious little gadget that pumps water automatically, all by itself. All it needs is a small amount of water running into it. It is quite inefficient, lifting only a small percent of the water it receives, but being automatic, it works day and night without any assistance.

A Frenchman named Montgolfier is given credit for inventing the ram in 1796. However, in 1772, a Mr. Whithehurst of Derby, England, made a ram for his own use. It worked only when he closed a faucet after drawing water from it. He discovered that when water flowing through a pipe was suddenly stopped, it caused a considerable shock and would force water up a stand pipe quite a bit higher than where it entered. By adding a valve to hold the water up, and a chamber for compressed air to help push, it would gradually fill quite a storage tank.

Montgolfier improved it to practical use by adding an automatic self acting escape cut-off valve. Otherwise it would not work automatically.

In 1797, Mr. Bolton, a partner of Watt, the steam engine man, was issued a patent in England for the ram. Apparently there was an agreement between Montgolfier, Watt and Bolton about the patent. The ram now was considered a very important invention.

A quote: "A very insignificant pressure is all that is necessary to raise water to a considerable height. A ram has been made to raise '100 hogsheads' of water to a height of 134 feet by a fall of only four and one half feet. A ram will operate with a fall of only 18 inches. A 3 inch pipe raised water 'several hundred feet above the Rhine".[19]

A quote: "The device by which Montgolfier made the ram self acting is one of the sweetest imaginable. It is unique; there never was anything like it in practical hydraulics, or in the whole range of the arts; and its simplicity is equal to its novelty and useful effects. By adding a simple valve to Whitehurst's -- its action was instantly changed, as if by magic".

The Ram was in general use by 1840. A Thomas air-injection valve was added to prevent 'waterlogging'. In 1868 a Mr. Blake improved it and built one that would 'pump' up to 100,000 gallons per day. The article did not say how much water had to enter it or how high it would lift that much.

Here is an interesting fact about the ram that I'll wager even you 'ram men' didn't know. It is a 'hydraulic Ram Engine Pump'. That's right. A pump operated by the ram. As you know, the ram is activated by water entering it through a pipe; an automatic valve system causes some of the water to be forced up to a considerable height. In this machine, the water that forces the water up to a tank forces up a plunger in a cylinder instead, making it a piston-cylinder pump. Simple, isn't it? No wonder the ram is called 'the neatest machine of all'.

THE RAM TO THE RESCUE

An artesian well, dug to furnish water for drinking fountains failed by 7 feet to get the water to street level. The water was required to flow continuously at 4 feet above street level, leaving a gap of 11 feet. How would you solve the problem? The LaCross pump man did it this way (another of those 'so simple' impossibilities). He dug a 20 foot deep pit about 25 feet from the 'well'. In this pit he installed a 'ram'. He connected a pipe from the well to the ram with enough slope or fall to operate it. The ram, of course, pumped the water to whatever height was necessary. The ground in and around the pit being very gravely, absorbed the overflow water from the ram. (Nothing to it when you know how.)

RAM PATENTS

In the 1847 patent record book (which is the earliest one in the Oregon State Library), I found 2 patents for improvements in the ram. Both were to 'use the ram as a pump'. 'To pump up pure water by use of the water entering the ram, which may not be pure'. It said both machines were destined to answer a useful need.

In the same patent book (1847) was the unusual and interesting information about the SIPHON; and the ram is directly involved:

"The Siphon has long been known for elevating liquids from one vessel and discharging them into another; but however high the liquid may rise in its passage from one point to another it has always been discharged at a point lower than where it was received. Except in the case of the SIPHON RAM. Patent has been granted within the year for improvements in the SIPHON, by which a 'portion of the water is discharged at a point higher than where it is received' ". The machine was quite complicated.

So you see, the ram was a wonderful gadget. It could and should have been used much more than it was. It would be useful now in undeveloped countries.

A large ram, or a battery of them, put in the Niagara or any of many other rivers, could have raised enough water to supply several towns and villages, without having to use inefficient steam engines, water wheels, or pumps operated by horses. Yes, they did use horses to operate some pumping stations in the USA in the early 1800s.

THE PELTON WHEEL

The Pelton Wheel put wood and iron pumps out of business and made thousands of people rich.

The Pelton Wheel seemed so far removed from pumps I almost had to 'invent' an excuse for including it. Later I think you will agree that I had sufficient reason. Very few people have heard of the Pelton Wheel. As simple as it was, or is, it was one of the most important inventions in the history of our people. Had Pelton known the terrific impact his invention was to have on the lives of people he would probably have fainted dead away on the spot.

I am always looking for old pumps. The odd ones I like to sketch, get the name of its maker and try to find out its history. When I was in the old mining town of Trinity Center, I found a nicely made, very old hi-pressure pump. I was disappointed, however, as its maker hadn't put his name or address on it and I was unable to look into its past.

Standing right behind this pump I saw something odd. – I turned to an old timer, Ed Scott – "Say, Ed, what is that queer looking thing there? Looks like an old mower wheel with funny looking iron cups bolted all around it". "Why that's a Pelton Wheel. Ain't you never heard of the Pelton Wheel?" "Why sure I have, but I've never seen one, and it's so crude looking. Tell me about it."

"Well, it was invented by this guy Pelton way back nearly 100 years ago, I don't know just when. Most of these home made ones are on the crude side, but they're perfectly balanced; they have to be, because they are run at very high speed and if they were not well balanced, the bearings would soon go out. See how accurately those twin cups are made? And they are made of good quality iron. The water comes out of those nozzles with terrific pressure, and if it wasn't well made, the water and speed would tear it all to pieces". "What was this one used for, Ed?" "This is a little one. They used it to generate electricity to light the cook shack, bunk house and a few other things around the mine here". "When was that, Ed?" "Oh, about the turn of the century or a little before".

Yes, sir, the Pelton Wheel brought electricity to the United States and a good many other countries throughout the world. Not only that, it helped to put the wood and iron pumps out of business. Oh, sure, a few still survive, as I will tell about under pumps. It also spelled doom to hundreds of pump factories, and caused thousands of men to change their vocation. But then, industry is always changing.

Of course, all of this didn't take place overnight. It took quite a few years to build large power plants and transmission lines. The old pump companies didn't all succumb, though. Quite a few of them took advantage of this new electric power to design new and more efficient pumps. As fast as electric plants were built, and the 'juice' spread out through the towns and rural communities, electric pumps were installed and the junk man got many of the old hand pumps.

While it is not a water lifter in any way, it is connected with hydroelectrics and deserves recognition. I would like to give a brief account of its origin and use.

Waterwheel power had been used for generations to run the wheels of many factories. The use of electricity was in the near future. Such famous men as Westinghouse, Telsa, Franklin, Faharady and others were experimenting with electricity and water power to generate it.

Lord Kelvin (Wm. Thompson) of Atlantic cable fame, seems to be the first to consider Niagara Falls as a source of power. Attempts were made to harness it, but the engineers of the time were unable to cope with its tremendous power.

The 'enclosed turbine' of Benoit Fourney, when improved by Uriah Boyden, attained a new high in efficiency: 82%. Apparently that wasn't good enough to generate electricity economically.

Lester Pelton, a young mechanic from Ohio, had migrated to California by ox team in the gold rush days. He followed the mining east to Nevada but was more interested in hydro-electrics than mining.

In Virginia City, in 1873, water was brought in by wrought iron pipe 11½ inches in diameter, under pressure of '800 psi', which was the greatest pressure to be used in the world at that time.

At the Chollar Mine, in the Comstock Lode, the waste water had a fall of 1600 feet. The stamp mill located about a mile away was in dire need of electricity. That was an ideal situation for Pelton to try out his theory about water wheels. He figured the reason that water wheels were only about 80% efficient was because the back-splash of the discharge water from the 'buckets' was impeding its own action. He designed buckets with divided, or twin cups, in such a manner that the high pressure water from a hydraulic nozzle or nozzles struck the center of the division, and was discharged to the sides instead of back. Therefore, it would not interfere with the following buckets.

He connected his wheel to a dynamo and put it to work. It was an instant success, rating 100% efficiency, theoretically (whatever that means). He filed for a patent on his invention on July 3rd, 1880. The patent number assigned to the Pelton Wheel was 233,692.

This was considered the *first hydro-electric A.C. power* in practical use in the United States and probably the entire world.

Its value and potential were soon recognized. England soon built one rating 8,000 horse power. Italy built them up to 35,000 HP. Cal Edison installed one at Big Creek that produced 56,000. It was 16.5 feet in diameter. Many other huge Pelton Wheel projects were built in California and other areas and are still in use producing millions of KWs of electricity.

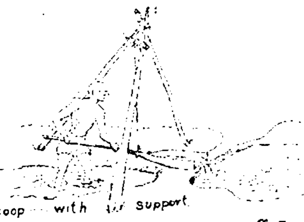
So you see, the simple Pelton Wheel was the forerunner of the turbines and generators, which now furnish the electricity to light our cities, pump our water and run practically all of our industry and made thousands of people rich. What would we do without it?

A crude one of early construction is in a museum of old mining things at Trinity Center, Cal. It was used to generate electricity for the cook shack at the Trinity mines.

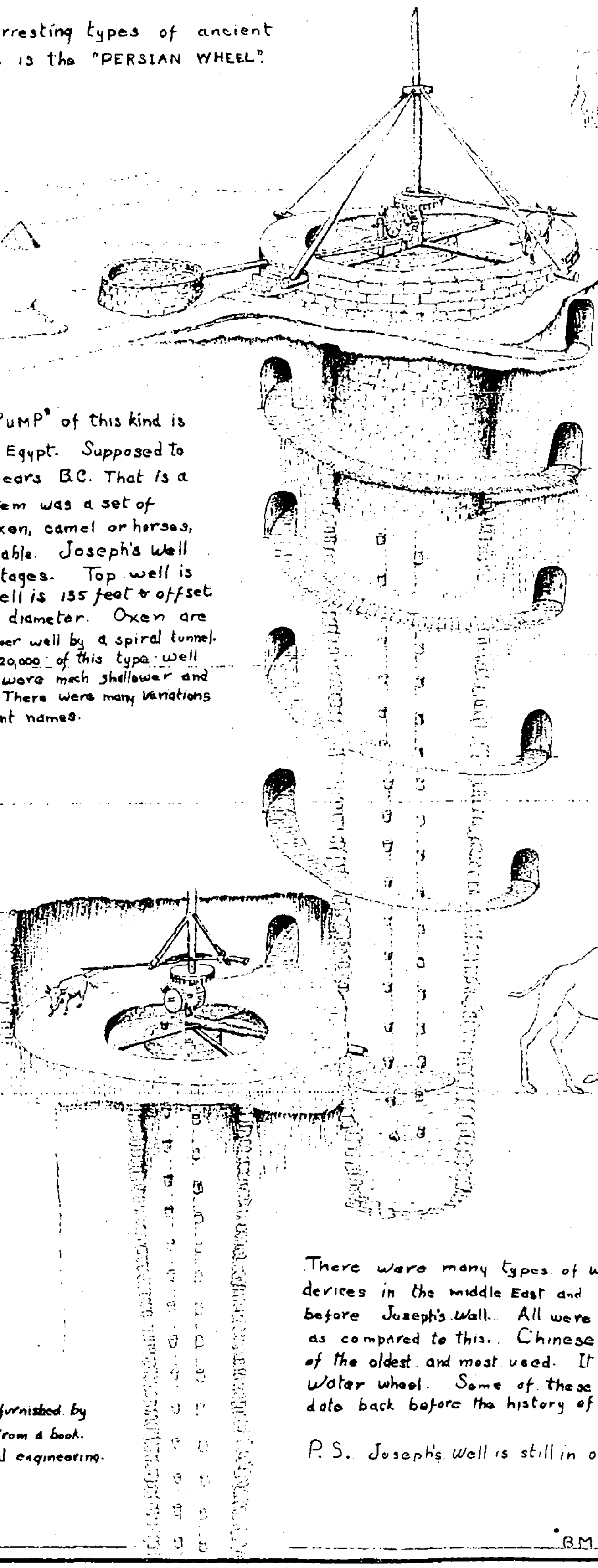
I have a xerox copy of Pelton's patent, and some history of the man, but I see no reason to give it here. Anyone who is really interested can look it up in most any public library.

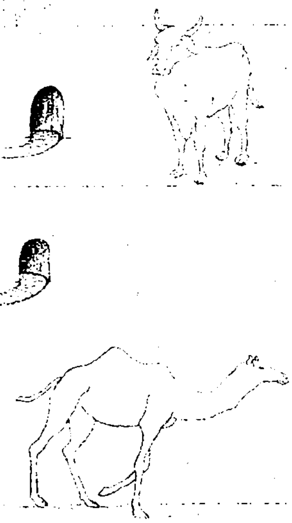
One of the most interresting types of ancient water lifting devices is the "PERSIAN WHEEL".

The "Scoop".



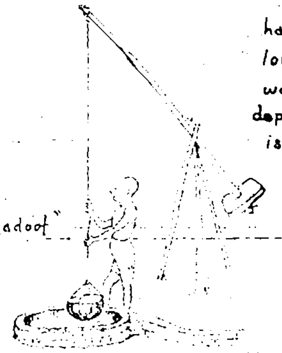
Scoop with support





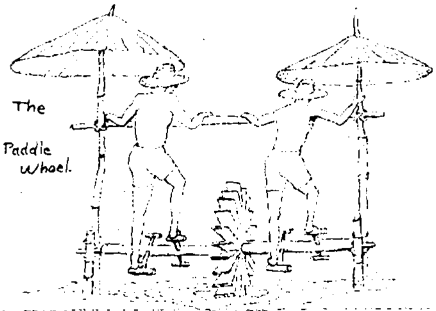
The best known "PUMP" of this kind is "Joseph's Well" in Cairo, Egypt. Supposed to have been built about 3000 years B.C. That is a long time ago. This system was a set of wooden gears, powered by oxen, camel or horses, depending on which was available. Joseph's Well is 295 feet deep — in 2 stages. Top well is 160 feet and bottom well is 135 feet + offset. Top well is 18 to 24 feet in diameter. Oxen are taken to winch at top of lower well by a spiral tunnel. IN 1890 there were about 20,000 of this type well in the "Nile Valley". Most were much shallower and of single well construction. There were many variations and were known by different names.

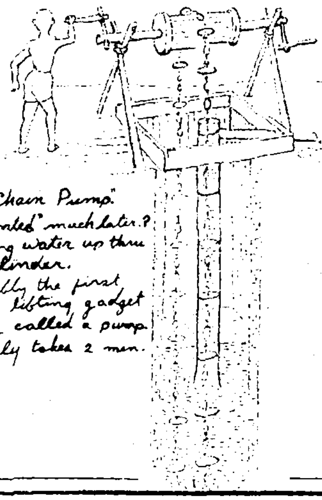
"Shadoof"



Counterpoise with basket + weight.

The Paddle wheel.





The "Chain Pump". "Invented" much later.? Lifting water up thru a cylinder. Probably the first water lifting gadget to be called a pump. Usualy takes 2 men.

This information furnished by Volney C. Finch. From a book. Professor of mechanical engineering. Stanford Univ.

There were many types of water lifting devices in the middle East and Orient long before Joseph's Well. All were very crude as compared to this. Chinese Noria is one of the oldest and most used. It is a type of Water wheel. Some of these water lifters date back before the history of man.

P. S. Joseph's Well is still in operation. as of 19[illegible]

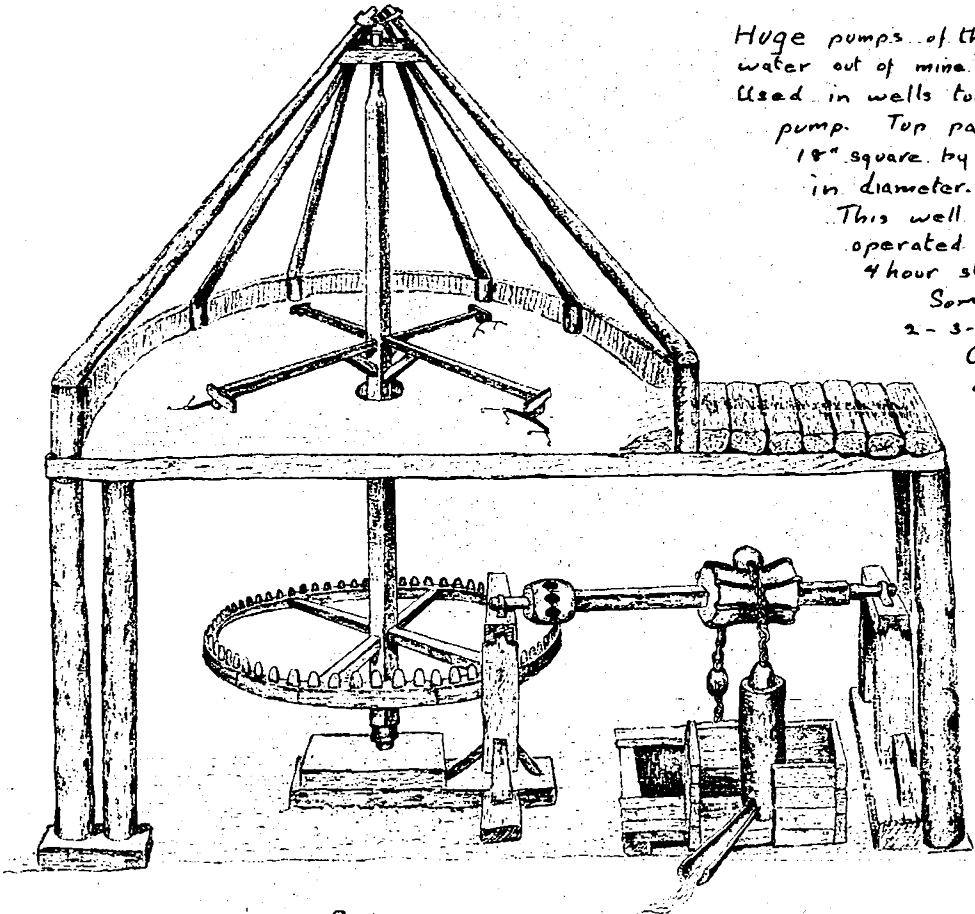
B.M.Eubanks 9-6[illegible]

JOSEPHS WELL

It is an excellent example of The PERSIAN WHEEL, which is a wooden tooth gearing system.

In this well the "CHAIN-O-POTS" water lifter is used.

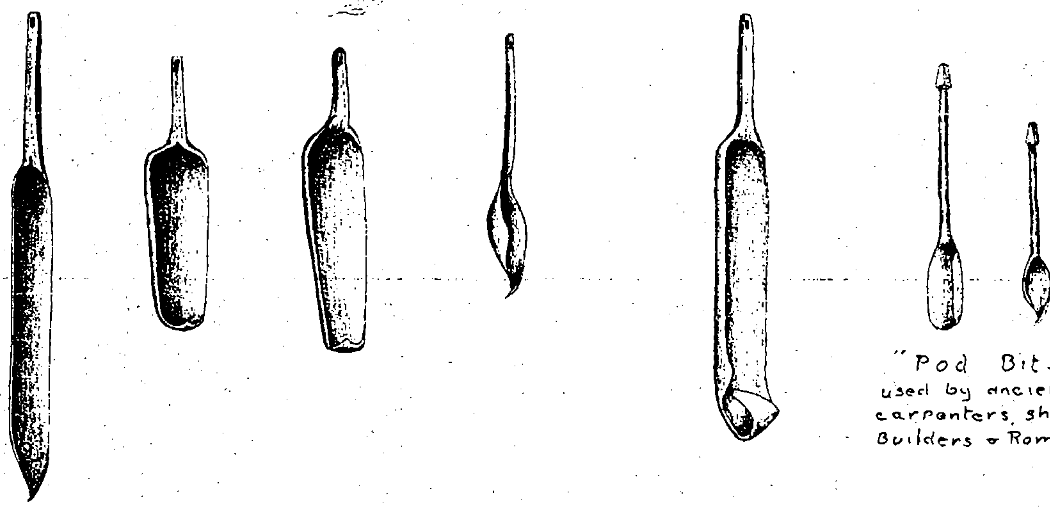
The Persian Wheel was also used to operate the "CHAIN PUMP", the NORIA, or wheel of pots, and the windlass hoist.



Huge pumps of this kind were used ages ago to draw water out of mine shafts. This is a CHAIN Pump. Used in wells too deep for the "Suction" type pump. Top part is 50 ft. in diam. Gear shaft is 18" square by 45 ft long. Gear at bottom is 22 ft in diameter. Gear teeth are wood 6" x 9" x 1 digit". This well is said to be 240 ft deep. It is operated by 32 horses working 8 at a time 4 hour shifts and resting 12 hours.

Some times multiple pumps are used 2-3- or 4, to draw large volums of water. One huge pump of this kind was Located in the Harz Mts in Germany. An extra large one using 96 horses was in a 3 level mine pumping in "Chemnitz" in the Carpathian Mts.

From Agricola-Metalica-1556.
Hoover 1910.



"Pod Bits"
used by ancient carpenters, ship Builders & Romans.

GIGANTIC CHAIN PUMP

This drawing shows the construction of the unbelievably huge pump operations used in the mines in Europe, probably as far back as the Roman times.

The book telling about it was written in 1556.

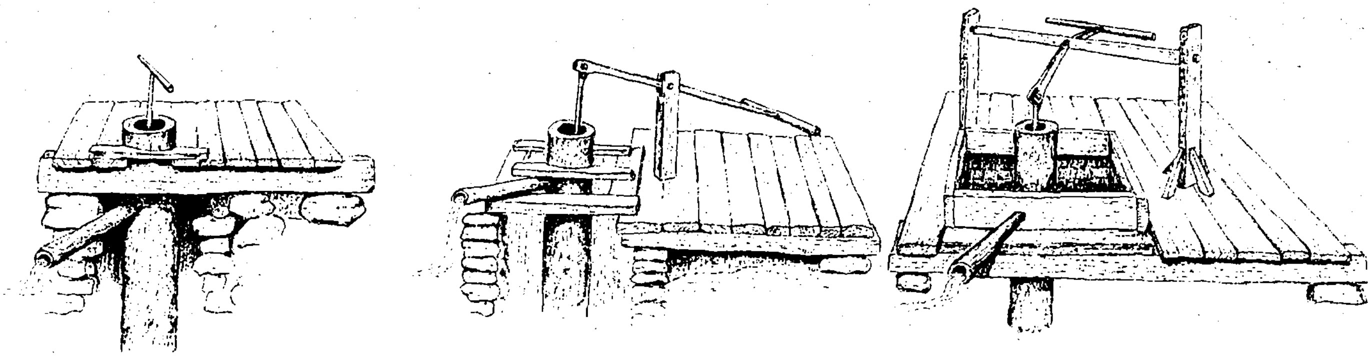
It is one of the early chain pumps. Balls of cloth, hide, wood etc. were attached to the chain and drawn up thru a hollow log.

Some of them drew water over 200 feet.

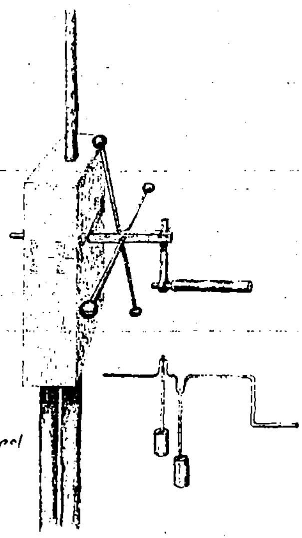
This one was operated by 8 horses at a time, and was kept going day and night.

The main ring gear is 22 feet in diameter, it is a modification of the "Ancient Persian Wheel". Read about it in the chapter on Ancient Water Lifters.

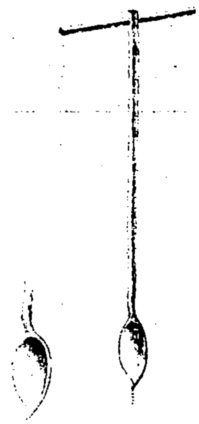
The type of augurs and reamers the old timers used to bore holes thru logs for pumps and wood pipe are also shown.



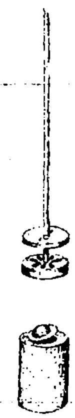
These very crude ancient log pumps are probably the first type hand pump ever used by man to pump water from a well. Probably used long before the time of Christ. They were in use with some improvments until Late in the 19th century.



Was this the first "FORCE or PRESSURE" pump ever used or invented? Very easily could be. "Agricola" describell and illustrated it in his book. It must use the "Vacuum" princirel as he says water was "sucked" in thru 2 pipes going down into the well and forced out thru one discharge pipe at the top of box. Iron ball weights on iron arms act as counter balance to make pumping easier.

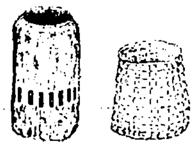


Types of augur used to bore holes thru logs. For pumps.



Type of "lift bucket" or plunger used. Some were made of iron and some of wood.

Foot valve



Bottom end of pump log set in strainers like these.

This information from book written by Georgius Agricola in 1556. Trasscribed to English by Herbert Hoover in 1910.

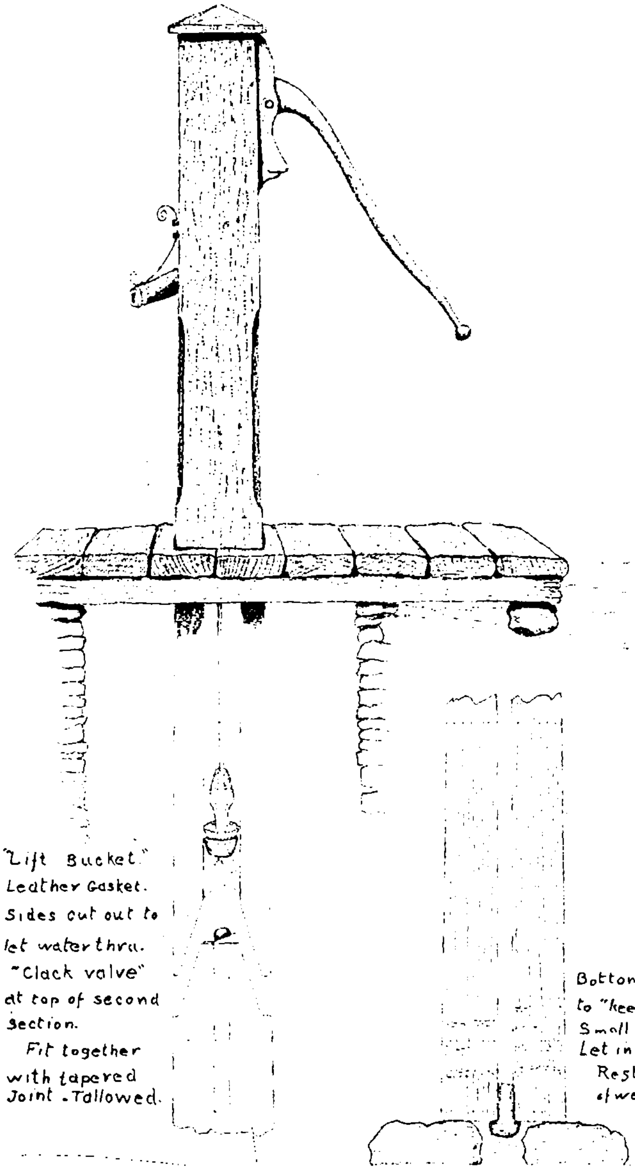
Bernard M Eubanks Feb. 1969

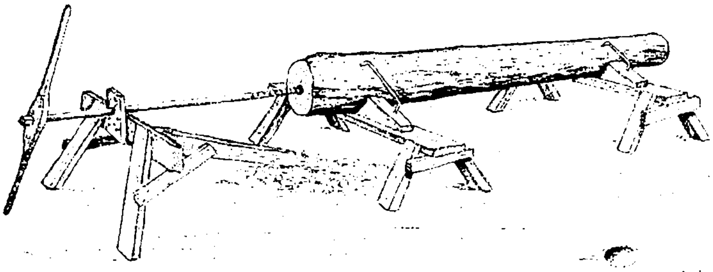
LOG PUMPS

When I first learned of these interesting old, primitive, 15th century, back-breaking log pumps, I believed them to be the first real pumps.

Farther research proved that the piston-cylinder pump had been used many years previous.

PUMP DRAWN TO SCALE - 1-16" = 1 IN — 3-4" = 1 FT.





Type of old English pump made many centuries ago.
Made of elm. 10" square at top & tapered. 5" bore in top section. 2" hole in lower sections. Iron handle. Ball on end.
Most logs squared before boreing.
Water and sewer lines were made by this same method.

This information from "The Village Carpenter"
Written by Walter Rose about 1923.

BOREING LOG Scale 1-32" = 1" :: 3-8" = 1FT.

Bernard M. Eubanks Jan 1969

THE OLD ENGLISH WOOD PUMP

as described by Rose

It was a very efficient pump and would "throw lots of water." This pump had a 5 inch bored hole as a pumping cylinder.

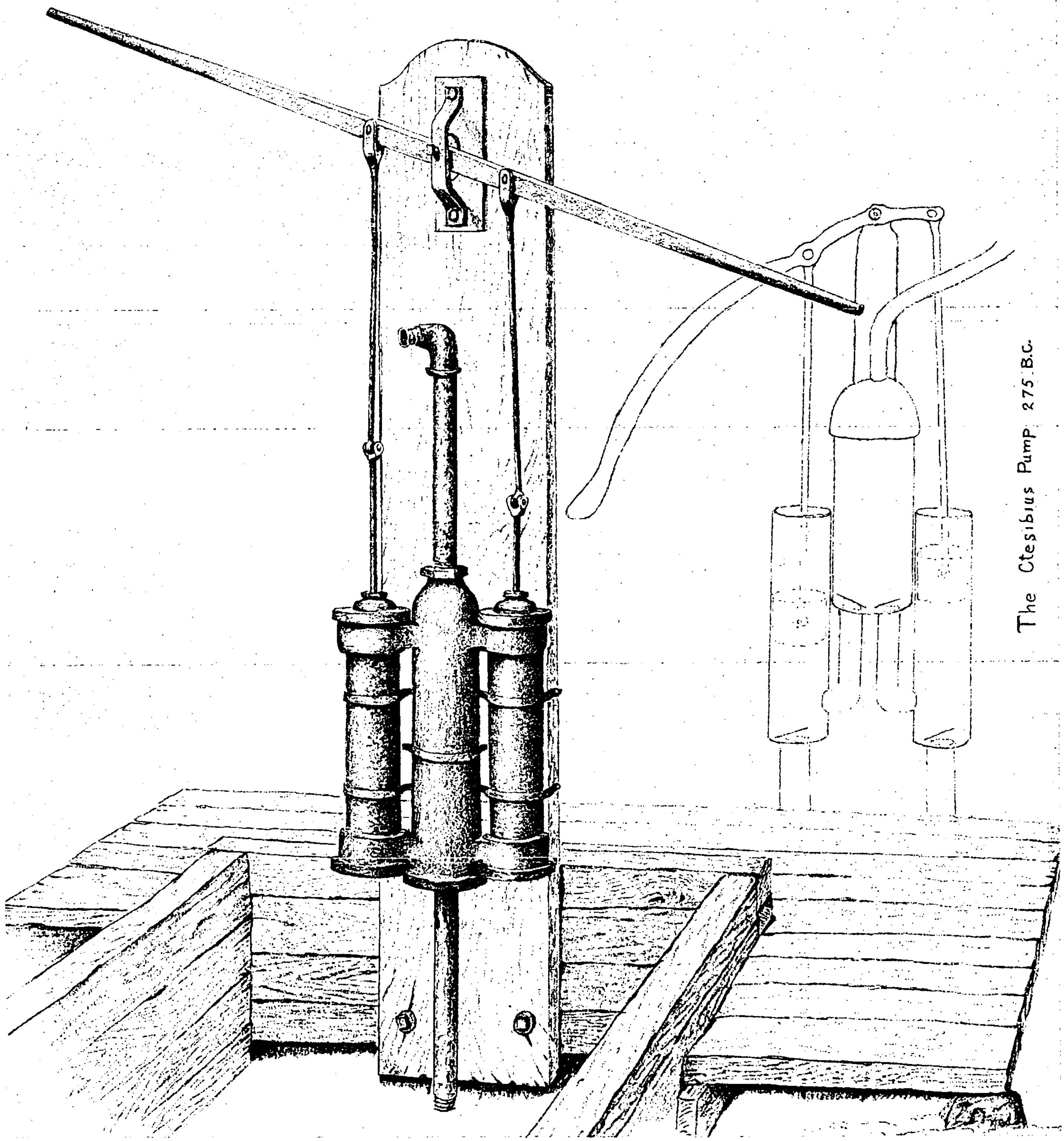
The pump was made of Elm. The well designed "lift-bucket" was made of white oak and skirted with leather.

Each 10 or 12 foot section was hued from an elm log. A 2 inch hole was bored first, then enlarged to 5 inches with a reamer.

A "bulge" is left at the top to make a hinge for the handle, and is usually carved in different designes.

The lengths of wood pipe were set together with a tapered joint, tallowed.

It usually took 2 men a week to make one of these pumps, complete- from tree in the wood lot to the pump installed in the well.



The Ctesibius Pump 275 B.C.

Shown opposite is one of the **FIRST CAST IRON PUMPS** to be made in the United States (the world).

It is a 2 cylinder, double acting, suction and force pump.

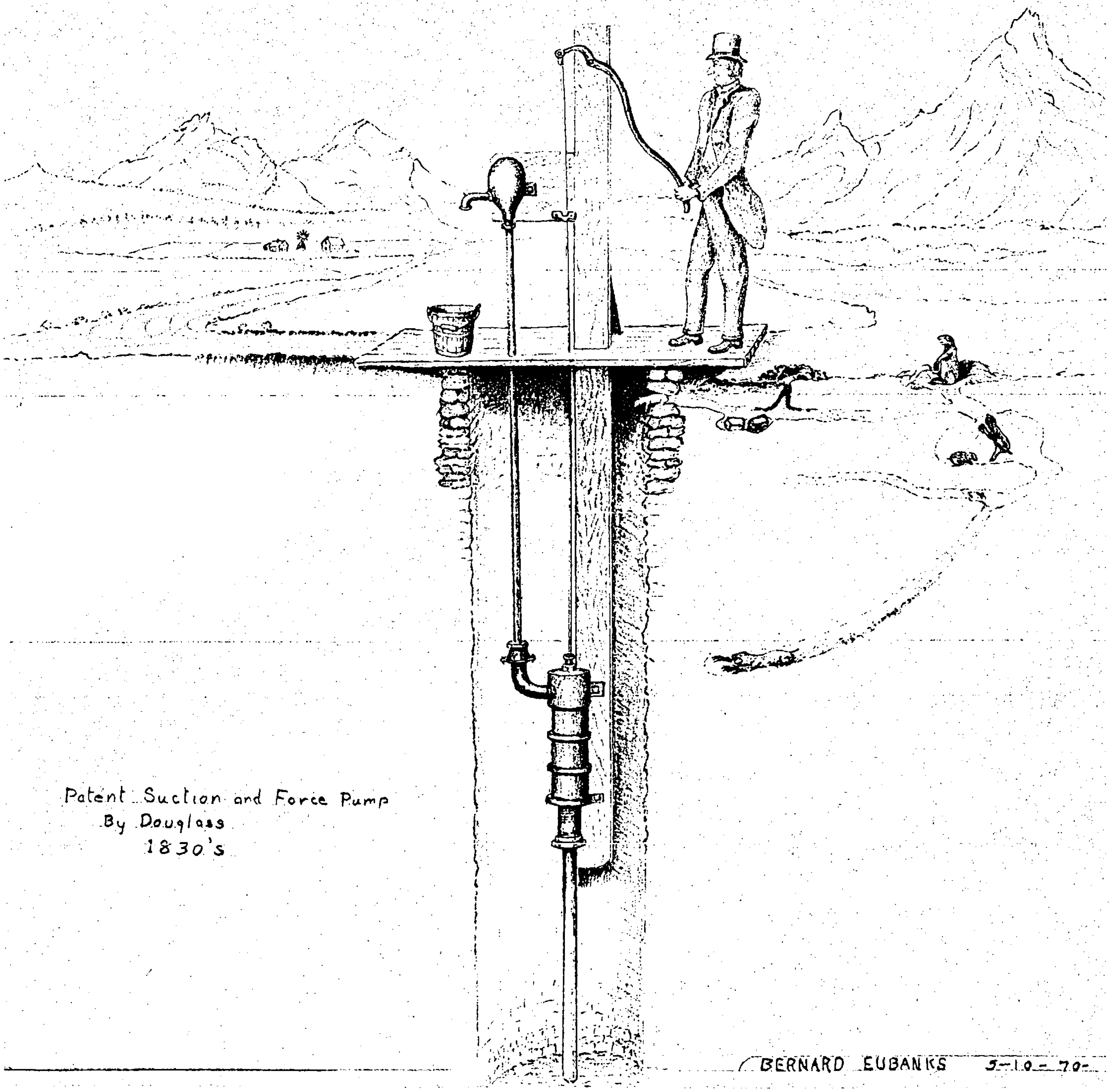
It was designed to be worked by one or several men, horse power, water wind or steam power.

"It is suitable for railway water stations, steam boats, quarries and factories; or for fire fighting purposes. Will throw water a great distance". That is a quote from the manufacturer.

The pump is fastened to a plank for mounting in a well.

It was made by the W & B DOUGLASS co who started making cast iron pumps in 1832. They claimed to be the first establishment of its kind in the United States.

The historical and controversial Ctesibius pump is shown in outline. Note similarity to our first cast-iron pumps, after 2000 years of progress.


Patent Suction and Force Pump
By Douglass
1830's
BERNARD EUBANKS 5-10-70

A FIRST IN DEEP WELL PUMPS?

This is "The First Douglas" idea of a deep well pump.

He merely took one of his regular pumps, mounted it on a plank, and sat it down in the well. The deeper the well, the deeper it was set.

Of course this kind of installation has its limits.

It was usually set in "dug wells", as it needed considerable room.

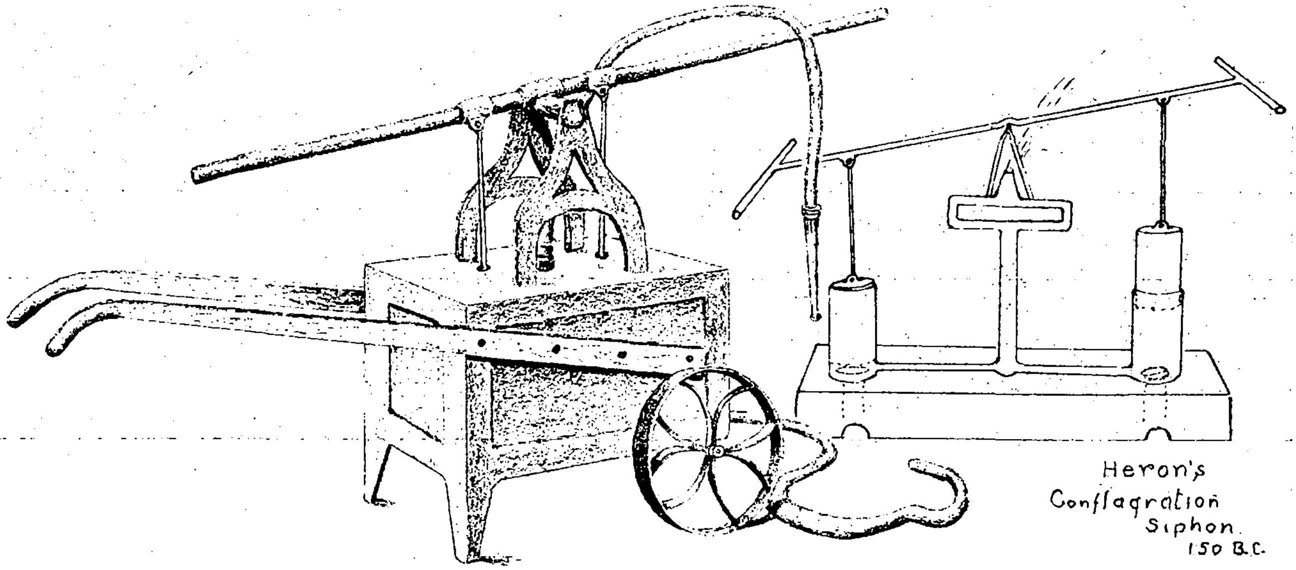
By 1870, the Pierce Well Co. were boring wells of 17 inches (and larger) that would accomodate such pumps.

However, by that time, the plank type of pump installation was being replaced by the later, or regular type of deep well pump.

The large "bulb" on top of the discharge pipe, he called an "air-barrel".

The double cylinder pump furnished water faster than it could run out and this barrel acted as a storage tank and compression chamber; thus providing a steady flow of water.

It was difficult to keep rodents out of this type of well.



Heron's
Conflagration
Siphon.
150 B.C.

Douglasses
Garden and Fire Engine
1832.

Bernard M. Eubanks 5-20-70

A PORTABLE GARDEN AND FIRE ENGINE

Made by the W. & B. Douglass Co. about 1840.

The two cylinder pump is enclosed in a box, which also serves as a water storage tank.

When operated by two or more men, it made a powerful, convenient pump of many uses.

Many a farmer and home owner has saved some of his buildings from burning, by the timely use of one of these machines.

HERON'S FIRE ENGINE

(insert)

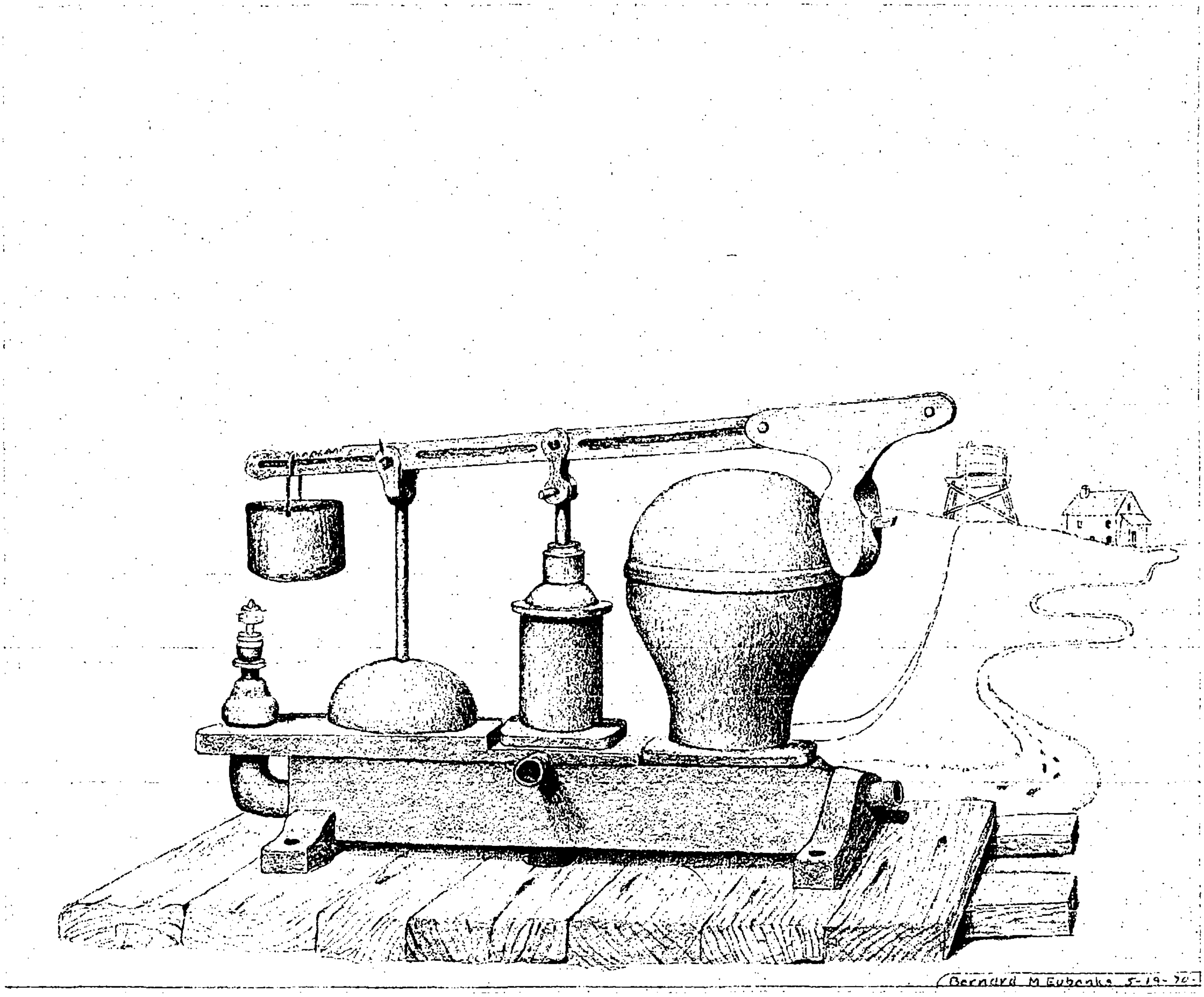
"The 'Siphons', (fire-engines) used in conflagrations, are made as follows;

take 2 vessels of bronze, having their inner surfaces bored on a lathe to fit a piston, (like the barrels of a water organ) – etc."

The "Water Organ" was in common use in Heron's time (150 B.C.). It was operated by water and air pressure, provided by COMPRESSION PUMPS WITH VALVES.

Apparently the piston-cylinder pump, with valves was well known in Herons time.

The big question in my mind is; WHY did it take nearly 2000 years to perfect it and put it to general and practical use?


Bernard M Eubanks 5-19-90

This is a HYDRAULIC RAM ENGINE

It was invented in 1847 by W & B Douglass.

The RAM was invented in 1796 by a Frenchman by the name of Montgolfier.

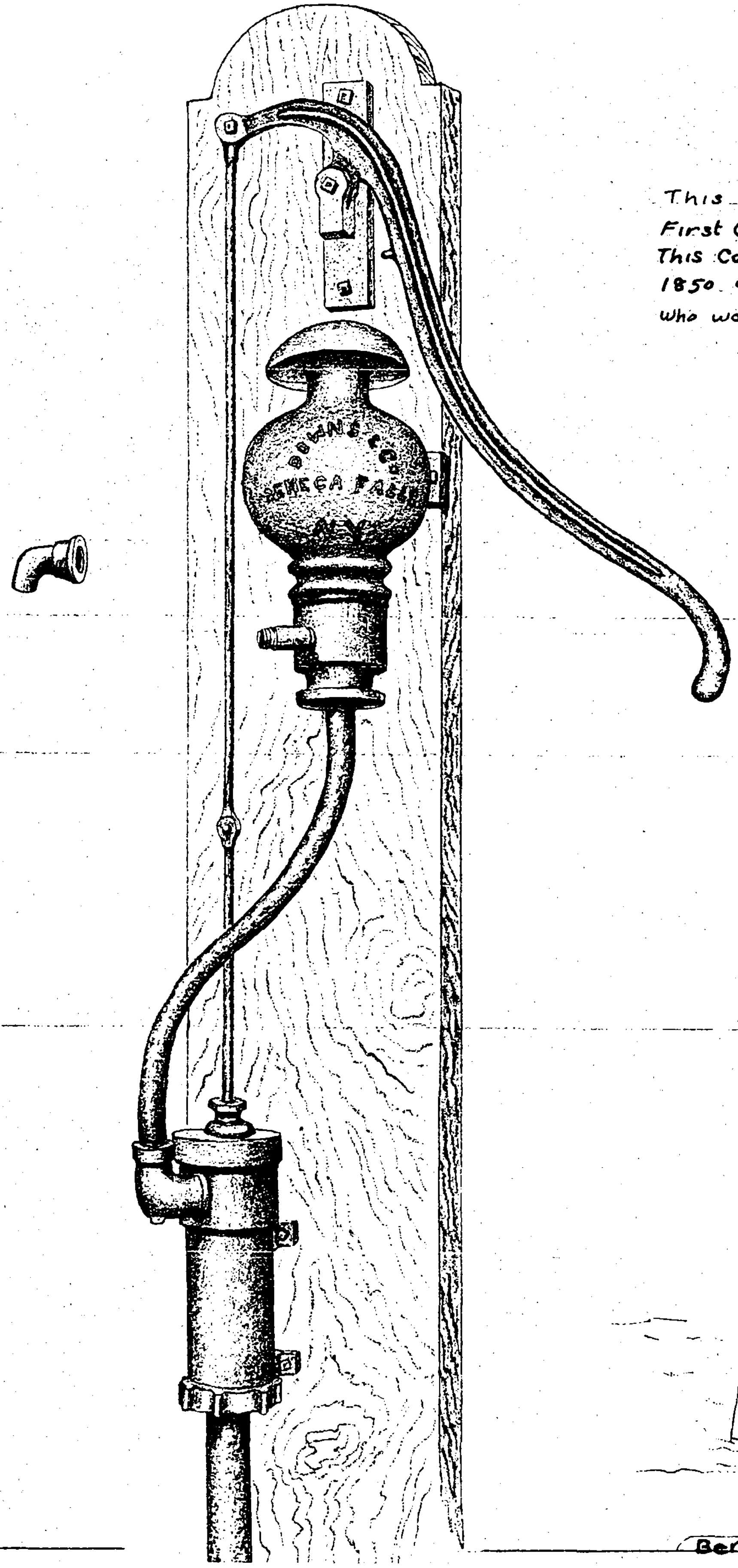
The cylinder in the middle of this "engine", is a "piston-cylinder" pump, which is operated by the ram action.

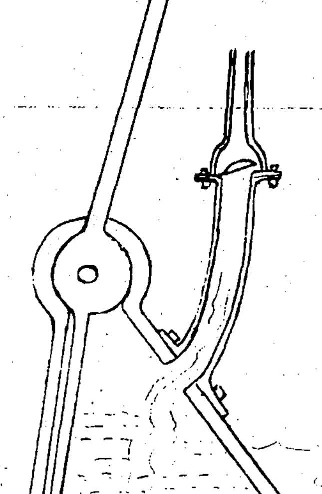
Very few people have ever heard of one, and I doubt if any person now living, has ever seen one.

The basic ram was a wonderful automatic pump, which worked day and night without any assistance.

A good many thousands of them were made and used.

This is one model of The First Cast Iron Pumps made in This Country. It was made in 1850 or earlier, By Downs Co. who was the Forerunner of GOULDS.





A rare hand Rotary(?)

Bernard Eubanks Jan. 1971

THE DOWNS PUMP

This is one of the FIRST IRON PUMPS to be made in our country.

This cut and description of it was in an 1853 Downs Co. (later Goulds) catalog, which is the earliest catalog on pumps I have seen.

It is a deep well force pump with a large air chamber. It can be used for 'throwing' water, by attaching a hose to the threaded spout. The extra spout can be screwed on if desired.

The entire pump is mounted on a plank; the pumping cylinder may be set lower down in the well, to make it a deep well pump.

The cylinder is connected to the upper part with lead pipe, which is flexible, and was extensively used in early pumps

A "RECIPROCATING HAND ROTARY PUMP"

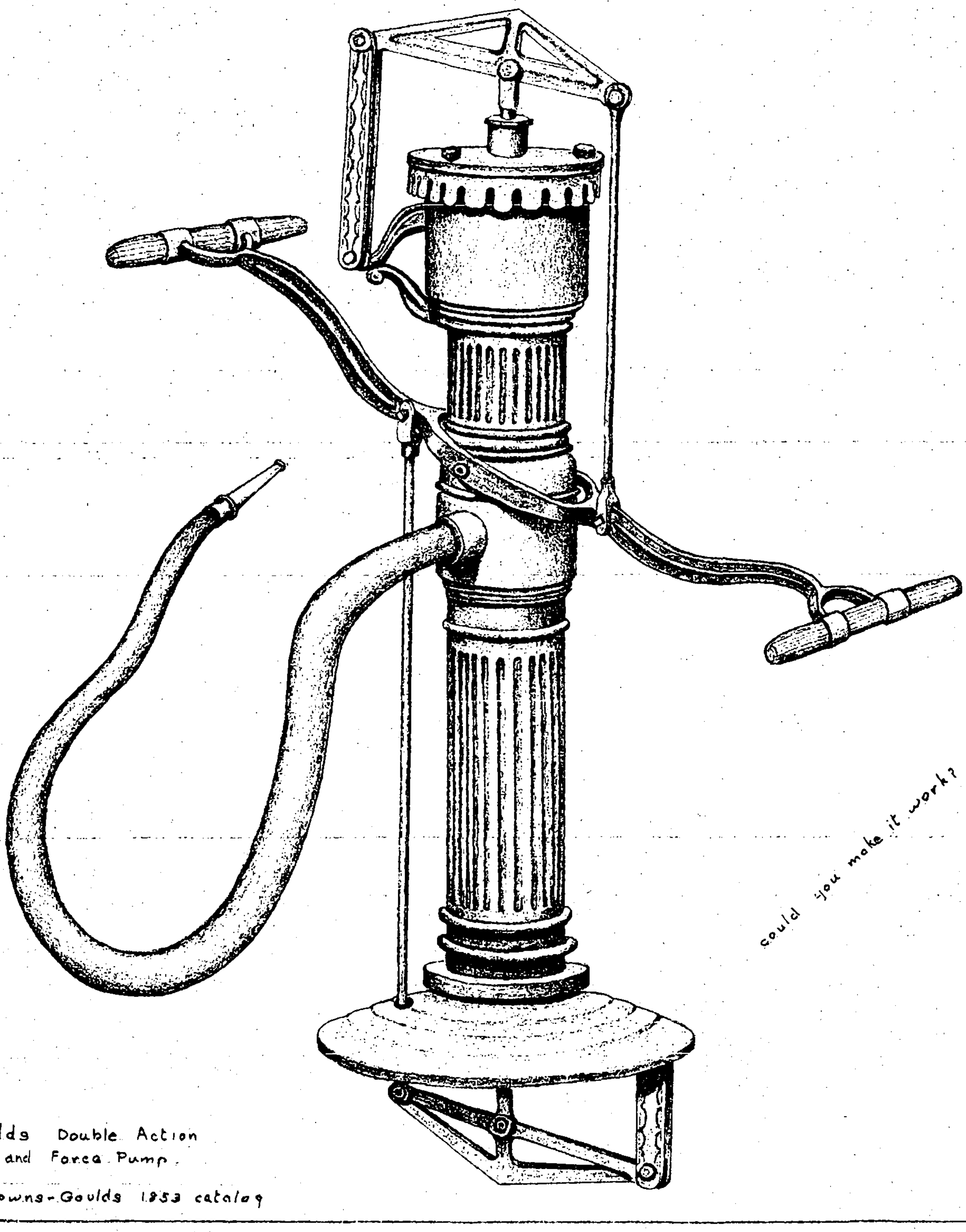
Several types were experimented with and used in the 17th and 18th centuries.

This cut-a-way sketch shows the operating principle of this model.

It must be set in the water, as the water is "forced out" but is not "sucked in".

The action is self explanatory.

No means was shown for holding it secure while operating.



could you make it work?

a Goulds Double Action
Suction and Force Pump.

From Downs-Goulds 1853 catalog

BERNARD M. EUBANKS 2 1971

GOULDS NO. 3 FORCE PUMP

It is a double action "suction and force pump" or fire engine.

"A glance at the cut must convey the idea of its many advantages over the ordinary pumps now in use.

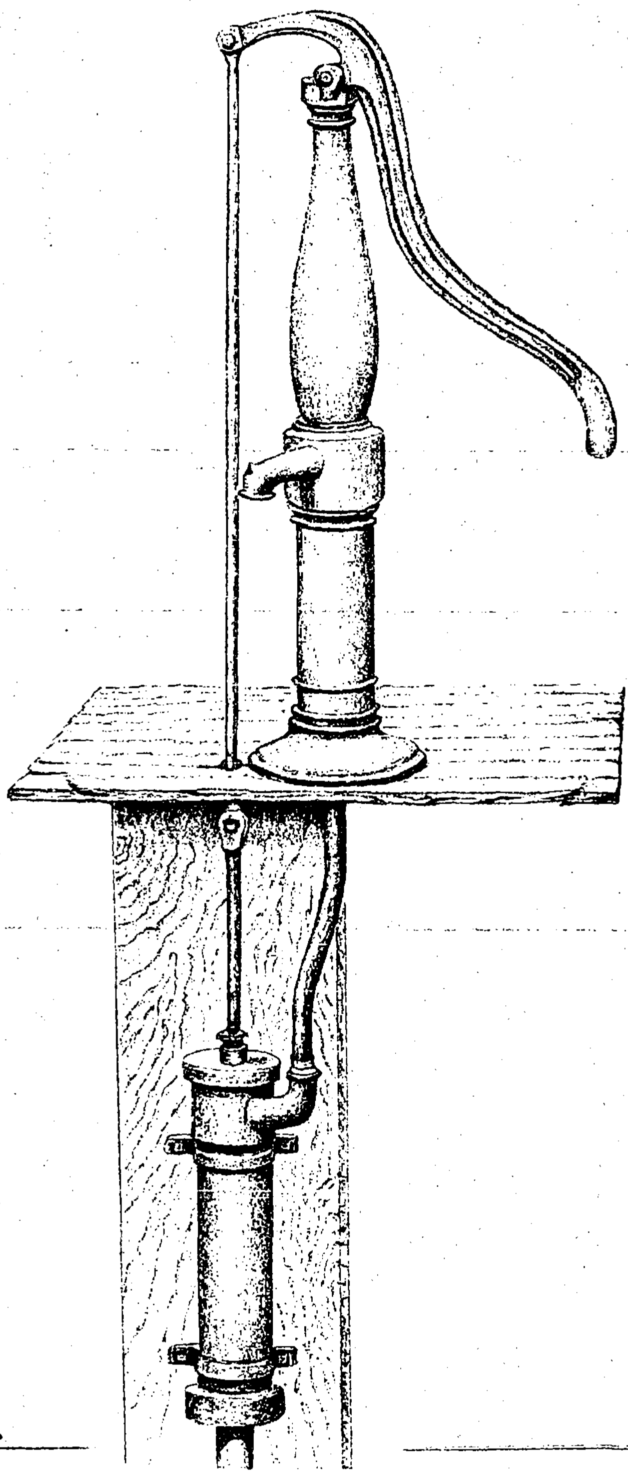
For domestic purposes this pump is invaluable. A man can pump the water out of his well or reservoir, and throw it on a three story house by his own strength; hence the Farmer, manufacturer or mechanic, can use it as a Pump, or force water into his cistern, shower bath &c, and by means of hose and pipe, wash windows and carriages, water the garden, pavement, yard, flowers &c., rendering the atmosphere cool, pleasant and healthy".

(Quote from catalog) $20.00.

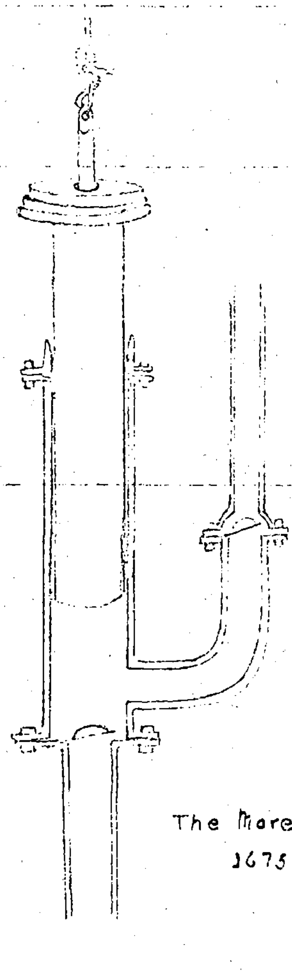
The pump was built about 1850.

It apprently has an air-compression chamber and two pistons which operate in opposite directions to each other.

I was unable to figure out the valve arrangements or how the water enters the pump.



One of Goulds first deep well force pumps. Built about 1850.



The Moreland Pump 1675

000 Force Pump

Bernard Eubanks 3. 1971

GOULDS NO. 000

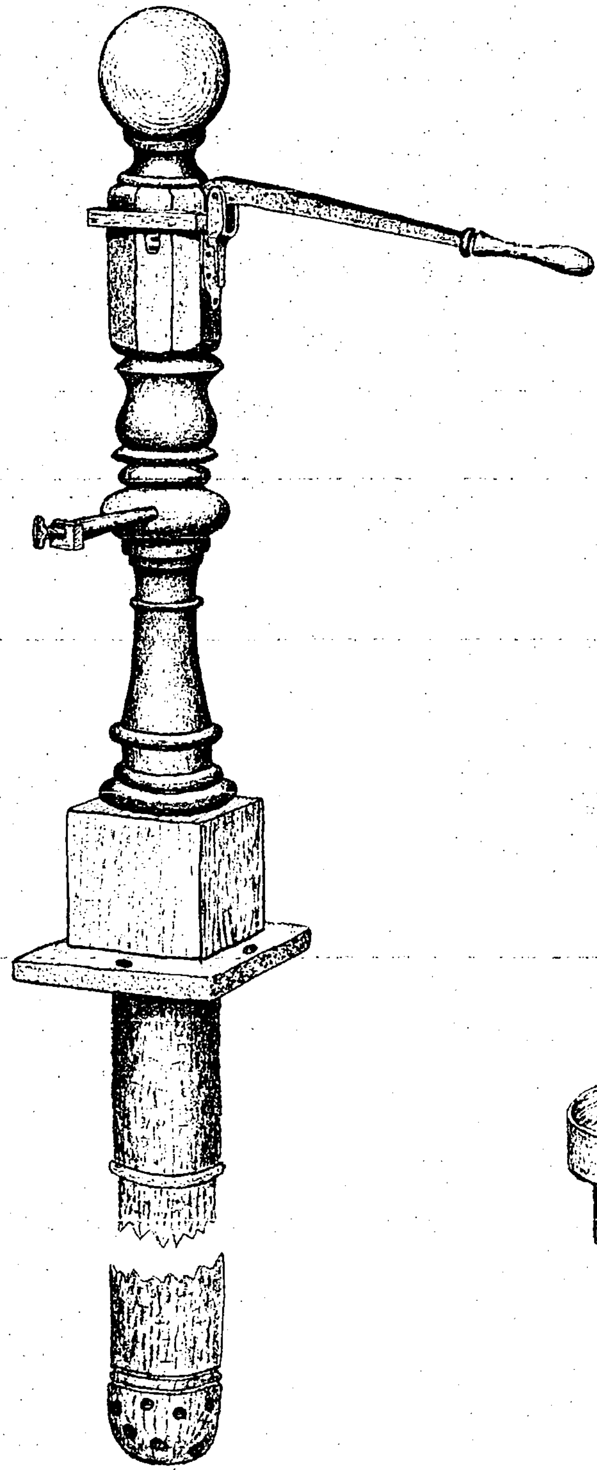
(price $10.00)

This is one of Goulds first deep well pumps. Made about 1850. It is made "deep well" by setting the pumping cylinder at various depths down the well plank.

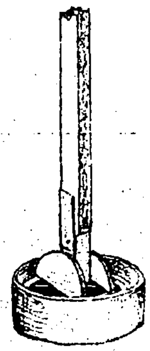
The pear shaped bulge at the top, is an air chamber and water storage tank. It lets the water out in a steady stream.

THE MORELAND PUMP

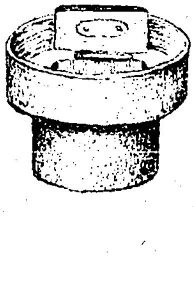
The insert is a cut-a-way outline of the historic Moreland Pump.



A Miner Pump Brake
Patd by Miner
July 7, 1835.



Plunger



Foot Valve

Assigned to H. Warren & Co.
The Industry of Seneca Falls, N.Y.
was built around this pump.

A very effecient wood pump

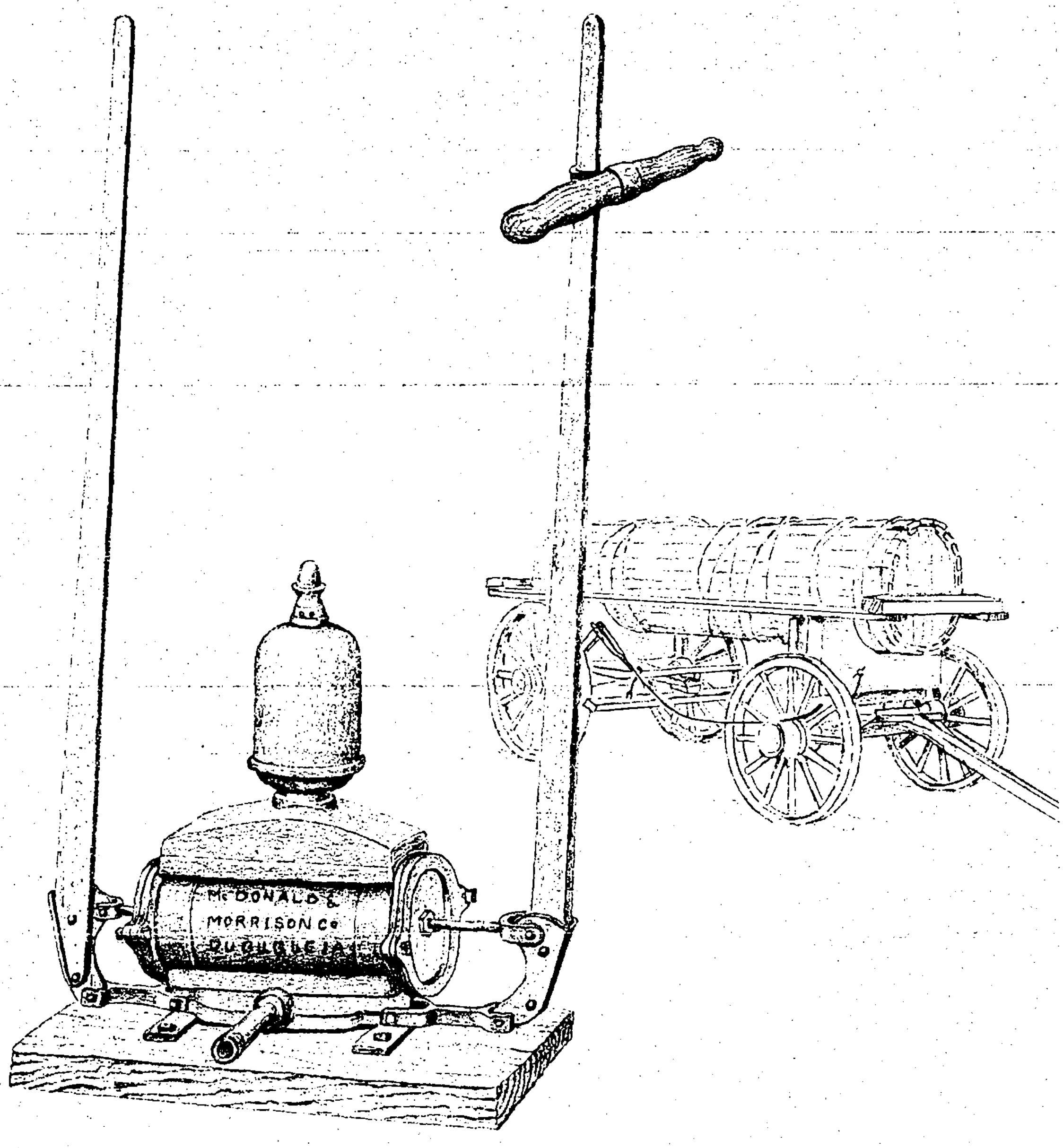
Bernard Eubanks Feb. 1969

THE MINER WOOD PUMP

Probably is the earliest wood pump on the patent records. The patent date is July 7, 1835.

The handle, foot valve and plunger are made of iron. The plunger used no leather as a seal, so it had to be fitted very precisely in order to "pump a vacuum".

The wood well pipe is shown, the holes in the bottom of it are to strain out the toads, water-dogs and other things that might get in the well.



Bernard M Eubanks 7-10-70

A PUMP OF MANY USES –
THE DOUBLE ACTING TANK PUMP

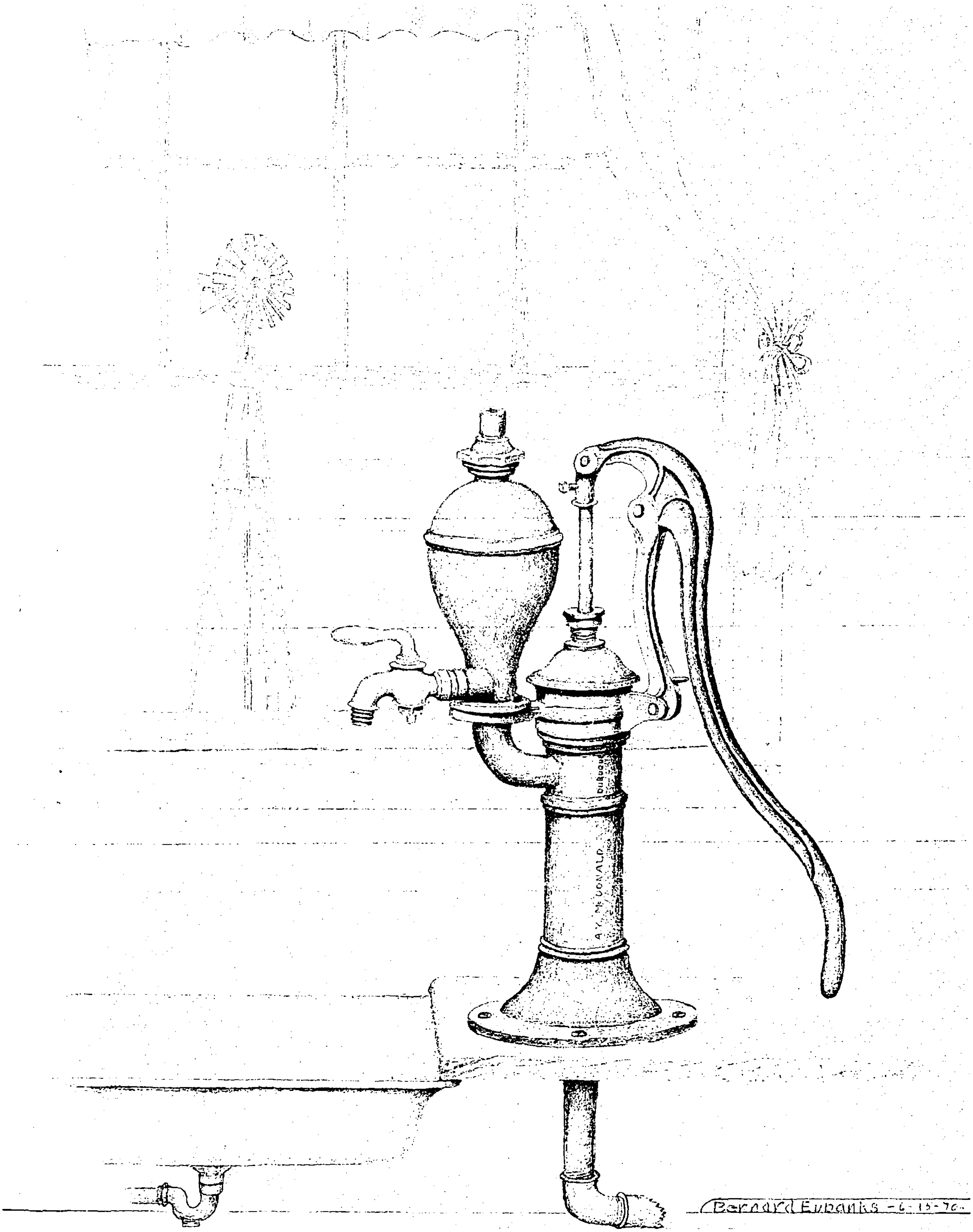
It was designed especially to fill "tank wagons".

"It is very useful to fight fires – spray orchards – around warehouses, and mills. Any where a shallow well pump is needed."

Three men on this pump can build up a tremendous water pressure.

The air compression chamber on top is a big help.

The old tank wagon was "salvaged" from the early logging days in South central Oregon.


DUBUQUE
A.Y. McDONALD
Bernard Eubanks - 6-15-76

Here is another one of McDonalds HOUSE pumps.

Designed to "force water up to M ' Ladies Chamber".

For a long period of time before the turn of the century and a number of years after, force pumps were extensively used in kitchens.

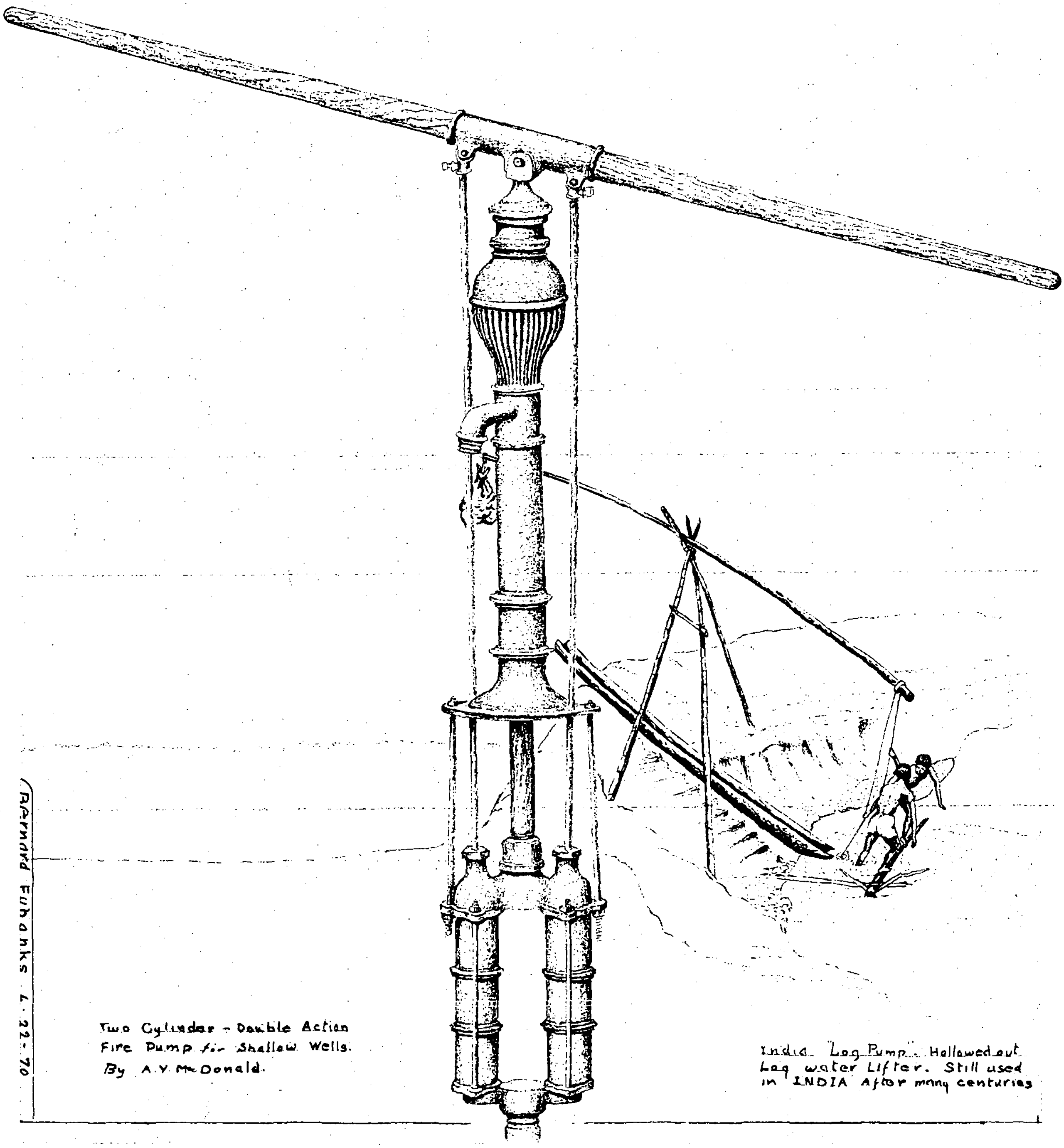
Baths were put on the second floor and pumps were used to put water in tanks, still higher up, to serve "the bath" directly, with gravity feed.

It is a very efficient little pump, with air-compression chamber and quick turn "off and on" cock.

It is a shallow well pump, as the plunger, or "lift bucket" is in the barrel of the pump and it lifts water only about 25 feet.

Small size, with iron cylinder, $9.25.

Largest, with brass lined cylinder, was priced at $18.50.


Two Cylinder - Double Action
Fire Pump for Shallow Wells.
By A.Y. McDonald.
India "Log Pump". Hollowed out
Log water Lifter. Still used
in INDIA After many centuries
Bernard Eubanks 6-22-70

ONE OF McDONALDS

early ideas of a hi-pressure pump, which indeed it is.

The two pumping cylinders, set below the frost line, work independently and alternately.

Combined with an air chamber, it builds up a tremendous pressure and will "throw water a great distance".

One of the most important functions of the air chamber, is to "cushion the shock" of pressure pumps. Without this "shock absorber" many cast iron pumps would burst under the pressure. Large size, brass cyl. $28.00.

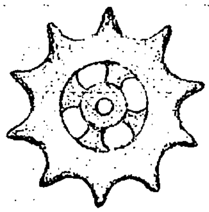
In the back ground is shown a type of "hollow log pump" or water lifter, used in eastern countries for hundreds of years.

This one is now in use in India.

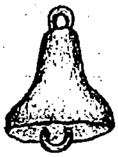
A. H. Barben sent me the picture from which this sketch was made.

A Modern Chain Pump

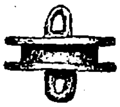
4 Pc. Galv. Steel cover
Removable for easy
Servicing.



10 Sprocket
Pulling gear



Rubber lift Bucket



Rubber & Steel

"Galv Steel," Painted & Varnished, nicely Stenciled.
Will not Rot, Rust, Warp or Fall to Pieces. No Rivets or Solder
Used in Construction. All parts securely locked by seams
That will not come apart."

Bernard Eubanks Feb. 27. 1969.

A type of **CHAIN PUMP** still in use in the 1930's. I call it the modern one.

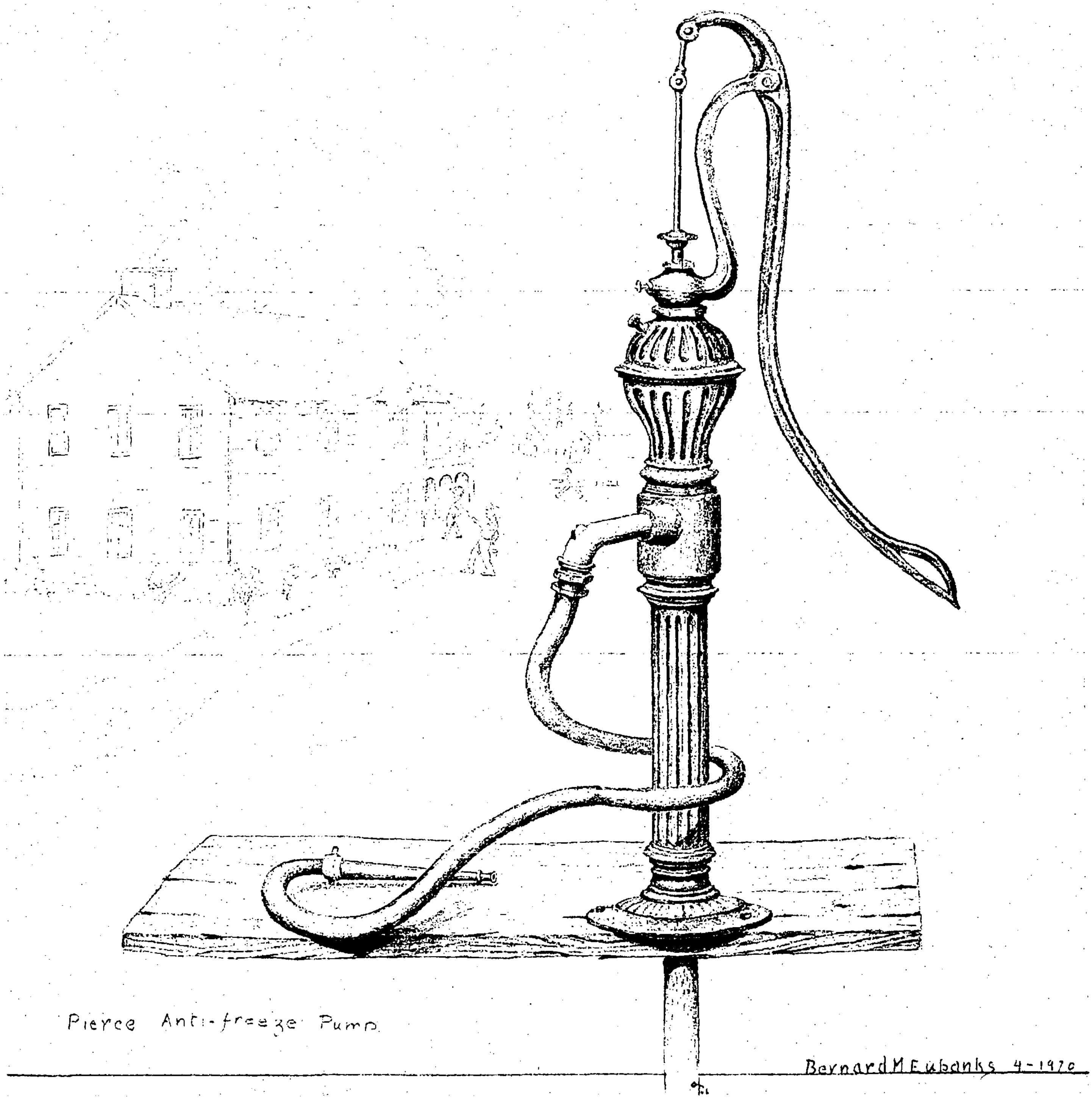
Chain pumps of various kinds have been in use for several thousand years.

This one used rubber "lift buckets" set in the chain, certain distances apart.

The chain operates over a steel sprocket and is drawn up thru the well pipe, the lower end of which sets in the water.

The water is trapped in the pipe, between the disks, and is drawn up in a steady stream.

The chain pump is very efficient. This model is good for shallow wells only.



Pierce Anti-freeze Pump

Bernard M Eubanks 4-1970

“PATENT ANTI-FREEZING ENGINE YARD PUMP

An attractive and gracefully designed pump made by The Pierce Well Excavator Company.

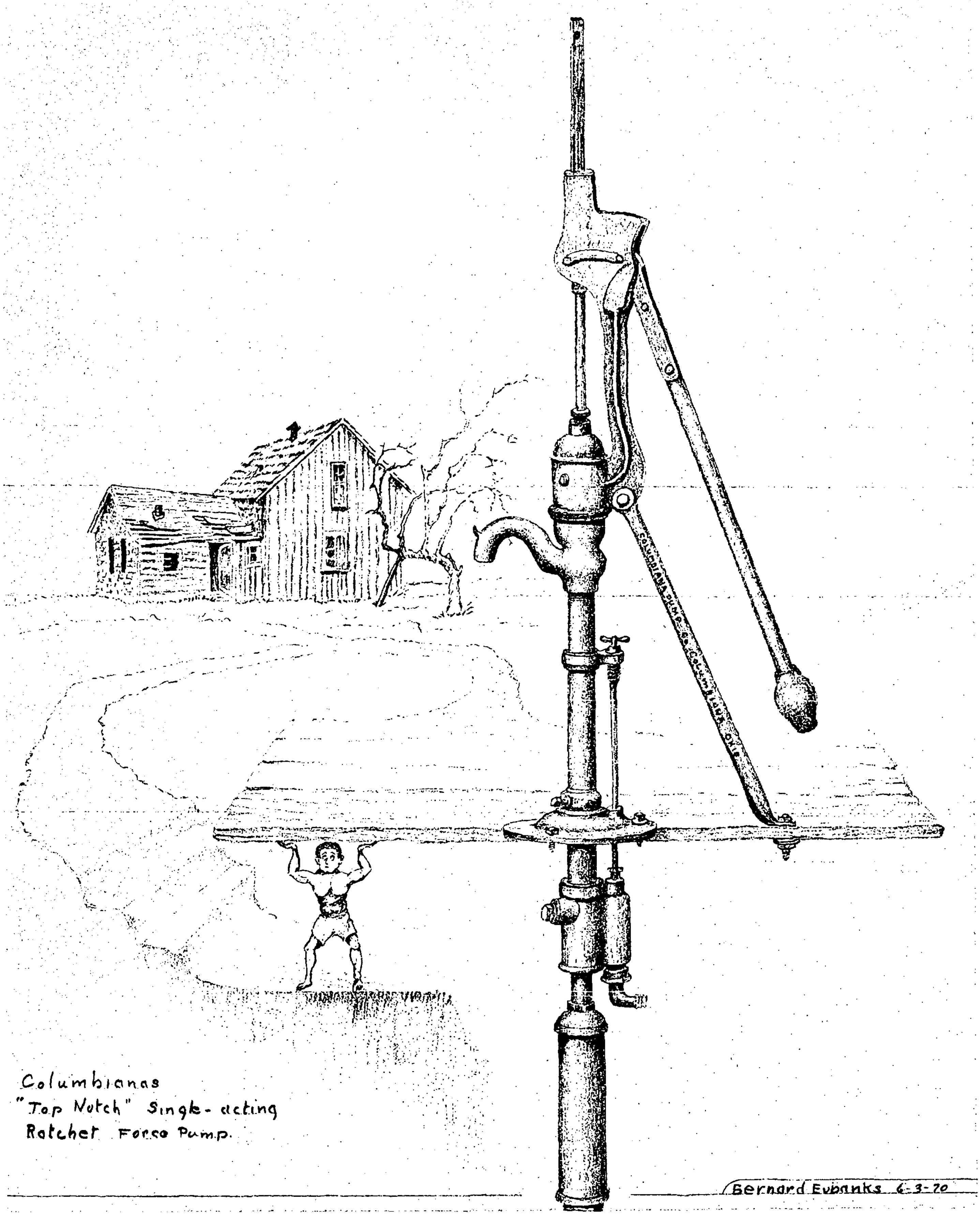
It is a large, heavy duty, deep well pump.

Mr. Pierce emphasized the use of his pumps for “Fire Fighting Purposes”.

The “anti-freezing” feature consists of a small hole drilled in the well pipe, below the frost line and above the pumping cylinder.

Thus the prime is not lost, and no water is left in the pump to freeze.

This pump, complete,
was priced at $16.00.



Columbianas
"Top Notch" Single-acting
Ratchet Force Pump.

Bernard Eubanks 6-3-70

THIS PUMP was made by The **COLUMBIANA PUMP CO.** 80 or 90 years ago.

It is a heavy-duty, air compression pump with several unique features. The enclosed "gear teeth" on the end of the handle, and on the pump rod, provide smoothe vertical action and eliminates the "lateral hinge".

(The Myers Company obtained several patents on this type of pump action).

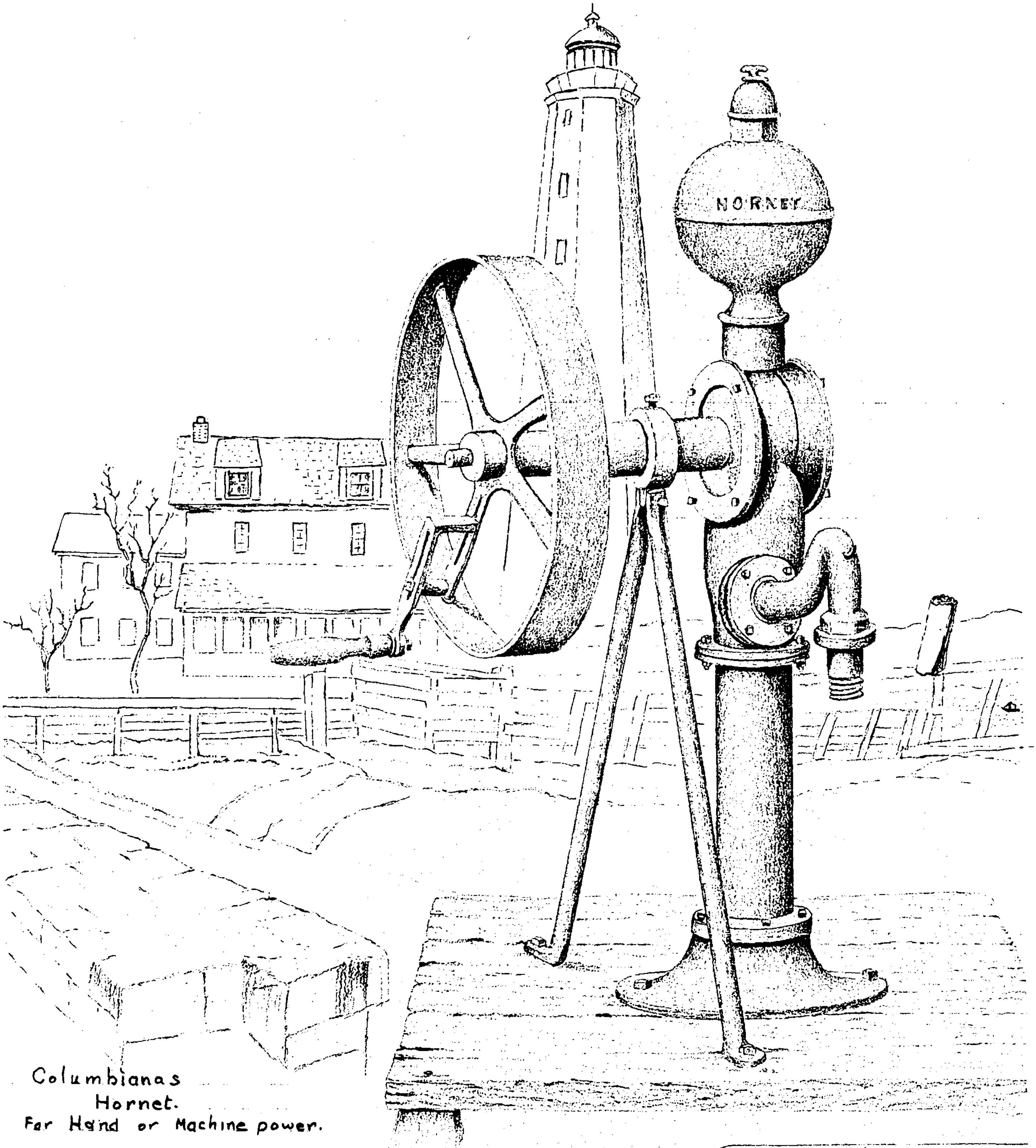
The iron ball on the end of the handle, adds leverage weight, and lessens the power needed to raise the water.

(See "pump lift weight.")

Note the method of controling the "underground discharge"; the water can be piped under ground to any place where it is needed.

The "pumping cylinder", (at bottom of pump), can be set at various depths of the well pipe, depending on the depth of the well.

The prices of this one ranged from $18.50 to $22.50.



Columbianas
Hornet.
For Hand or Machine power.

Bernard Eubanks 6-15-70

This **HORNET** model was made by the Columbiana Pump Co.

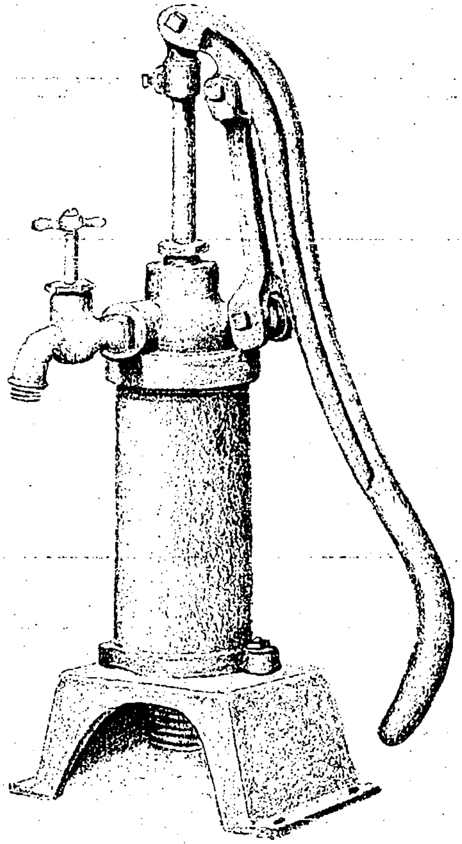
Altho it is operated by a wheel and crank, it is a reciprocating, piston-cylinder single acting pump.

Can be run by hand, or may be equipped with tight and loose pulleys, so it can run with a steam engine. (Before the days of the gas or electric motors.)

Was used mostly in shallow wells, but could be fitted with the pumping cylinder lower down on the well pipe for deeper wells.

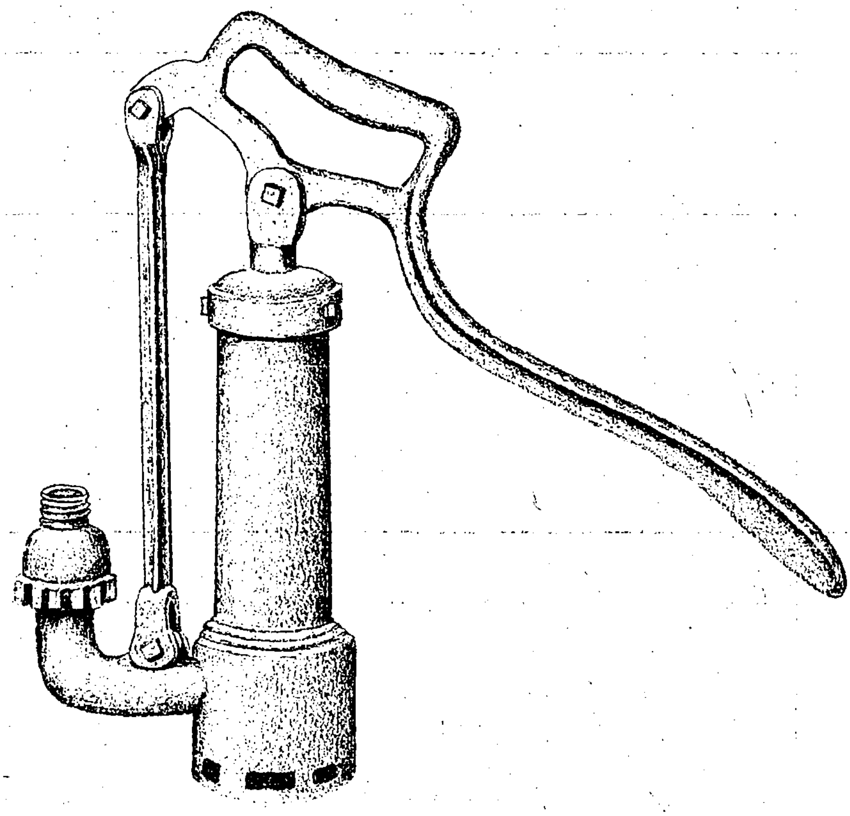
A rare type of pump. They made it in two sizes.

Price ? $28.00.



Bantum House Force Pump

By Columbiana



Plumbers Pump

Bernard M Eubanks 5-25-70

COLUMBIANA PUMPS

These two pumps are part of Columbianas many interesting models.

The "Bantum House Force Pump" is designed to be used in the kitchen.

It works the opposite of the Plumbers pump. It has a valve in the plunger and "sucks" the water in, as well as expelling it, on the up-stroke of the piston, or the down stroke of the pump handle.

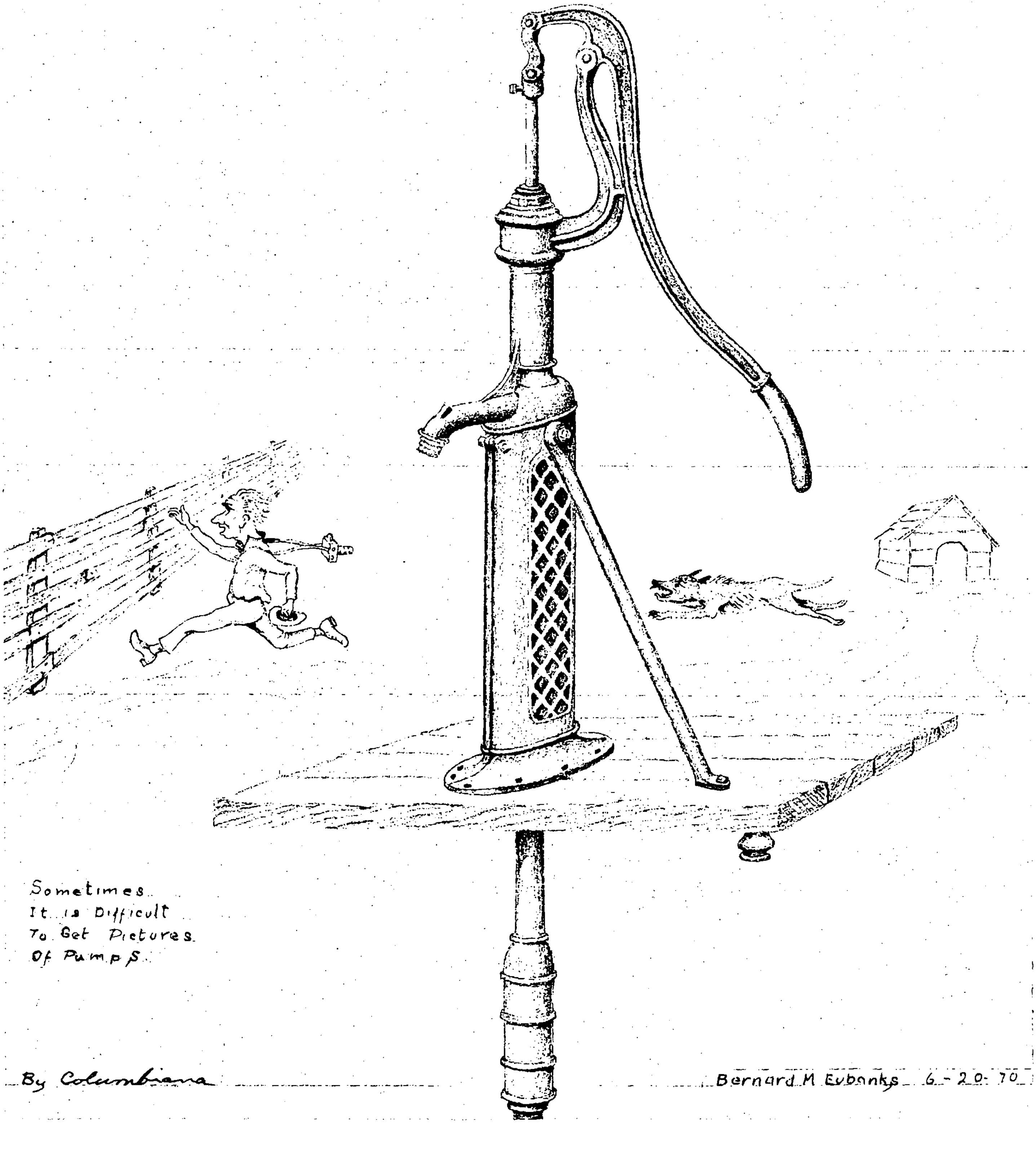
The **PLUMBERS PUMP** is about the simplest of all pumps.

You will notice that the discharge pipe is at the bottom side of the cylinder.

The "plunger" has no valve, it sucks the water in on the up-stroke of the plunger AND handle, and forces it out on the down stroke.

There is a check valve in the bottom of the cylinder, and one in the outlet pipe.

Each priced at $10.00.


Sometimes
It is Difficult
To Get Pictures
Of Pumps
By Columbiana
Bernard M Eubanks 6-20-70

COTTAGE FORCE PUMP

Columbiana made this force pump with a "decorative jacket" for domestic use.

The small "barrel" above the spout, acts as a compression chamber to help put out a steady flow of water.

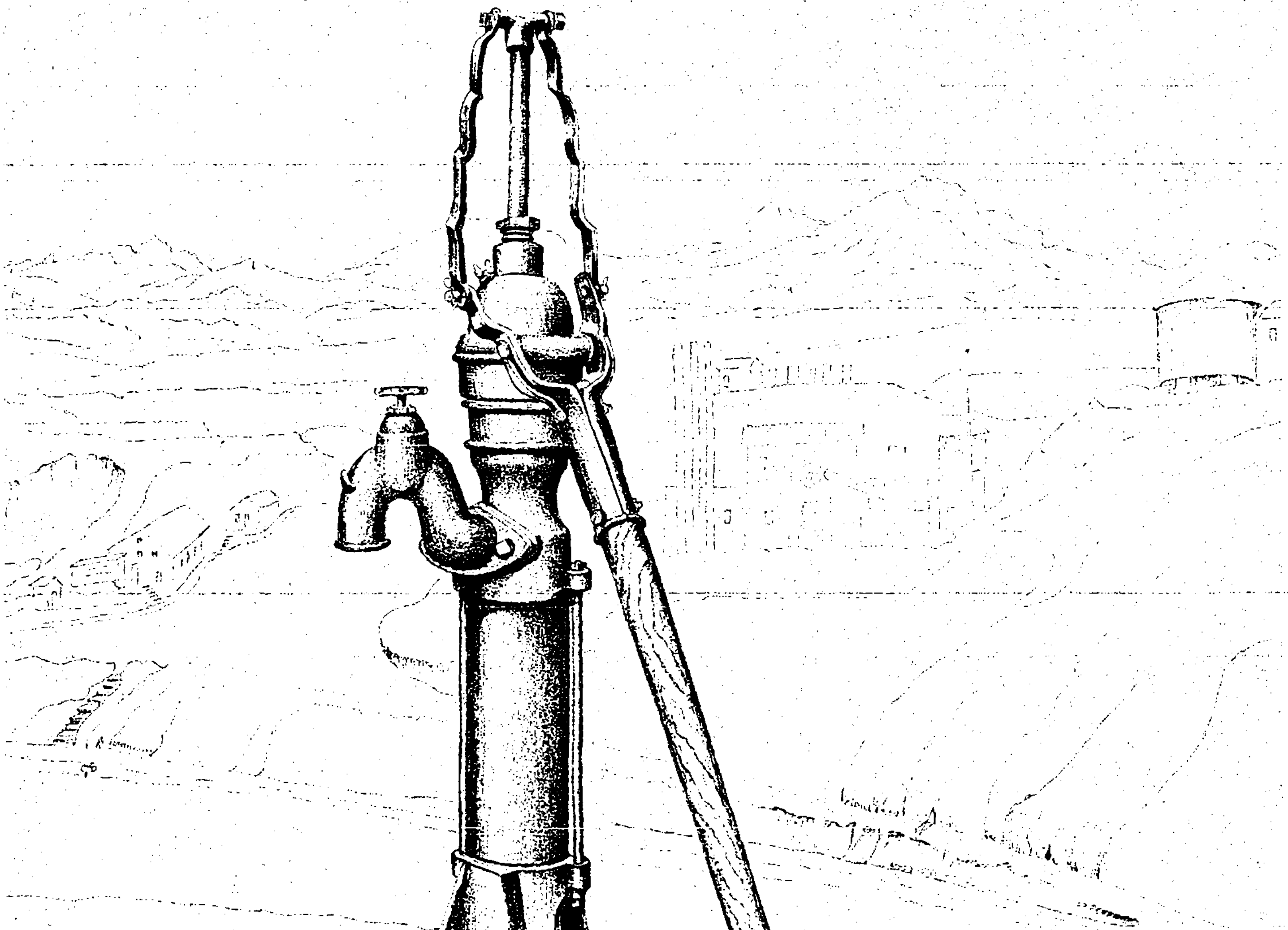
The "pumping cylinder" can be set at various depths along the well pipe for deeper wells.

The "anti-freeze" hole is bored just above this cylinder.

The pump has a sturdy brace rod to keep it steady while pumping.

COLUMBIANA made about 80 different models of pumps, each in several sizes.

Price; 11.00 to $15.00



Didtomaceous Earth Plant
And Oregons 3 Sisters
Mountains in Background.

"Royal House Force Pump."
By Columbiana.

Bernard Eubanks 6-8-1970

COLUMBIANA

Called this odd looking one

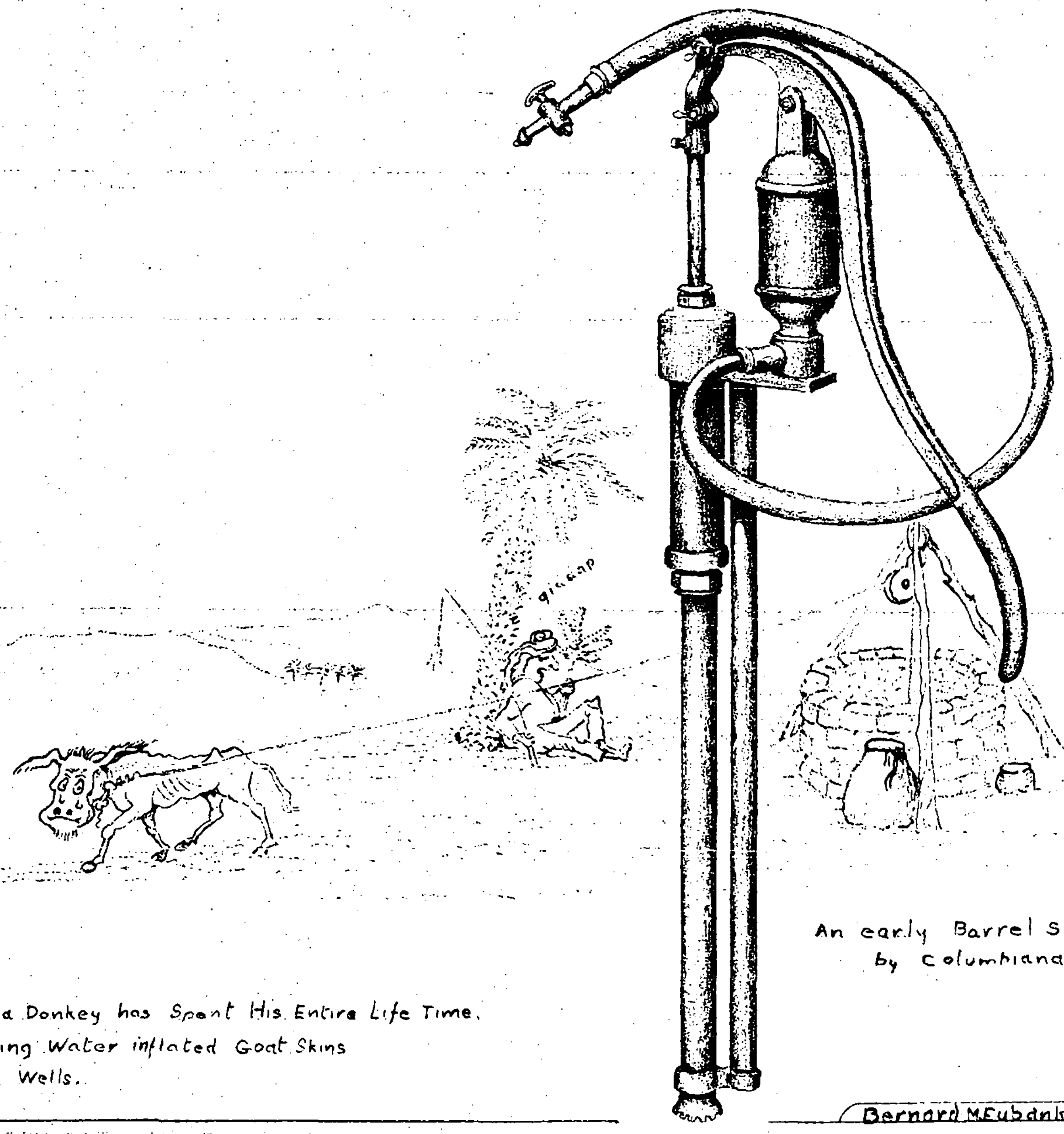
THE ROYAL HOUSE FORCE PUMP.

Note the unique leverage method used to operate the plunger rod.

All kinds of "gadgets" and different methods were patentable, which partly accounts for so many hundreds of patents issued on pumps.

This one has an air-chamber and "force spout". When the valve is closed, the water is forced out a pipe connection on the other side of the pump.

Price quoted; with brass cylinder, $12.00.



An early Barrel Spray Pump
by Columbiana

Many a Donkey has Spent His Entire Life Time,
Drawing Water inflated Goat Skins
From Wells.

Bernard M Eubanks 5-17-70

A neat efficient **SPRAY PUMP** made by Columbiana about 70 years ago.

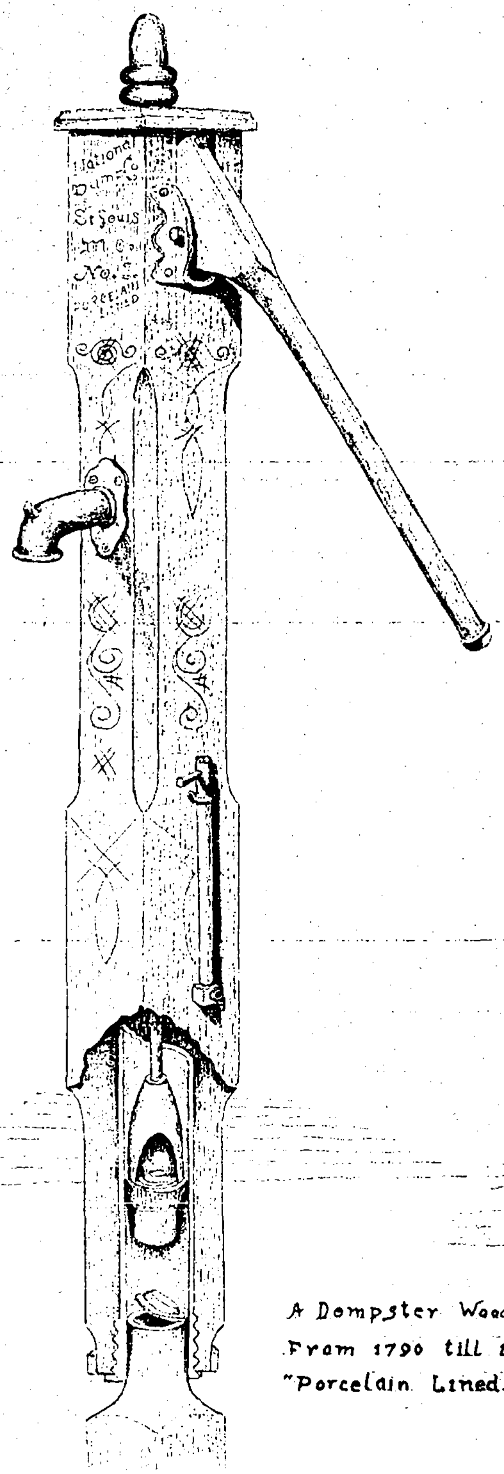
It was designed to pump water from a barrel or tank, especially for the purpose of spraying fruit trees.

The "plunger" is in the top part of the "standard" pipe and has no valve.

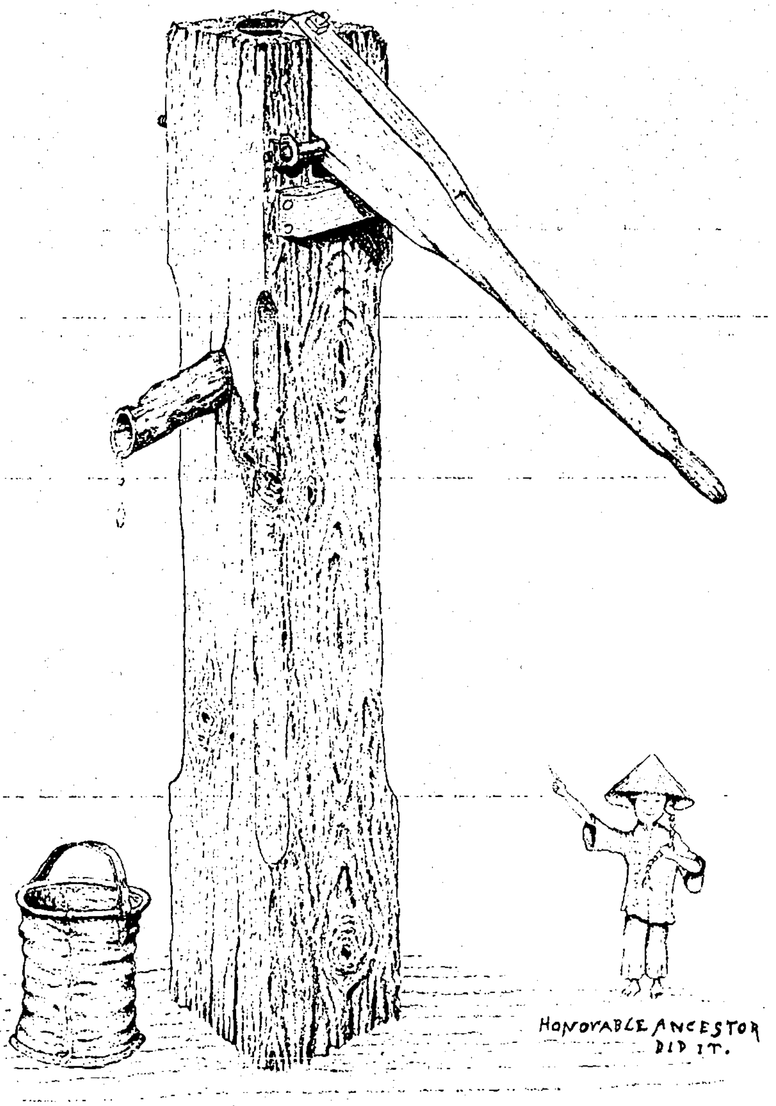
It sucks the water into the main pipe on the "up stroke" and forces it out through the side pipe to the hose, on the down stroke.

The air chamber helps provide a steady flow and an even pressure. Priced at $12.00.

The background sketch shows an age old, universal method of drawing water.



A Dompster Wood Pump.
From 1790 till 1910.
"Porcelain Lined."



CHINESE PUMP.
LEATHER BUCKET.
Probably Built about 1860
In Mueseum at Jacksonville Ore.

SCALE 1½" = 1'

Bernard M. Eubanks 1-10-69

SEVERAL HUNDRED THOUSAND WOOD PUMPS

Such as this were made in this country by various pump companies and individual pump makers.

This one has a "procelain lined" cylinder; It, and the popular type lift bucket, or plunger, are clearly shown. Note the simple type "check valve" on top of the wooden well pipe.

The long "gadget" on the side of the pump, is a simple drain cock, so the water can be drained out to prevent freezing.

The Dempster Pump Co. was involved in the manufacture of such pumps as far back as 1790.

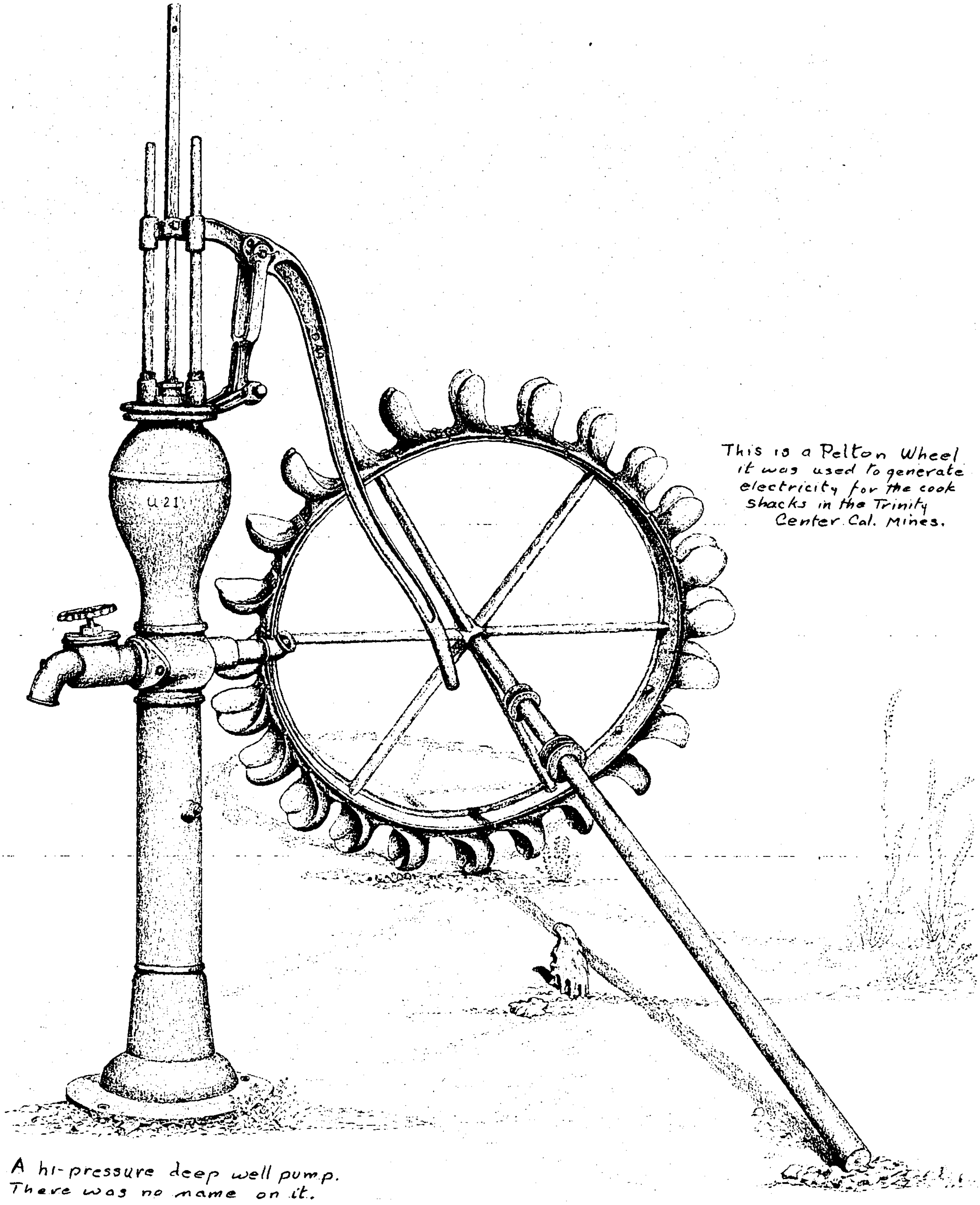
This very crude wood pump

is in the museum at Jacksonville, Ore.; an old mining town.

I call it a CHINESE PUMP, as the Chinese miners and workers are supposed to have made it; perhaps as long ago as 1860.

These pumps were very easy to make, simply by boring a hole lengthwise thru a log or timber, and a hole for the spout. Then installing a check valve, a plunger and a handle.

The "boring augurs" were made by the blacksmith.



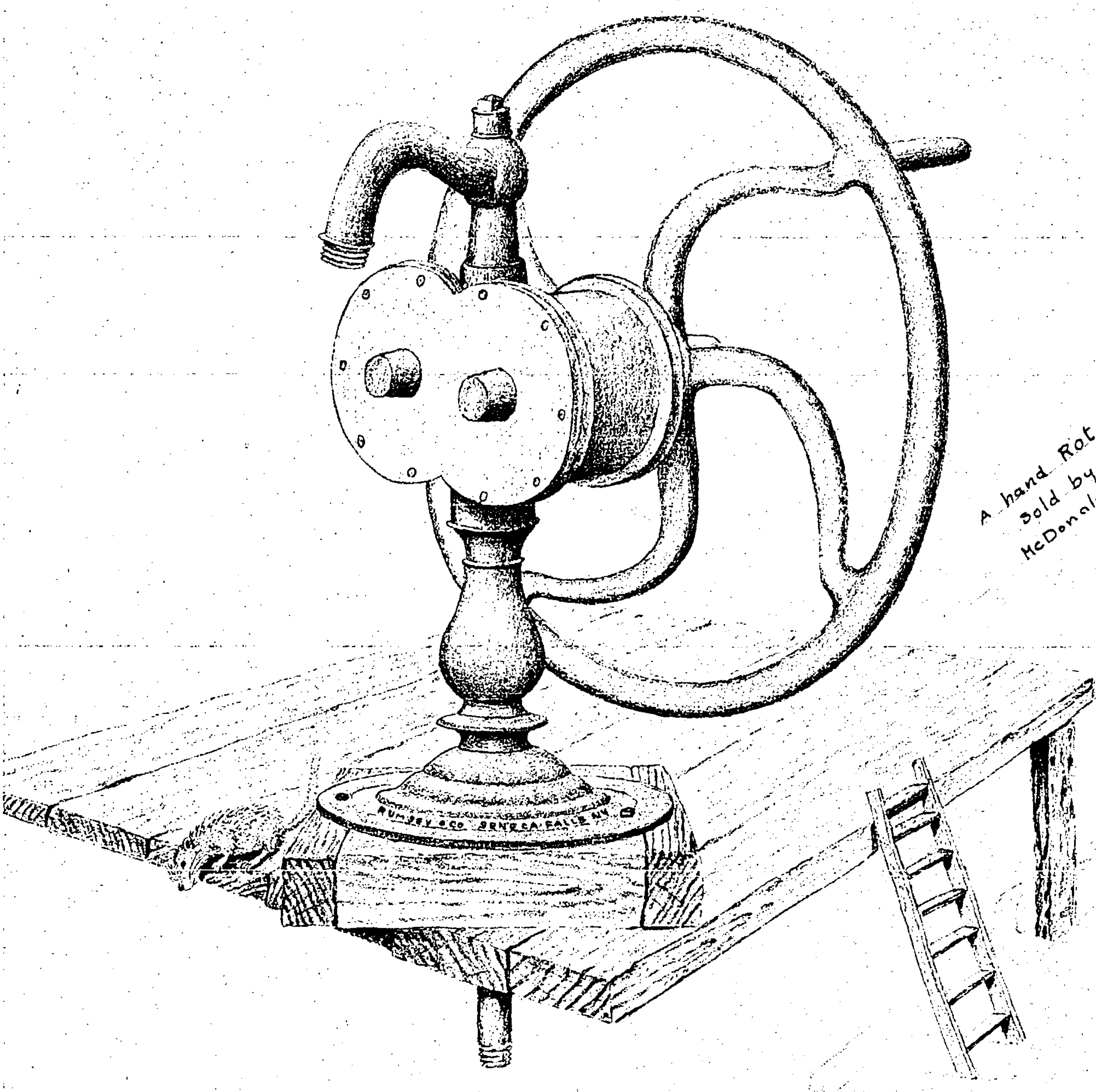
A hi-pressure deep well pump.
There was no name on it.

Pump and Pelton Wheel

Bernard Eubanks Nov. 1968

This **ANTIQUE PUMP** found in the museum in Trinity Center, Cal., had no identifying marks on it.

PELTON WHEELS such as this crude home made one, were used around the turn of the century to furnish electric lights "on the spot" for isolated places, such as mining camps and farms.

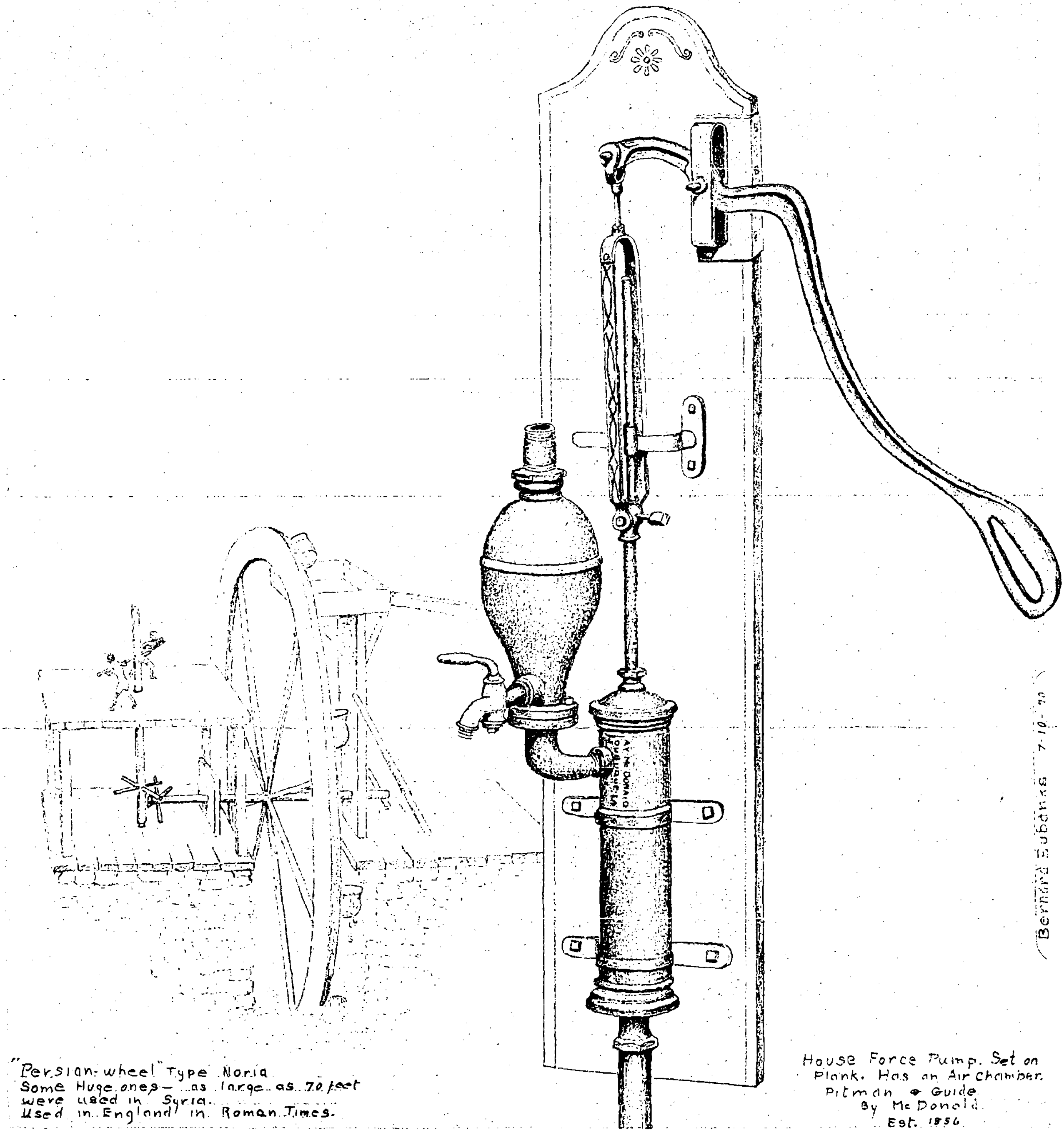


A hand Rotary
sold by
McDonald Pump Co

Bernard M. Eubanks 5-29-70

HAND ROTARY

At one time the hand rotary pump was a real contender for pump business. It's use proved to be very limited, so it soon gave way to the piston-cylinder pump, both wood and iron.



"Persian-wheel" Type Noria
Some Huge ones— as large as 70 feet
were used in Syria.
Used in England in Roman Times.

House Force Pump. Set on
Plank. Has an Air Chamber.
Pitman & Guide.
By McDonald.
Est. 1856.

HOUSE FORCE PUMP

Made by McDonald

"It is beautifully finished, with brass bolts and rods. The board it is mounted on, and the pump itself, are artistically painted and decorated, and great care is taken to have all parts neatly and tastfully finished".

This kind of pump was frequently installed in kitchens.

It is a "powerful, hi-pressure pump."

Lead pipe was still being used with some of them.

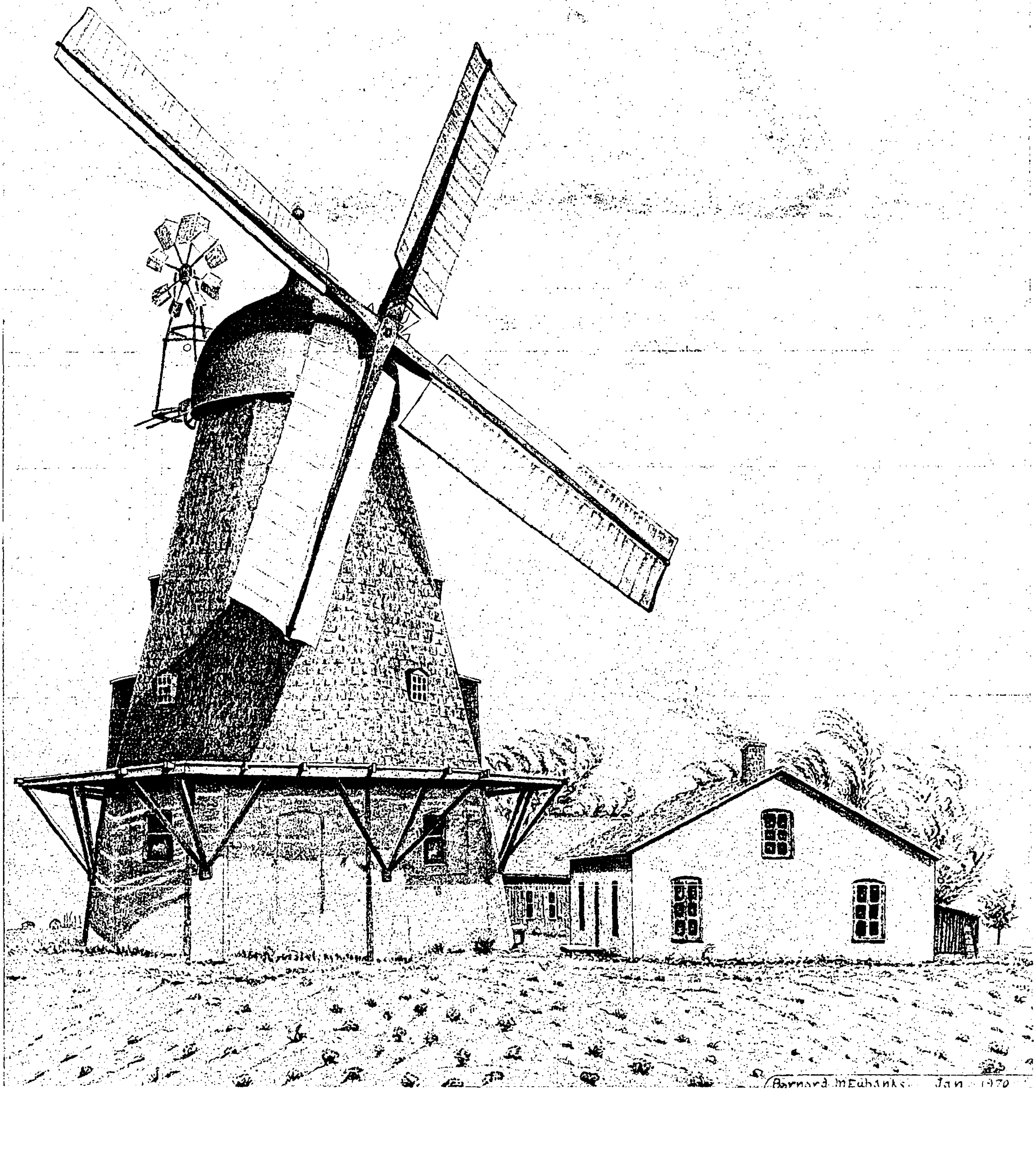
Note the simple method of compensating for the "lateral" motion of the pump rod, so it can continue its vertical movement thru the "stuffing box", with a minimum of friction.

Lots of this type of pump were mounted on planks, even after the turn of the century.

This **PERSIAN-WHEEL** type

of NORIA was a very popular kind of water lifter for a period of several thousand years. In the middle east, a good many of them are still in use.

This one has a very crude "gearing system". Many of them were operated by animals instead of men.


Barnard M Eubanks Jan. 1970

THE OLD DUTCH MILL

This is only one model of the many that were used in England, Europe and other countries for over 500 years.

Many of them are still in use.

They migrated to our country with the first settlers.

This particular one is Danish.

SECTION II

AMERICAN PUMP COMPANIES AND THE PUMPS THEY MADE

THE W. & B. DOUGLASS CO.

In looking into the history of American pumps, one of my greatest desires was to find out what the first cast-iron pumps were like, who made them and when. Well, I finally found out. It took about two years of research; writing letters, following leads, using libraries, checking books on early American manufacturers. The honor apparently goes to the W. & B. Douglass Co. of Middletown, Connecticut. They were the makers of the first cast-iron hand water pumps in the U.S.A. Not only that, there is no evidence of any cast-iron pumps made in any other country before that time.

I was very fortunate in getting copies of the "pump pages" of one of their catalogues which was on file with the Connecticut Historical Society.[42] This catalogue, which is dated September 1854, contains the Douglasses claim of being "The Oldest Establishment of its kind in the U.S.A., established in 1832." Apparently their claim was not disputed at that time, nor is it apt to be at this late date. There were mostly wood pump makers up to that time though there probably were a few pumps being made of brass and bronze, but not in any quantity.

The only later information I could find about the company was one page from a later catalog that came with the 1854 one. On this page was the following statement:

The Patent Aquarius
A New and Valuable Hand Force Pump
Awarded the Highest Medal
by the
Universal Exposition
At Paris, France, 1867

I do not know how much later the W. & B. Douglass Co. was in business. The librarian researching the Douglasses did not report any thing more on them. The Wm. Douglass & Sons were not related and were in business later.

Later, in checking over testimonials about the Pierce Well Excavator Company's display at the International Centennial held in Philadelphia in 1876, I found one by the W. & B. Douglass & Co., Mfgr. of Pumps. So, apparently, they were in business as late as 1876. What became of them after that I have been unable to learn.

The 1854 catalog of the W. & B. Douglass Co. shows about ten different models of pumps. It does not indicate which model was the original.

One was a tall "yard pump," in three sizes, "for shallow wells only."

One model of "double rod" pump was shown in two sizes. There was no mention what the double rod was for. It was merely shown as an extra rod protruding from the top of the pump alongside the regular pump rod, but is not fastened to the handle.

They made six sizes of the "Patent Revolving Stand Premium Pump." This was their main model for average home and farm use.

The "suction and force pump", made in two sizes, was short and heavy barreled with the upper part of the barrel enlarged to form an air chamber, which they say, makes it an "Engine Pump" and throws a steady stream of water.

One model was called #3. It was a small "force" pump with a large flat base, to set on a table or platform, making it convenient for supplying water "to bathing rooms and other purposes." The spout was turned up with a coupling on it so a pipe could be attached.

They made two models of double barrel pumps, which were mounted on planks set in the well. These were very powerful pumps, made to be operated by two or more men, or any other power: horse, wind, water, or steam. They were made in five sizes. The smallest, #3, used 1¼ inch well pipe. The largest, # 10, used 3 or 3¼ inch well pipe.

Such a pump, operated with maximum power, would make a very effective fire fighting machine. The water could be piped quite a distance and still have plenty of pressure. It was recommended for railway water stations, steam boats, factories, etc.

Larger sizes of these pumps "were made to order on short notice."

One model of a single barrel suction and force pump, was also mounted on a plank. It was described as "suitable for forcing water up into bathing chambers", factories, or any other elevated position required. This model was made in six different sizes, and could be operated by whatever power was available.

The only "deep well" pump shown in their catalog was the single barrel one just described. The way they made a deep well pump out of it was to mount it on a timber farther down in the well. Of course, that had its limits. The whole pump was set on the timber at whatever depth was necessary to get it within 25 feet of the water.

The pump rod had to extend from the handle, through guides, down to the pump, which contained the plunger.

In the regular, or "modern", deep well pump, the pump rod goes down through the pump and water pipe to the pumping cylinder, which is inside the pipe.

In the Douglass pump, the water pipe comes up to one side of the pump rod. On top of the pipe is an air chamber from which the spout protrudes. This "air barrel" as well as the pump handle, is attached to the part of the plank that protrudes above the top of the well.

I made a drawing of this "deep well arrangement" as depicted in the catalog.

In all of the W. & B. Douglass pumps shown, the "barrel" of the pump was also the pump cylinder, in which the plunger worked. At no time did they show the type of plunger they used.

I was a bit surprised to learn that "lead" pipe was used as standard equipment. "Other kinds would be supplied if desired."

Iron was the standard metal used in the main parts of their pumps but they would make them of brass on special order.

Their regular house and yard pump was a "lift" pump, similar to the later ordinary "pitcher" pump, except the spout was round instead of pitcher-spout shaped. The plate on top of the pump was "slotted" to allow for the lateral action of the pump rod. The top plate which was also part of the handle support and hinge, was made so it could be turned to any necessary position. Thus, the pump was called "Patent Revolving Stand Premium Pump." (They had received many premiums and awards at fairs for their pumps.)

Another feature of their pumps they claimed as very important was that the whole pump (or standard) screwed on and off of the base, which gave easy access to all working parts.

The air-compression chamber was not used very much in the Douglass pumps. However, in most of them, they used an air tight "packing nut" where the pump rod enters the top of the pump. This had the effect of making it a force or pressure pump which was necessary in order to force water to elevated tanks or for fire fighting purposes.

A very important product of the Douglass Co. was a portable "Fire Engine." It was a four man pump mounted on a water tank. The tank had two handles and two wheels so it could be easily moved around like a cart. The pump was a two cylinder affair that would throw a steady stream of water. The water could be pumped from the tank or from a cistern or well by using a suction hose, which was provided for the purpose. A hose with a nozzle was attached to the outlet so the water could be directed where needed. The machine could throw water 50 or 60 feet high.

It certainly was a valuable pump to have around factories, farms, or any other place where there was danger of fire or where water was needed.

They also made a "one man" machine of this kind, called a "hand garden or fire engine", for use around homes.

How about Chain Pumps, you may ask? Yes, they made several models and sizes of them. They show cuts of "three styles of our IRON CURBS for CHAIN PUMPS." A "curb" is the main body, or housing of a pump, be it a wood, iron or chain pump. "They are very ornamental and the most perfect arrangement of its kind in use. We have just received letters patent from the U.S. for our latest improvements on the article." They show two short styles to be placed on a sink, table or other platform. Also, one long one in suitable length to stand on the level of the ground.

They also made a more or less crude type chain pump for regular farm and outdoor use.

"These are a very cheap and simple pump for outdoor use, and are admirably adapted for COLD CLIMATES, as they will never freeze up. We made the chain with buckets of various sizes, from one inch to three inches, yet 1¼ and 1½ inches are the sizes commonly required."

The type of "bucket" and chain they used was not shown. The sprocket was, however, and the "ratchet" to keep the chain from going down backwards, due to the weight of the water in the lift buckets.

The W. & B. Douglass Co. was quite proud of their RAMS. They made five sizes of the regular hydraulic ram. The smallest weighed about 22 pounds and would supply about two gallons of water a minute. Their largest one, #6, weighed about 125 pounds, and would supply up to 25 gallons per minute.

The amount of water a ram raises, and the height to which it is pushed, depends on the size of the ram, the amount of water entering it and the drop or fall of the water.

An outstanding achievement in hydraulics was the invention of the "Hydraulic Ram Engine," for which Douglass claims the honor. The 1847 U.S. patent book shows two patents for "ram operated pumps," but the name to which they were issued was not stated. Medals were issued to Douglass for the invention, one at a fair held in New York in 1848 and one in Connecticut in 1849.

I have written more on the ram in a special chapter.

To ship their pumps to dealers and agencies, Douglass packed them in "hogsheads." Which was to them, an extra large wooden barrel. Their #0, or smallest, pumps were packed 40 to a hogshead, and of the #6, it took only ten to fill one.

The #0 pump would put out 6 gallons of water a minute. The #3 pump, 15 gallons and the largest, #6, was good for 30 gallons. These pumps weighed 15, 29, and 55 pounds each, respectively.

In studying the W. & B. Douglass & Co. catalog, I would say that they had developed a complete, practical and efficient system of pumps. Their one weak point might be their "deep well" pump. It wouldn't be practical in wells over 40 or 50 feet, and it has to be installed in dug wells. Drilled wells with a casing required a different type of installation.

The only history I have been able to get about the W. & B. Douglasses of Connecticut was – "in the early 1700's, one son went to New York, one to Virginia and one to Pennsylvania."[42] Also, that there was no connection between the W. & B. Douglass and the Wm. Douglass & Sons Company.

THE MINER PUMP

The first, or earliest, patent I can find on the wooden hand water pump was one issued to A. Miner, of Jordan, Onandaga County, New York, on July 7, 1835. The pump was manufactured by Henry Warren & Company who apparently had exclusive rights for the states of New York, Vermont, Georgia, and South Carolina.

I have a xerox copy of a picture of this pump as registered in the U.S. Patent Office. The written description of the pump was unavailable as it was lost in the Patent Office fire in 1839 or the one in 1850.

This picture (drawing) of the pump is the same as the one appearing in an advertisement in the "Onondaga Standard" of February 24, 1836. Even if this should be the earliest wood pump on Patent records, it does not mean that it was the first one made in this country.

Wooden pumps were being made in New York state about 200 years before this pump came along and very likely some had been patented, as our patent system started right after the Constitution was written. For over 50 years Patents were only dated and not numbered so it is a difficult job to find out about them during that time. I asked a research librarian to look up Patents on pumps prior to 1835 but was unable to find anything.

Some of the features of this new Miner pump was the use of iron for the handle, spout and base. The "plunger" was also made of iron and did not use a leather skirting. The plunger had to be very accurately fitted into the cylinder in order to "pump a vacuum" to suck water.

The Warren Company must have made several different models of the Miner pump as their advertisement reads, "The public is solicited to come in and see the various specimens of said pumps now in operation, their ease of operation, convenience, durability, security from frost, and SUPERIORITY OVER ALL OTHERS NOW IN USE."

It is quite evident that the pump was made in 1834, the year prior to the patent date of 1835. One testimonial in July of 1835 mentioned the pumps being installed "last fall." Others said that the pump was superior to any he had seen so far, or any he had used. Most people liked the no-freeze feature and the use of wood well-pipe instead of lead, which could be poisonous.

Some other wood pumps also had no-freeze arrangements such as the pumping cylinder down in the well below the frost line with a small drain hole. In the cold winters as they sometimes have in New York, wood pumps as well as the iron ones could freeze and break.

THE GOULDS PUMP COMPANY

GOULDS trace their origin back over 125 years, and is one of our Country's very first pump makers that we have any record of.

For a long time it was thought that DOWNS, the fore-runner of the GOULDS Company, made the first cast-iron, hand, water pump. However, research proved otherwise and I have already told about the "first one." I happen to have xerox records of it.

Able Downs really started the company back in 1840 in Seneca Falls, New York. He was one of the first to take advantage of the water power at the falls for manufacturing purposes. He set up shop in a wing of the "Old Cotton Factory", which was previously used as a plaster mill. He started making wooden pumps and was soon joined by Hezikiah Kelly and a man by the name of Wheeler. Their place burned in the "great conflagration of 1843." They then erected a small factory "over the river" and employed five men. Mr. Downs went into the mercantile business for a couple of years, to sell pumps, while Kelly ran the factory.

In 1844, Downs went back into the factory and was soon joined by Mr. Smith Briggs, and the company was called the Wheeler, Briggs & Company. The members of the company seem to be a bit confused about that time. Anyway, in 1845, Wheeler and Downs purchased the "Old Stone Shop" and moved all of their material and machines to the new place.

They purchased a Steam Engine to replace the old water wheel for power. This was the first steam engine to be used for manufacturing purposes in Seneca Falls. Also, at this plant in 1845, they built the FIRST CAST-IRON HAND, WATER PUMP made in Seneca Falls. This one and some of Douglass' was the forerunner of many millions of iron water pumps eventually to be made in the U.S.A.

In another year or so, a Mr. Menderse and Mr. Silsby became associated with the company and in 1846 it was called Downs & Menderse Company. They were now making both wood and iron pumps.

I do not know why so much change in personnel, unless it was for financial reasons, either godd or bad. Maybe some sort of stock market manipulation.

At last a Gould came along, which I knew eventually would happen. In 1851, Seabury Gould bought the interest of Ed Menderse, and the company became "Downs, Silsby & Gould." It was not long until Silsby dropped out which left only Downs and Gould as sole owners and the company was again renamed and became Downs & Company.

The pump business was now going strong. In 1851 the plant had 60 to 70 men working and they were using four tons of iron a day. They needed to expand so in 1854 they built a new plant between the canal and the river, east of the Ovid Street bridge. The work force soon was increased to 200 men and they were using between 10 and 14 tons of iron every day. It had become quite a factory for that day and age.

Mr. Barben, of Goulds Pump Company, resurrected an old Downs (Goulds) catalog dated 1853. Thanks to him, I now have a copy of it. It is one year older than the oldest Pump Catalog I had received up to that time which was from the Douglass Company, dated 1854.

Downs & Company were only 13 years old at that time and were not making very many models of pumps but were certainly making some odd looking ones. Many of the pumps that far back were so queer looking it was hard to realize they were made to pump water unless someone told you.

However, most of Gould's early models looked pretty much like regular water pumps. Some were called "revolving spout" pumps. The spout was cast in a separate section of the standard and could be revolved or turned to any position desired in relation to the handle. Some pump makers achieved this by making the section that the handle was attached to, adjustable, and secured by a set screw.

Gould's lift pumps could be drained to prevent freezing by raising the "brake" clear up, which tripped the valve. Most of the later pump makers adopted this feature.

They also made "garden engines," which was a short husky pump with a large air compression chamber, and mounted on a "wheel-barrow tank." Very similar to the ones made by Douglass.

Small chain pumps for use in the kitchen were popular in those days and Gould's made some of them, also. Their catalog shows two highly decorated "Iron Curbs for Chain Pumps," "combining ornament with utility, and are without rival in the market."

The following is part of the written description of their chain pumps, which is interesting and informative:

"Zinc Tubing for Chain Pumps"

"We here present a representation of the NEW ZINC TUBING for the chain pump which seems to be all that is wanting to render this very popular pump perfect in every particular. The only serious objection which has ever been urged against the chain pump has arisen from the fact that the water, after a short time, has been rendered impure by the friction of the Buttons on the sides of the Wood Tubing – a very serious objection, indeed, whether considered in reference to its use for Dairy purposes or any other. But this objection will at once be seen, is entirely obviated by the Zinc Tubing, while it is entirely free from other difficulties to which the other is liable; and is much more easy of transportation than the Wood Tubing."

In 1849, their sales amounted to $43,000 and in 1850 had increased to $70,000. Then, in 1851, their sales amounted to $100,000. The business was really growing by "leaps & bounds." By 1860, their annual sales had reached $400,000. No wonder so many people wanted to get into the pump business about that time.

They were now making 20 models of pumps in 130 different sizes. Now that is a lot of pump business and a lot of pumps, especially when you consider that it was over 100 years ago and before the Civil War.

I wonder how many pumps could be made in one year, by 200 men, using 3600 tons of iron? Well, if the pumps averaged about 70 pounds each (they were not that heavy) the number would be about 100,000. Ten years at that rate and they would have a million of them scattered around the country. Remember, the Goulds made hand pumps for over 100 years. The number of pumps they made could be staggering.

Of course everyone took time out for the Civil War (about ten years). After that, pump companies sprang up like mushrooms. The population increased fast, just like after every war, and the demand for pumps increased accordingly. Pump production in the U.S.A. reached its peak around the turn of the century. You can readily see how difficult it is to arrive at a reasonable estimate of the total number of pumps to eventually come off the production lines. (I made such an estimate; now I am thinking of revising it, upwards.)

It was in 1869 when they finally took the name of "GOULDS MFGR. COMPANY" and it so remained until 1926 when the present name, GOULDS PUMPS, INC., was adopted.

For quite a few years they had been making several iron articles besides pumps. In 1905, they discontinued everything except pumps. I do not know when they started on electric pumps but they continued turning out the old hand water pump until 1943. The Goulds Company had no record of how many models or numbers they made during that period of about 100 years, but it must have been over a million.

It seems odd to me, but I have not run across a single Goulds pump in this area, and I have done a lot of searching and have looked at many dozens of pumps. Of course, there are a lot of them around that I have not seen and no doubt I have by-passed some of the Goulds.

They have been one of the most prolific pump makers in the country and made several unusual models as well as a great many "conventional" type. (By the way – Mr. Barben, of Goulds, has in his private pump collection an old wooden pump with Kelly's name on it.)

The new plant became one of the world's largest and most modern pump manufacturing companies. They sell pumps all over the world, turning out over 100,000 a year, electric, of course. They made household pumps as small as 3-4 HP, pumping only about five gallons a minute, to huge ones that will handle as much as 70,000 gallons a minute. Yes, that is right: 70,000 gallons. Hard to believe, isn't it? A few of them would almost pump the ocean dry; at least it would clean out Joseph's well in one gulp. The pump only weighs 16 tons and requires a 2500 horse power motor to operate it. The largest pump they ever made was for a petroleum pipe line. It was so big it took three flat cars to carry it to its destination.

That certainly belittles my insignificant little hand pump, doesn't it?

I had better quit there before I get to telling some *real* pump yarns.

No. 1 Stock and House Pumps,

6¾ x 6¾

Cylinder, 3½ in.; Stroke 9 in.; Capacity per minute, 50 Gallons.

LENGTH.	Plain or Unlined.	Polished Iron Lined.	Porcelain Lined.
6 feet,	$ 4 80	$ 6 30	$ 6 80
7 "	5 20	6 70	7 20
8 "	5 60	7 10	7 60
10 " with extension cyl.,	6 00	7 50	8 00
12 " " " "	6 60	8 10	8 60
14 " " " "	7 20	8 70	9 20
16 " " " "	7 80	9 30	9 80
18 " " " "	8 40	9 90	10 40
20 " " " "	9 00	10 50	11 00
22 " " " "	9 60	11 10	11 60
24 " " " "	10 20	11 70	12 20
26 " " " "	10 80	12 30	12 80
28 " " " "	11 40	12 90	13 40
30 " " " "	12 00	13 50	14 00

No. 0 Tubing, 4½x4½, 2 in. bore,	15
" 1 " 4x4, 1¾ " "	12
Extension Tubing, 6x6,	30
" " 5x5,	25
Couplings, with welded bands,	40
Extra Plungers, 3½ inch,	65
" Plunger Leathers, per doz.,	3 00
" Check Valves, " "	1 50

No. 2 House Pumps,

6¼ x 6¼.

THE FAVORITE.

Cylinder, 3¼in.; Stroke, 8¼ in; Capacity, per minute 45 Gallons.

LENGTH.	Plain or Unlined.	Polished Iron Lined.	Porcelain Lined.
6 feet,	$ 4 50	$ 6 00	$ 6 50
7 "	4 85	6 35	6 85
8 "	5 20	6 70	7 20
10 " with extension cyl.,	5 70	7 20	7 70
12 " " " "	6 30	7 80	8 30
14 " " " "	6 90	8 40	8 90
16 " " " "	7 50	9 00	9 50
18 " " " "	8 10	9 60	10 10
20 " " " "	8 70	10 20	10 70
22 " " " "	9 30	10 80	11 30
24 " " " "	9 90	11 40	11 90
26 " " " "	10 50	12 00	12 50
28 " " " "	11 10	12 60	13 10
30 " " " "	11 70	13 20	13 70

No. 0 Tubing, 4½x4½, 2 inch bore,	15
" 1 " 4x4 1¾ inch "	12
Extension Tubing, 6x6,	30
" " 5x5,	25
Couplings, with welded bands,	40
Extra Plungers, 3½ inch,	65
" Plunger Leathers, per doz,	3 00
" Check Valves, " "	1 50

WM. DOUGLASS & SONS

Wm. Douglass & Sons was another prominent name in early pump history. Mr. Douglass started his pump career in 1857 by working for or as an associate of the R.A. Durbin Pump Company. In 1864, he became a member of the firm under the name of R. A. Durbin & Co.

Then in 1879, Mr. Douglass succeeded his partner and associated with his two sons, Oliver and Stevens, under the name of Wm. Douglass & Sons. The name became well known, as it was painted on many thousands of wooden pumps.

By 1896, the firm was known as Oliver F. Douglass & Company but by 1901 the Douglass pump people seem to have vanished from the records.

William, the elder, or original Douglass, was born in Ohio in 1822 and died in 1899 at the age of 77. Further checking revealed no additional information on the firm.

The only Wm. Douglass & Sons Pump catalog I was able to get was sent to me by Mrs. Frances McDonald of the Indiana State Library. It consists of only four pages. One showing two wood pumps and a chain pump, two pages consisting of an order sheet giving pump sizes and prices and the cover, which showed a very dim picture of their old factory and the following wording:

ORDER BLANK AND REVISED PRICE LIST OF 1890
Wm. Douglass & Sons, Mfgr. of
WOODEN PUMPS WITH BRASS, PORCELAIN OR POLISHED IRON CYLINDERS, CHAIN PUMPS, RUBBER BUCKETS, CHAIN, TUBING, WATER PIPE, TURNED VERANDA COLUMNS, etc.
WORKS: COR. NINTH & MAIN STS., Lafayette, Indiana

I have not made a drawing of the Douglass pump, because it looks the same as many other wood pumps, some I have already drawn. (I will use a copy of their order sheet if it is legible enough to print; otherwise I will list several of their pumps, with prices.)

The order sheet for Douglass pumps, lists the wholesale discount as 50 & 5%. For instance, the #7 cistern pump. "5 x 5 timber, 3" bore, 6 feet long, is listed at $4.25. A 50 & 5% discount off that price sets the wholesale price at slightly over $2.00 each.

How would you have liked to have been in the wood pump business in 1890, maintain a factory, have a large payroll of workmen and sell pumps for $2.00 each?

Apparently, that was the going price, as Wm. Douglass was a member of the Wood Pump Mfgrs. Assn. of the U.S., as were I X L and many others. His prices are listed as:

The Standard List of the Wood Pump Mfgrs. of the U.S. adopted Dec. 9, 1882. Revised Jan. 9, 1890.

(You can probably think of better ways "to get rich quick.")

R. A. DURBON PUMP COMPANY
(The First Pump Maker?)

R. A. Durbon is the first, or earliest, pump maker in the U.S. that I have been able to get the history of.

When the research librarian of the Indiana State Library[28] looked up the histories of the W. & B. Douglass Company and the Wm. Douglass & Sons Company to find out if there was any family connections, she found that R. A. Durbon was associated with Wm. Douglass in the pump business in 1864.

Mr. Biggs had worked for the Durbon Pump Company, as foreman, from 1849 until 1857.

STANDARD LIST
OF THE
Wood Pump Manufacturers
Of the United States.

Adopted December 9, 1882.
Revised January 9th, 1890.

1890

Please ship the following bill of **PUMPS, TUBING,** *&c., to address, which agree to receive and pay for in accordance with the following terms: Time days from Discount* 55 & 5 *with per cent. extra if cash is paid in days.*

Signed Cash with order *Ship via* ~~FOB Terre Haute~~

(With Wood Spouts and Brace.
" Iron "

No. 1 STOCK PUMPS.

Made from 8x8 Timber, 4 inch bore.

	Plain.	Porc. Cyl.	Brass Cyl.	Pol. Iron Cyl.
6 ft. long.	$7.50	$9.00	$10.00	$9.00
7 " "	8.50	10.00	11.00	10.00
8 " "	9.50	11.00	12.00	11.00

No. 3 FARM AND HOUSE PUMPS.

Made from 7 x 7 Timber, 3½ inch Bore.

	Plain.	Porc. Cyl.	Brass Cyl.	Pol. Iron Cyl.
6 ft. long,	$5.70	$7.20	$8.20	$7.20
7 " "	6.20	7.70	8.70	7.70
8 " "	6.70	8.20	9.20	8.20
10 " "	8.00	9.50	10.50	9.50
12 " "	9.30	10.80	11.80	10.80
14 " " two pieces,	8.65	10.15	11.15	10.15
16 " " "	9.35	10.85	11.85	10.85
			Porc. Cyl.	Brass Cyl.
30 " Wells measured from Platform fitted up complete.			14.50	15.50
35 " " " " " " " " "			16.20	17.20
40 " " " " " " " " "			18.00	19.00
45 " " " " " " " " "			19.75	20.75
50 " " " " " " " " "			21.50	22.50

No. 5 FAVORITE HOUSE PUMP.

Made from 6x6 timber, 3½ inch Bore.

	Plain.	Porc. Cyl.	Brass Cyl.	Pol. Iron Cyl.
6 ft. long,	$5.00	$6.50	$7.50	$6.50
7 " "	5.35	6.85	7.85	6.85
8 " "	5.75	7.25	8.25	7.25
10 " "	6.80	8.30	9.30	8.30
12 " "	7.90	9.40	10.40	9.40

No. 7 CISTERN PUMPS.

Made from 5 x 5 timber, 3 inch Bore.

	Plain.	Porc. Cyl.	Brass Cyl.	Pol. Iron Cyl.
6 ft. long,	$4.25	$5.75	$6.75	$5.75
7 " "	4.50	6.00	7.00	6.00

No. 9 DRIVE WELL PUMPS.

Made from 6 x 6 timber.

...long, with 3 ft. iron Cyl. att'd for 1¼ or 1½ Iron pipe,	$6.75
[illegible]	7.40

TUBING, COUPLINGS EXTENSION CYLINDERS.

No. of ft. Ordered.			
......	No. 1 Tubing, 4x4, for all sizes Pumps, except 5x5,	per foot,	$ .14
......	" 2 " 3½x3½, (for cistern pumps,)	"	.11
......	Extension Cylinder, 6x6, 3½ inch bore for deep wells	"	.35
......	" " 5x5, 3 " " " " "	"	.30
......	Heavy Seamless Brass Cylinders, in Block,	"	3.50
......	Porcelain Cylinders, in Block,	"	2.50
......	Maple Cylinders, 3½ inch bore,	"	1.25
......	No. 1 Couplings, with Band, for 4x4 Tubing,	"	.40
......	" 2 " " " 3½x3½ Tubing,	"	.30

EXTRAS, (for Repairs.)

Buckets or Plungers 4 inch leather,	$1.00
" " " 3½ " "	.80
" " " 3 " "	65
Spouts—(Wood,)	20
" " and Brace,	.35
" —Iron Japanned,	.40
Handles,	.30
Iron Handle Brackets or Ears,	.40
Valves, per dozen, assorted,	1.50
Links or Hinges,	.25
Drive Well Attachment—1¼ or 1½-inch Iron Pipe.	1.00
" " Cylinders 6-inch, 1¼ or 1½ inch Iron Pipe,	2.25
Bucket Leathers, per dozen, assorted,	3.50
Splice Iron and Bolts,	.25
Rods and Hinges, 10 ft. and under	.35
" " Bucket and Handle 10 ft. and under,	1.40
Frost Plug, Slide and Staple,	.25
Cap and Ornaments, all sizes,	.55
Heavy Bands,	.12
Plunger Rod, per ft.	.03

CHAIN PUMPS, Discount

Column Curbs, Shoes and Fixtures fastened on.	3 75
Box " " " "	3 15
Galvanized Steel Chain, per ft.	14
Rubber Extension Buckets, [illegible]	[illegible]

In the 1885-86 Lafayette & Tippecanoe County Directory was the following: "The original starting of this old pump company (meaning Wm. Douglass & Sons), was in 1857, when R. A. Durbon was the proprietor. Mr. Durbon was, without doubt, the 'OLDEST PUMP MAKER' in the United States, having been engaged constantly for 40 years in the business."

According to that, Mr. Durbon started his pump business in 1817, which is 15 years before W. & B. Douglass (not Wm. Douglass) was founded in 1832 which claimed to be the earliest establishment of its kind in the U.S.A.

Durbon was making wood pumps and Douglass was making iron pumps.

In 1879, Wm. Douglass bought Durbon out and that was the last we have been able to find out about him. He must have been a very old man by that time. Sixty-two years is a long time for one man to be making pumps. I wish I knew what his first wood pumps were like and how many he made in his life time.

(DEMPSTER COMPANY was connected some way with the manufacture of wood pumps as far back as 1790, through the Florence Lumber Co. of Florence, Alabama. An enquiry from Florence revealed no particulars.)

WOOD PUMP PRICES

I have cuts of wood pumps made by several different companies. Some of them are almost identical and I think the drawings were made by the same draftsman or else taken from an illustration put out by The Association of Wood Pump Manufacturers. Even the decorations seem to be the same.

I also have, from the various pump makers, some forty sheets of price lists and wood pump sizes. They also are very much the same; some companies stated that the prices were adopted by the association.

The list shown on page 102 is only a sample. Some prices were a bit higher and some a little lower. I think the variation is due to the different dates of the catalogs, which were from about 1875 to 1910.

However, this gives a good idea of what the wood pumps used at that time were like and what they cost.

BIGGS PUMP COMPANY

B. F. Biggs and wife migrated from Maryland to Lafayette, Indiana in 1849. He gave up his job as millwright to become foreman of the R. A. Durbon Pump Factory. After nine years with Durbon, he formed a partnership with Wm. Douglass. Two years later he bought Douglass' interest and carried on alone until 1870 when Curtis Wells joined Biggs and the company became Biggs & Wells. The partnership lasted five years when Biggs acquired full control and once again the company became the B. F. Biggs Pump & Supply Company.

Biggs died in 1883 and a son-in-law, H. M. Timberlake, took command. Next in succession was a grandson, Frank Timberlake, in 1921.

In 1944, the company was purchased by George Needham, became the Biggs pump & Supply Company and joined the ranks of modern business.

So much for the history of the Biggs Pump Company.

Now a bit about the product they made, which, of course, was wooden pumps. There was no data as to styles, sizes or how many wood pumps they made, but it must have been a full line in order to meet the competition of the times and be as successful as they were. Mr. Biggs spent much time in "perfecting his pump in every possible way, until it became 'the acknowledged pump of the country'"

The first Biggs pumps were made of yellow poplar and the handle of sugar maple. The "sucker", plunger, liftbucket or whatever you care to call it was made of white oak. (Those three kinds of wood must have been the best available for the purpose as many other pump makers of early times used the same kinds.)

The "sucker", as Biggs called it, was skirted with the usual leather to make a flexible seal in the cylinder. The unique, or unusual feature of Biggs Pumps, was the water lift arrangement. "The sucker" worked up and down on a shaft of elm, thus drawing the water to the spout of the pump. I think Biggs got a patent for this special kind of sucker.

That is all the information I have on the kinds of pumps the Biggs Company made. About 1883, they started stocking iron pumps, but continued making wood pumps and tanks.

I have a picture of the Biggs wood pump, and outwardly, it appears very little different than many other wood pumps, such as National, I X L, etc. It is tall, square, slender, has a metal spout and handle hinge, wood handle and a decorative cap on top. The important part of the Biggs Pump, was the "insides," as is the case with all pumps.

I have seen a picture of only one Biggs pump. The name on it was:

LAFAYETTE PUMP
BIGGS PUMP CO.
LAFAYETTE, INDIANA

There is no way of knowing how many pumps they made but it must have been considerable.

I have a picture of their old factory and it is shown to be about one half block long and three and one half stories high. Five stacks or chimneys are shown, which would indicate quite a bit of manufacturing.

The Biggs Pump & Supply Company of Lafayette, Indiana celebrated their 100 anniversary in 1958 under the able leadership of George Needham.[63]

A. Y. McDONALD PUMP COMPANY

Ol' McDonald may have had a farm; he also had a pump factory and a mighty big one it must have been, or is perhaps I should say, as they are still in business having celebrated their 110th anniversary in 1966. What's more, a grandson, John the third, is chairman of the board of the present company, having served his term as president.[73]

The Ol' man, A. Y. McDonald, an energetic, ambitious Scotchman, came to this country from Scotland in 1856 and opened a small plumbing shop in Dubuque, Iowa. Pumps were in great demand about that time, and he apparently specialized in pumps. From that small beginning, the company flourished under four generations of McDonalds. The younger is now manager of the home plant at Dubuque.

They kept on expanding as opportunities came along and now have over 20 branches in strategic locations. Of course, they have had to keep abreast of the times with modernization, which means that their "old time pumps", the kind this story is about, have passed into history. Their present business is wholesaling complete modern water systems, plus plumbing and heating supplies.

In 1964, the McDonald Company was greatly honored by being selected as "The Wholesaler of the Year."

Mr. Michael Brooks, Assistant to the President, was kind enough to send me a xerox copy of one of their old pump catalogs, dated February 15, 1900. I was very pleased to get it as it was just what I had been looking for. It showed pictures and gave descriptions and prices of many of the old time pumps which they made.

I consider this McDonald catalog as one of my best sources of information on the old pumps. Several models were shown and most were of early type. Dates were lacking on the different models so there was no way of telling which ones were made first. A common fault I find with most old catalogs is a lack of dates.

Specifications and prices were given for all pumps so we can see what the various pumps would cost about 1900 and before.

The heavy duty, set-length pump with windmill rod, 4 inch cylinder, priced at $15.

Cistern pump, about like a pitcher pump, with 3 inch bore, $5.50.

House force pump with air chamber, 3 inch brass lined cylinder, sold for $15.

Rumsey hand rotary; smallest of 4 sizes, $20.00. That is only a few of some 80 models and sizes of McDonald's pumps.

McDonald must have been a great believer in the "air-compression chamber", as most of his pumps are shown with it. However, they are made so the chamber can be detached and a pipe screwed on in it's place, so the water could be forced to any desired location. The one type of air chamber was interchangeable on several types of pumps. Out of about 15 models shown, only two were made so the air chamber could not be used. One was their "Revolving Top Cistern Pump", which was about like the common pitcher pump, and the other was a "Set-Length" pump, for cisterns and shallow wells. It was called their "Whirl-pool Model." It had a unique feature of a "water storage bulb" just above the spout; which tends to let the water out in more or less steady stream.

Two other models have an air chamber cast in the top of the standard, which became the usual method of manufacturing it.

All of the "detachable air chamber" pumps were designed so the chamber was set off to one side, and not on top of the pump. I have made drawings of several of the McDonald pumps. He was one of the many who also made hydraulic rams.

Their catalog showed a "hand rotary pump", the only one I have seen so far in old catalogs. It carried the name of RUMSEY & CO., Seneca Falls. Rumsey was one of this country's first manufacturers of fire engines; their factory was located at Seneca Falls, New York. (Note drawing of the rotary pump.)

Tank Pumps was another of their products. They made both one and two-man models. These pumps have a "horizontal" cylinder and lay flat on the ground. McDonald put "air-compression chambers" on these pumps, too. My drawing gives an idea what it was like.

Wood pumps were popular in McDonald's time and they made two models of them. I did not make drawings of them as they are very similar to the "National", made at St. Louis, Mo., (which I have already shown), the Biggs, I X L, and several other wood pumps. The sizes of McDonalds wood pumps ranged from 5 x 5 inches square, 6 feet long with a 3 inch bore, to a large one 8 x 8 inches, 5 inch bore and 16 feet long. With that length pump, about 10 feet of it extends down into the well. By putting the "lift-bucket" near the lower end, water could be sucked up another 25 feet through the drop pipe, or "tube", McDonald called it. He lists these "tubes" as being square; 3 x 3 inches, 4 x 4 inches, etc., so they may have been made by nailing four boards together, instead of using the customary bored-log wood pipe but I think they were bored.

The other model was about the same, except that it was made for "drive wells." The only difference was that the well end was designed so that iron well-pipe could be screwed on; or rather, the pump could be screwed on to the "driven well-pipe."

Four kinds of cylinders were indicated; plain ones, which was the bored hole in the standard, well polished; polished iron, porcelain or brass lined. Porcelain must have made a very good cylinder, as it was considered a great improvement to the wood pumps. It was usually available as an option by most wood pump makers, at a price, of course. There must have been some trouble with it breaking, as I have seen patents on means to protect it.

More information on McDonald's pumps accompany the drawings.

A. Y. McDonald invented the Monkey Wrench. It was patented April 28, 1863. (#38316) He was an inventive "genius"; he kept monkeying around with gadgets and came up with the monkey wrench which we know and use today. So, if someone throws a "monkey wrench" into your works, you can blame it on Ol' Man McDonald.[73]

THE F. E. MYERS & BRO. PUMP CO.

If the pumps I find around Oregon are any indication, Myers had his name on more pumps than any other company that ever made pumps. The ratio around here runs about eight Myers pumps to one of all other makes combined. Of course, I know that doesn't hold true all over the country, and probably is just the reverse in many areas. It gets a bit boring, after a while, when you "canvass" the farmers for pumps, and the man says, yes, I've got one stored away out there. Your hopes go high that perhaps you have found a new make but chances are that you will find the name Myers on it somewhere. Then the search continues. It is not all disappointment, though, as you are continually finding different models, even if they were made by Myers. There does not seem to be any limit to the kinds of pumps they made.

So it should not be surprising to run across so many Myers pumps. Only ten years after they started making pumps: "The little factory was bulging at the seams, and they had to expand. Their pumps were being sold in every state in the union and in many foreign countries."

George Myers, father of the "pump Myers," came from Pennsylvania and settled near Ashland, Ohio; home of the Myers Pump factory. John Studebaker, the wagon maker, happened to be a neighbor. Together, they made the famous Studebaker wagons. Myers doing the iron work and Studebaker the wood work. Studebaker's sons eventually got into the automobile business and for many years made the Studebaker cars which we all knew so well.

Myer's sons, F. E. and P. A., started a farm implement store in Ashland in the year 1870. They made iron pumps. They were not interested in wooden pumps. Their "factory" started out in a small way as did most businesses in those days. What machinery they had was run by an old portable thrashing-machine type steam engine. To keep the smoke out of the building, the engine was set up outside, and the belt was run through a window.

At first they did not even have a foundry to make their casings. They made the pump patterns and models and turned them over to a commercial foundry to have the castings made.

P. A. was the designer and inventor of the firm, and he worked diligently to improve existing pumps and to produce new models. At that time, around 1870, there were about 150 companies in the United States making pumps. Of course, they all wanted to make something a little better, or different, than the other guy and once in a while someone succeeded.

P. A. eventually contributed several hundred patents to the pump industry. One of the first pumps he came up with, they claimed, would "revolutionize the pump industry."

It was a "double-acting" pump, which would "deliver water in a steady stream, instead of in spurts, as did other pumps of that day."

No doubt, the new pump was a major improvement over many other pumps, as the "acceptance of this new pump was tremendous." Their first new factory expansion was due to the new pump.

A pump to throw water in a steady stream had been the goal of pump makers for hundreds of years. I do not think Myers was the first to achieve this result. But more on that in the chapter on continuous flow pumps.

Among Myers many patents, was one quite unusual, unique or outstanding. It was the "geared pump handle." The patent was issued to P. A. Myers 6-5-1911, and reads as follows:

"In a pump, the combination, with a reciprocating pump-rod, having a segmented gear connected thereto, and travelling there with, of a pump handle, having an intermeshing gear, a support for said handle, whereby a reciprocating and a pivoted segment are combined, and a link connection between the handle support and the pump rod, by which one of said members is given lateral with respect to the other member as the rod reciprocates."

(You can readily see why they need drawings along with patent descriptions.)

Simply stated; there is a gear on the pump rod which intermeshes with the gear on the end of the pump handle. When the handle is "pumped" these gears compensate for the lateral movement of the pump rod in its vertical motion.

Columbiana is the only other pump company I know of who used this gear system. I made a drawing of one of them. I think Columbiana was using it before the 1911 Myers patent.

I was never able to get a catalog of Myers old pumps. It would be interesting to know how many different kinds they really made. I doubt if it was as many as a hundred. By the time they got into the pump business, the models were beginning to be "stabilized." However, I have seen so many different Myers pumps that it is almost like having an old catalog. I have made drawings of many of them and several are shown in this book.

Myers, like several others of the old companies, did not let the electric pump put them out of business. They took advantage of it; designed new pumps as new technology came along and kept abreast or ahead of the times. Today, as in the past, Myers is recognized as one of the greatest names in pumps. (I'll let someone else tell you about their wonderful electric pumps.)

PIERCE WELL PIERCES THE EARTH

One way I locate old pump companies is by writing to Historical Societies and Research Libraries in various parts of the country where I have reason to believe that some such company existed at some time or other.

The Pennsylvania Historical Society, established in 1824, informed me that they had on file an old catalog of the Pierce Well Excavator Company and that a xerox copy would cost me $6.50.[47] I was not sure if I wanted to pay that much for a well driller's catalog but I sent for it anyway and found a lot of very interesting information in all 57 pages of it.

The company was founded in 1870 and it turned out to be quite a remarkable outfit. As the name implies, their main business was wells. Not just drilling or boring wells, but selling "counties" or territory in any state in the union. Mr. Pierce apparently designed and patented some very efficient machinery for boring wells. He could not make much money just by digging a few wells, so he sold "machines and territory" and gave exclusive rights to use his machinery in any county he sold. When Mr. Pierce could not get cash for his deals, he would take land and various other things of value. Eventually, he became a land owner and real estate dealer as well as a well-driller. He must have been a high-powered promoter and salesman, as people seemed to be anxious to make deals with him. Expecially after the Centennial World's Fair in Philadelphia in 1876. There he bored wells, set up some of his machinery to demonstrate and furnish water for the Fair Goers. At that Fair he was awarded the "Grand Medal of Honor and Diploma of Merit" for his well-drilling methods. He also received first awards at several state fairs in the United States and some foreign countries. His patent rights included Canada, Great Britain, France, Germany, and perhaps others.

Several pages of the Pierce catalog were devoted to testimonials. One in particular I noticed was dated 1877 and was by the W. & B. Douglass Pump Company who, as before noted, was our country's first producer of cast iron pumps. At the end of the testimonials, in parenthesis, was the following statement: ("The heaviest manufacturer of pumps and other hydraulic machinery in the world.")

That is the latest information I have been able to get on the W & B Douglass Company. I wonder when and how they quit business. It does not seem that a company of that magnitude could just fade away suddenly.

There also was a testimonial from close to home. This is just as it was printed: "Bethel, Polk Co., Oregon, July 11, 1875. The man who took Yamhill County bored a hole through 60 feet of sandstone. I am taking the lead here in the augur business. Your augur is the best one for boring in hard substances. Can clean them all out. Have sold five of my counties and more engaged. J. H. Robbins."

(I wonder how many of Prescott's Salem wood pumps were used in Pierce's wells?)

Apparently there were many other well drilling outfits in the business at that time, as most testimonials mention the fact that Pierce's rig was the best they had used or seen. There were testimonials from many states around the country, which indicates the extensiveness of his business.

Pierce made a large variety of drilling rigs, from small hand operated ones to large deep well ones run by horse power. The latter were made so the horses walked round and round, turning the geared wheels that run the drill up and down, up and down, while a man tended the machine and kept the drill bit turning by a simple method provided. Most of the wells were dug by boring, using the horse powered method. A 17 inch well was the most desirable size for most purposes.

Pierce also made pumps. Sand pumps, chain pumps, wood pumps and any kind of iron pump desired. They took special pride in their high-pressure, air-chamber pumps for fire fighting purposes.

Notice my drawing (No. 17) of one of his pumps.

One of their most interesting products was their windmills. They were shown by sketches but no written description of their construction was given.

One mill appeared to have about 40 vanes made of metal, with a rudder made of wood staves, 9 in number. Another mill was shown to have 9 or 10 sections of vanes, numbering about 12 in each section, totaling around 100 vanes, probably made of metal, also. The rudder consisted of a group of 9 square "paddles."

Sizes of the mills ranged from 8 to 50 feet in diameter. The "power" the mills produced was listed as from one man power to 30 horse power. The prices quoted were from $90 to $450, F.O.B. factory.

Pumping water was their main function but even in the late 1800's windmills were extensively used to run a wide variety of machinery.

Western customers were supplied with mills from their plant in Illinois.

COLUMBIANA PUMP CO.

The recipt of a 1916 catalog of old pumps from the Columbiana Pump Company was a pleasant surprise.[64] I had never heard of the company until the name was given to me by another pump firm who recently discontinued the manufacture of hand water pumps.

Many of the pump companies which I contacted directly or through research libraries or historical societies, furnished me with the company or personal history but very little about the product they made. A few are just the other way. The Columbiana Pump Co. is one of the latter. In the 128 page catalog of old pumps and accessories, not a single person was mentioned. The company was started in 1888, by whom, I do not know.

They must have been very much interested in making pumps. In checking through their old catalog, I counted 80 models of pumps and most models were made in several sizes; as many as 6. Again I will have to say that is a lot of pumps. They also picture several models of the very first electric pumps, which are very interesting. I would like to picture a few of them with drawings, but I have had to draw the line somewhere, and I have all I can handle without getting involved with electric pumps. (It, however, would make a very good subject for some ambitious "retired" person, with a fair amount of drawing ability.)

You would think, with 80 models of pumps, the field of varieties would be pretty well covered. Not so, I admit that several of them are very similar with only slight differences. Never the less, they are listed under different numbers. In another chapter I will give you some idea of the over all number of models made by the different pump companies, as well as the total number of pumps.

A good many of Columbianas pumps were about the same as some of the ones which were made by other companies. However, most of them had distinctive features of their own. One model looks quite a bit like the famous "Buckeye" pump made by the Mast-Foos Company.

Several companies made some sort of "diaphragm" pumps, but the only one I have seen listed is the one called "Herculese", made by Columbiana. The catalog picture shows it as a complicated assembly of cast iron parts. In reality, it is very simple. Its action is a bit like the bellows pump. The "diaphragm" works with a slow vibration motion, and throws a lot more water than one would think possible. If the diaphragm was made of good tough material, it could be a very practical and efficient pump. The catalog says: "It will handle a large volume of muddy, gritty water in a very short time. It has a 12 and one-half inch diaphragm and a 3 and one-half inch discharge pipe. It will throw 1 and one-half gallons per stroke." There is no piston or cylinder for the gritty water to abraise and wear out.

One very unique pump is their "Hornet" force pump. It is a piston cylinder pump operated by turning a crank by a handle. I have made a drawing of it so you can see what it looks like.

Then there is the "Plumbers" force pump. (See drawing.) It is about as simple and compact as a force pump can be made.

Their several models of pitcher pumps are a bit different than the average, and all can be drained to prevent freezing by raising the handle "clear up." They also made several other types of "lift" pumps, but they were not expecially distinctive.

The "Cottage" force pump is another interesting model of which I made a drawing. Columbiana seemed to go strong on "force pumps", that is, using the "stuffing box" and air chamber.

Several Bantam pumps were listed. The "Bantam Force Pump" is very efficient and weighs only 18 pounds. It can be used either with or without the air chamber.

Like McDonald and a few others, Columbiana used the air chamber in most of their pumps. As I have said before, the air chamber "cushions the shock", causes the water to come in a steady stream and helps to create pressure.

Take a look at my drawing of the "Royal" house force pump. Notice the odd method used to get leverage to operate the "plunger." The top part of the "standard" acts as an air chamber and the pump rod goes through a "stuffing box" to make it air tight. Therefore, it is a force pump.

There are at least 20 distinctive pumps in the Columbiana catalog which I would like to make drawings of, but I will have to limit it to seven or eight in order to have space for some other companies' pumps.

One of their odd looking pumps is their "New Century Ratchet Pump" with encased gears. They are the only ones I have seen, except some made by Myers, where "gears" are used. The gears are enclosed, so I cannot see exactly how they work. Very likely the same as in Myers pumps, in which the gears are open. The "gears" consist of a set of gear teeth set straight on the pump rod, which mesh with curved gears on the end of the pump handle. It has certain advantages which I have described in the Myers pumps.

One of the most important parts of a pump is the cylinder and plunger, which operate as a unit. No matter how well a pump is made, if the cylinder and plunger, which includes the valves, are defective, the pump will be a failure.

Columbiana made a wide range of excellent cylinders. They list 48 sizes, which include the plungers. They range from 2 x 10 inches, made of iron, at $4 each, to 4 x 20 inches, all brass, priced at $31.50 each.

Eight sizes of "water packed" cylinders in sizes from 2 x 16 inches to 3½ x 20 inches at $27 each. In a water packed cylinder, there is no leather used in the plunger or valve. The plunger is made of "bronze" so it will not corrode. It has several deep grooves cut around it "to trap the water" in order to make the "suction" seal. They are for use in wells where the minerals in the water "eat up" the leather gaskets.

They also made 39 sizes of "Artesian Well Cylinders," complete with plungers and valves. The sizes ranged from 1-7/8 inches in diameter, 23 inches long, with a 12 inch stroke, at $17.

The largest was for large pumps where plenty of power was available. It was 5¾ inches in diameter, 65 inches long, with a 36 inch stroke. It would put up over four gallons of water at a stroke. Such a cylinder, complete with plunger and valves, would have cost you $225 back in 1916.

I do not know why they were called "artesian" well cylinders, as they were operated by stroke action, the same as any other reciprocating pump. This type cylinder with extra long stroke, as long as 36 inches, was to be operated by a special type pump. (An artesian well is one in which the water is forced out of the earth by internal pressure).

A necessary article you must not forget, if you are going to put down a "drive well" is the drive well point. Columbiana listed two different kinds of them in 51 sizes. They range from one inch in diameter by 24 inches long, at $6 each, all the way up to 2½ inches by 72 inches long, costing nearly $60 each.

Drive well points are short lengths of perforated, screened pipe, with a sharp point on one end. They screw onto the well pipe so it can be driven into the ground. The water is "screened" as it seeps through the perforations into the well pipe.

A cap is screwed onto the top end of the pipe so it can be driven into the ground without damaging the pipe threads. When the pipe has been driven to a depth where water is likely to be found, the cap is removed and a pump screwed on, primed and pumped. If no water, or not enough, is found, the pump is removed and the pipe is driven some more. If water is not found in about 25 feet, a new location is usually tried. The pipe cannot be driven through rock, as "drilled" wells are. "Drive wells" are usually shallow wells, and the pitcher pump is most often the kind of pump used.

Most of us think of the old hand water pump as being obsolete. The Columbiana Pump Company apparently does not think so. Their 1969 catalog lists over 50 models and sizes of pumps still in production. (Counting iron or brass cylinders as optional in a few models.) Some of them do not look a bit different than their 70 year old models. In fact, I think they are exactly the same.

The prices have changed, however. In 1916, the #28½ wind-mill force pump would have cost you (with a brass lined cylinder) $13.50. Today, for that same pump, with a brass lined cylinder, you would have to dig up $86.60. That, of course, comes under the head of "progress."

In 1916, if you wanted one of Columbianas little old pitcher pumps, it could be yours for the sum of $7.25. That same pump has not increased very much. It does not contain very much iron, nor much labor to build it. It is now only $16.70.

It seems that the romantic old back-yard hand pump will be with us for some time yet.

Of course, Columbiana made, and still make, necessary accessories and replacement parts for their pumps.

THE IXL WOOD PUMP

Many old timers of today will remember several old IXL products. One of our very first carpet sweepers – the old fashioned clothes wringer with folding bench – seed sower and other old time "modern" gadgets with the IXL trade mark.

They were most famous for their pumps. Wooden pumps, that is. I can find no evidence that they ever made iron pumps. I admit that their history is a bit elusive and I have not been able to find out when they started in business, or what eventually became of them. I was fortunate enough to get pages 1 through 23 of their old catalog, plus a few odd pages. I will give a condensed rundown on the most important parts that concern pumps. The cover of the catalog lists the following: at the top, in small letters, which is the only clue as to the owners of the company:

> "Rogers, Duer & Miller. 1883 wholesale price list of the IXL Pump Co., 135 Market St., Philadelphia, Pa., Mfgrs. of Porcelain-lined, Polished Iron Lined, Unlined, and Drive Well Pumps. Factory at Goshen, Ind. There are no trimmings made that you cannot get on the IXL Pump."

Next there were eight pages of pump and accessory lists with prices, dated Jan. 1, 1883. Also, a note saying "supersedes all previous price lists." So they must have been in business for some time before that date; how long before I have no idea. Apparently, they were a member of the Association of Wood Pump Manufacturers since the following was printed on the price list. "The above list was adopted March 17, 1880, by The Wood Pump Mfgrs. Assn. of the United States, at Peoria, Illinois, and approved December 5, 1882, and subject to change without notice."

IXL were quite proud of their pumps, especially their patented porcelain lined pumps: "the best now in use, without exception." I guess the porcelain lined cast iron cylinder made the difference. (However, several other wood pump makers were using it about that time and belonging to the association, they must have known about it.) Their drive well pumps were especially adapted to drilled and driven wells, and "are SUPERIOR to the CAST IRON PUMP SOMETIMES USED."

By that time cast iron pumps were beginning to make quite an inroad on the wood pumpers. For several years there was a feud on between the wood pump people and the iron pump makers who were looked upon as intruders into the pump business. The wood pump men had it their own way for several hundred years until Douglass came along in 1832 with his new invention and started a new fad.

Several pictures of the IXL pumps were shown, but they all looked about alike and similar to some I have drawn. They were well painted and elaborately decorated with designs. The name painted on one was IXL PUMP CO., Goshen, Indiana. Another one on a page dated Jan. 1, 1884, read: "The IXL Co's IMPD, Goshen Pump, Goshen, Ind." They made quite a few sizes of pumps, starting at five inches square on up to eight inches square. Several of the in between ones were in ¼ inch sizes, such as 6" – 6½" – 6¾" and 7". Why such small graduations in wood pumps I have no idea, except that it was easy to do and gave more variety. The sizes of the bore, or cylinders, ranged from three inches to five inches. The stroke varied only from eight to ten inches. The IXL company also made pumps to order; most any style or size a customer wanted was whittled out of a piece of timber.

The No. 0 "stock pump", 7 x 7 inches with 4 inch bore and 10 inch stroke was supposed to put up 60 gallons of water a minute. I looked up the capacity of a 4 x 10 inch pump cylinder and found that it is .544 gallons. A pump, according to my figures, operated at the recommended speed of 40 strokes per minute, would furnish about 22 gallons. Perhaps some of you mathematicians can straighten it out. Their smallest, or #3 pump, 5 x 5, 6 feet long is listed at $3.75. Each pump was listed with different lengths of well pipe. The larger pumps could be extended for wells as deep as 75 feet, or even 100 feet, by putting the pumping cylinder down to within 20 feet of the water. The #0 pump with pipe for a 75 foot deep well was listed at $26.50 (with porcelain lined cylinder). Seventy-five to one hundred feet is getting pretty deep to install wood pipe in a well. Sometimes lead or iron pipe instead of wood was used for the last fifteen or twenty feet.

In the IXL list of pump parts, I noticed they listed a windmill connection. That verifies the fact that wood pumps were used with windmills.

At no time was there any mention of the number of pumps turned out by the IXL Company.

LaCross was the only wood pump maker who told of the method they used to bore the hole through the logs. It was probably in such common use by then that it was taken for granted.

PUMP DIFFICULTIES AND HOW TO REMEDY THEM
By the IXL Pump Company

"If the pump loses its prime, check the valve seat. If the pump retains its prime, but delivers little water, and the water is bubbly and agitated, it is evidence of an air leak. This may be caused by worm holes in the pipe, and must be plugged, a difficult task. Go down into the well and apply the ear to the pipe while it is being operated, and listen for the hissing. When holes are found, they must be plugged. If the pump works with difficulty, and the handle springs back, it is evident that the supply hole is too small, plugged or not bored through.

"Before taking much trouble upon yourself, and attacking the pump manufacturer, ascertain if the water is not falling in the well; if not, go for the pump."

THE CEDAR RAPIDS PUMP

Chandler was not the only one in Cedar Rapids, Iowa, who was making pumps.

In my search for old water pumps, I found one with the name Cedar Rapids on it. I wrote to the Cedar Rapids library[27] to find out if they had any record of such a company. Yes indeed, they had, and it was quite a pump company.

Mr. C. A. Munger was the owner, and following is part of an interview the 1890 Gazette man had with him:

> "1889 was the banner year for the Cedar Rapids Pump Company. Our business amounted to more than $30,000 over 1888. Besides selling more wood pumps than ever before, we did a large trade in iron pumps and iron pipe. With one exception, we are the largest dealer in the state in this line of goods. (I wonder if he meant the Chandler Company who were still in Montecello at the time.) The pump company is preparing for a still larger trade in 1890."
>
> "Where are your sales, principally?"
>
> "In Iowa, for there is scarcely a town in the state where we are not represented. Our next strongest hold is in Illinois, and we reach pretty well into Nebraska, Kansas, Missouri and Minnesota. Of course, when we went into the field, we had a lot of old manufacturers to buck against. They had been selling pumps for years, and had good pumps, too. Of course, we had something we thought was a little better then any of them, and we gradually worked up to where we are today."
>
> "Where do you get the immense quantities of lumber you must use?"
>
> "Our poplar, of which we use about a million feet a year, all comes from Tennessee. Our maple and oak, of which we consume 30- to 40,000 feet, is bought here."

"How about iron pumps?" "That part of our business has grown rapidly, and we look for an even larger increase in the immediate future. We went into the sale of iron pumps because the iron pump men generally sold wooden pumps, and to make things even we took on iron pumps. Those we handle are all made in Mansfield and New Carlsted, Ohio, and are fitted with the brass valve seat that has become such a strong feature in the wooden pumps."

"You say the future outlook is good?"

"Decidedly so; if the spring opens favorably, we shall do the largest trade in our history. WE ARE NOW SELLING ABOUT 21,000 PUMPS A YEAR, and expect to do even better in the next year. Cedar Rapids is the best distributing point in Iowa, and its central location and magnificent railroad facilities enable us to reach a great area of country, conveniently, cheaply and quickly."

"I observe you are going to have competition."

"Yes", replied Mr. Munger, "and I am glad of it. There is plenty of room here, and I am glad to see them come. . . ."

The Cedar Rapids Pump Company is just another of the famous old timers who were very prominent businesses at one time in their community. They made many thousands of pumps which were installed all over the country. Now, in such a short time, they have just about faded away and are nearly forgotten.

CHANDLER PUMP COMPANY

John Adams & C. H. Chandler started in the pump business in 1868 in Monticello, Iowa. Twenty-three years and many pumps later they moved their business to Cedar Rapids which they considered a better location for distribution, since most of their pumps were sold through jobbers.

When they moved to Cedar Rapids, they put in the most modern machinery. They added 14 new models of pumps to their line, making 31 different styles of iron pumps. There was no mention of wooden pumps but I am quite sure they handled some as a side line. They claimed exclusive rights for the "Haight patent cylinder valve," which was especially good where sand was encountered.

In another report in 1894, business had flourished; they had to expand and they installed some more new machinery. They were now making over 70 styles of pumps and 100 kinds of brass and iron cylinders. Several more states were added to their "market."

They made two "special" pumps. One they called "The Water Witch." A double acting force pump and the other the "Little Joker," which was a small house force pump to be used in the kitchen.

In 1895, the "Gazette" again tells of the wonderful progress made by Chandler Company. "Their plant has had to be enlarged three times now, and is one of the largest and most complete plants for the manufacture of iron pumps, iron, brass and brass lined cylinders in the West. They carry the largest stock in Iowa."

In 1900 they decided to take on windmills. The plant was again enlarged to make windmill towers and water tanks. They manufactured all kinds of water tanks, open and covered, using hard pine from the north and cypress from Louisiana. They did not make windmills, they were only "jobbers."

Again in 1902 the plant "was greatly expanded" and several new buildings were added. "The growth of the Chandler Pump Company has been phenominal." (Cedar Rapids Public Library.[27])

There is no way of knowing how many pumps this company made during their spectacular career, but they certainly spread a lot of them around the country.

RED JACKET

A SENECA INDIAN CHIEF

Bernard M Eubanks 1971

RED JACKET, the man.

"An intelligent gentleman, who knew this chief intimately, in peace and in war, for more than 30 years, speaks of him in the following terms; Red Jacket was a perfect Indian in every respect – in costume, in his contempt for the dress of the white man, in his hatred and opposition to the missionaries, and in his attachment to, and his veneration for, the ancient customs and traditions of his tribe.

He had a contempt for the English language, and disdained to use any other than his own. He was the finest speciman of the Indian character that I have ever known, and sustained it with more dignity than any other chief.

He was second in authority in his tribe. As an orator, he was unequaled. His langauage was beautiful and figurative, as the Indian language always is, and delivered with the greatest of ease and fluency. His gesticulations were easy, graceful and natural.

His voice was destinct and clear, and he always spoke with great amimation. His memory was very strong. I have acted as interpreter for most of his speeches, to which no translation could do justice".[24]

J. A. Chandler passed away in 1903 and his brother died in 1917. A grandson took over later and carried on.

FAIRBANKS & MORSE

FAIRBANKS-MORSE of scales, pumps and windmill fame, got their start back in 1830; but not with pumps. Thadius Fairbanks was the person who invented the platform scales and became world famous for that one product alone. But we are not interested in scales at the moment, so we will jump to 1850 when young Morse joined him as sort of an apprentice still making scales. He became a member of the firm in 1865.[69]

The Eclipse windmill, which they called a 'wind-engine', was patented in 1867 and Fairbanks-Morse soon became exclusive agent for the improved, patented mill for pumping water. Of course, that naturally led them into pumps, which they started making in 1880. (One account I read, stated that they became general agent for the Eclipse wind engine in 1880, when they began their pump business.)

How many kinds, models and numbers of the old hand and windmill water pumps they made is hard to find out but the number must have been considerable. Since there are still a lot of them scattered around the country.

Their 1942 service manual does not mention hand pumps, so they must have been discontinued before that time. Windmills, however, were shown in detail and bear their own label: Fairbanks-Morse. Apparently the agency for the Eclipse mill was dropped and they manufactured one of their own.

The "engine" part of their "modern" windmill was an efficient precision made piece of machinery. The gearing system ran in a crank case of oil just like our auto engines of today. All friction parts were automatically greased.

The exact number of RPM's at which the mill will "turn out of the wind" is controlled by a governor, which is easily adjusted to any turn-out speed.

I have one old Fairbanks-Morse pump. It is an extra large, heavy duty, force pump. All of the exterior parts of the castings are rough and unfinished, only the sharpest projections were ground off. The insides, of course, were accurately smoothed and polished, so the piston, or plunger, could work as near frictionless as possible. It was designed especially to pump lots of water.

Fairbanks-Morse gradually got into electric pumps as did all of the "old" pump companies who survived the "change-over."

They now make just about the most diversified system of pumps of any company in the world. There is hardly anything you can mention but what it, or some part of it, has been run through a Fairbanks-Morse pump. From turkey feathers to nuts; sugar beets, tomatoes and shrimp; chunks of wood and castor oil. Apples, asphalt and parafine. The list goes on and on. If you visit Disneyland, you can see a hippopotamus rise from the murky pool and let out a roar. All of that, and much more, is done with Fairbanks-Morse pumps.

Here I am, getting into "up-to-date pumps," which I vowed to avoid.

RED JACKET PUMP COMPANY

Red Jacket is not one of our oldest, but certainly is one of the country's most progressive. I would not have known about them but for a very unusual looking pump I found in Fort Jones, California. Fort Jones is a very old stage stop town between Yreka and the Scotts Valley gold mining country. I took a snapshot of the pump, made some notes on it, and later made a drawing of it. The pump was quite old and I had no idea that the company was still alive. But I wrote anyway, and sure enough, they are still going strong, and have been ever since their interesting beginning over 90 years ago. In fact, in 1968, they celebrated their 90th anniversary in a big way.[74]

Mr. Norman Westphal, the company president, very obligingly sent me a document giving the origin and history of the company, and how the name "Red Jacket" was chosen for the company name. I will have to condense the story somewhat, but will try to give the essentials. The story follows:

"It was the year 1876, just 100 years after the Revolutionary War; the new republic was just 100 years old. Fourth of July celebrations and patriotic speeches were causing a lot of excitement; Wild Bill Hicock had just been murdered; the final count of General Custer's dead was announced: 276 men.

Mr. Robert Lafferty had not expected so much excitement; he was in town to attend a meeting of "The Assn. of Wood Pump Mfgrs. of America." At this meeting a letter from a Mr. John P. Martin, of the Cincinnati Pump Co. of Exina, Ohio, was read. Mr. Martin boasted that "he had invented a new pump that would put the wood pump manufacturers out of business."

Bob Lafferty went to Exina to see the pump. He was so impressed with it that he made up his mind to buy it. "It was indeed an innovation; a double acting force pump, with the now famous 'so easy to fix feature' ". (I have been unable to get a picture or description of the pump.)

Apparently Mr. Lafferty did not have much money, as it was two years before he could raise enough money to buy the Cincinnati Pump. He finally made it in 1878, and the new company was called the "Cincinnati Pump & Supply Co."

During that two years, a Mr. Blodget and Mr. Chandler formed a pump company in Davenport, Iowa, known as the Davenport Pump Co. They soon got in financial difficulty and Bob Lafferty's company "merged" with them to form the present "Red Jacket Pump Co.," located at Davenport, Iowa.

Mr. Lafferty took actual control of the business until his death in 1891. In the early 1930's, a Mr. Musser acquired an interest in the company. H. R. Lafferty, a grandson of Bob Lafferty, acted as president until he retired in 1954.

The name "Red Jacket" was adopted by the company to commemorate the memory of a famous patriotic Seneca Indian Chieftain called Red Jacket. His Indian name was "sa-Go-Ye-Wat-Ha," which means "he who keeps them awake."

Prior to the war of Independence, a commander of the British troops gave this Seneca Chief a red coat, which at that time, was a part of the British soldiers' uniform. The constant wearing of the coat gave the Indian the nickname of "Red Jacket." In fact, he was given a second and even a third red jacket.

When war broke out he became loyal to the Colonies, and persuaded six Indian nations to side with them. After the war, Red Jacket was greatly honored. In 1792, President George Washington presented him with a large silver "medal of honor," which he wore incessantly with great pride. He died January 20, 1830, and was buried with honors at Forrest Lawn, near Buffalo, New York.

"The great Chieftain's name was chosen for our company's name in 1878, because of the sterling qualities and leadership which earned him the respect and admiration of the entire country. It is our endeavor to always live up to the name of this fine American." – Norman Westphal, Pres. Red Jacket Pump Co.

The Red Jacket Pump Co. is now one of our country's leading manufacturers of modern pumping equipment. They also continue the production of several models of the old hand water pump. The current prices of two models are as follows:

"The Red Jacket pitcher spout pump: $14.75. A light weight lift pump, good for wells up to 50 feet, $31.50.

A large, heavy duty hand and windmill pump "stand", for any size cylinder; good for deep wells, $67.20. The cylinder and piston will cost you "extra." Notice that word "stand," for any size cylinder. In deep well pumps the cylinder and plunger are set far down on the well pipe in order to get it within 25 feet of the water. A two and one-half inch cylinder with a ten inch stroke, is listed at $27.30. So the pump complete would cost $94.50."

That is quite a bit different than Pierce's similar pump at $16.00 in 1870, or ones made by Columbiana in 1916 which were priced at 13 and 15 dollars, complete.

It is interesting to note that a few hand and windmill pumps are still being made. I expect that some company or other will be making some for some time to come. Even now, you have to do a lot of travelling to spot one. When I started looking into pumps a few years ago, I was of the opinion that they were completely out of production.

MONITOR (means Baker)[62]

When prowling the country for old pumps, I found an unusual "drinking fountain pump," it had the name Monitor on it. It also bore the name Baker Manufacturing Company, Evansville, Wisconsin. Of course, I made a drawing of the pump and wrote to the company, asking questions, as usual. I was not surprised to learn that Baker's trade name, Monitor, had been on windmills and pumps starting in 1876. Otherwise, how could so many thousands of them be scattered all over our country, and many other parts of the world? After 1910 they were shipping several car loads a year to Australia, as well as to Europe, South America and several other countries. Even the Kaiser's submarines got one ship load during the first world war.

I do not know when Baker quit making windmills. From about 1915 to 1924, they were still introducing new models. In fact, during that time they were experimenting with mills to produce electricity for farms. Some of them were quite promising, but were never put in production for that purpose. Perhaps power "over the wires" was beginning to cut in. "Self oiling" windmills were introduced about 1920, and Baker lost some business because he was stubborn, and did not adopt it until 1924. Although self oilers cost more, a man did not have to climb the tower occasionally to fill the grease cups. In 1882 Baker was selling about 70 Monitor windmills a month and by 1895 their output had climbed to over 200 a month. I could find no figures of the number they were making at the peak of the windmill era, but it grew into a very large business. They must have made a lot of pumps, too, to go with so many mills. By 1945, right after the war, the demand for windmills fell off drastically, and production accordingly.

They never did get over the pump making habit, and still make an adequate line of excellent hand water pumps. They are especially proud of their line of cylinders, plungers and valves, which, of course, are the critical part of any of the reciprocating hand water pumps.

I was unable to find out about any of Baker's first pump models. I doubt if they were any different than hundreds I have already seen, but you can never be sure of that.

The MONITOR DRINKING FOUNTAIN pump is unique, and the only model of its kind I have seen. It serves a very useful purpose where ever it is installed. (See drawing No. 2 in Sec. 3.)

Like most of the old pump companies, the story of their beginning was one of struggles, setbacks, disappointments and finally success. The company started in 1872. Six men, A. S. Baker, L. Shaw, C. Snashall, L. Mygatt, W. Smith and A. Eager, each put up $1,000 and formed a partnership to manufacture a rotary steam engine, which had been invented by Baker and Shaw. The steam engine turned out to be a failure, so it was dropped. They then turned to foundry work and the manufacture of windmills and pumps. The name of Monitor was chosen as a trade name for their products, which were advertised in newspapers as early as 1876. Shaw retired from the business, as it was unprofitable, and they reorganized, giving Allen Baker the entire management. The company soon began to show a profit and in 1879 was incorporated under the present name, Baker Manufacturing Company.

FACTORY BURNS

In 1884, their factory, consisting of several frame buildings, was burned. The loss was $10,000 and quite a blow to the young company. The insurance money, amounting to $2900, gave them a good start on a new and more permanent brick and stone factory. Business was good and they declared their first dividend in 1891. In 1896, a son, J. S. Baker, joined the firm and immediately invented and patented a new windmill. In 1899, the company adopted a profit sharing plan for the workmen and it has remained in effect to the present time. The plan was so novel and acceptable that it was given widespread recognition. It helped greatly to stabilize the work force so they would take an interest in their jobs and try to earn their pay. At that time the big labor bosses looked on the plan with skepticism and suspicion. In 1916, J. S. Baker became president and general manager of the company and in 1938, C. S. Baker succeeded his father, who had become seriously ill.

The Baker Mfgr. Co. is one of the few businesses to survive the great depression of the '30's without missing a dividend.

In 1958, the University of Wisconsin printed a 100 page pamphlet on the profit sharing plan of the Baker Company. In it, they also gave the interesting history of the company and of each of the four Bakers who headed the firm from its inception in 1873 to the present time.

The Baker Company always made and still makes numerous and important articles other than the windmill and hand water pumps, which this story is about.

THE LACROSS PUMP CO.

The only LaCross pump I have seen does not look any different than dozens of other pumps I am familiar with. I decided to see what I could find out about it, so I wrote to the Public Library.[30]

They had a very interesting story about Mr. Powers, the founder, but not much about the "product."

Right after the war he set up a foot lathe in a stable to do odd jobs. In 1866, he went into the wood pump business with a partner. They went broke, and he borrowed $100 to buy the bankrupt stock of 100 wood pumps. He set up a shop "under a mill", did odd lathe jobs, made a few pumps, and "kept the wolf from the door."

He finally got 'goin' and put up a building in which to make pumps. "Boring" the logs was one of the most difficult jobs, and one of the most particular, in the making of wood pumps. Getting the chips out of the 'hole' without clogging was a problem. To do this, he invented a very clever device, in his words:

"For the manufacture of the pumps, I had before this, developed a BELT MADE OF WIRE, WHICH RAN INSIDE OF THE AUGUR AND REMOVED THE CHIPS; in this way, I bored a 16 foot log, by changing ends, and meeting in the center. I patented the chain belt, thus made."

That chain belt turned out to be a very valuable invention. He sold half interest in the patent, and many saw mills began immediate use of it.

The 100 pumps he saved from the "wreck", eventually led him into the handling of iron pumps and windmills, a few of which found their way to all parts of the country.

In the LaCross area, quick-sand hindered the digging of wells. He solved the problem by introducing "the tublar well". By this method he could get down below the quick-sand to the water. It was quite successful.

About 1875, an artesian well was put down in the city to get water for drinking fountains, but the water lacked 7 feet of getting to the level of the street. Mr. Power studied the problem, then made a contract with the city, whereby he would "secure a steady flow of water, four feet above the ground level." He was to be paid one dollar per barrel per 24 hour flow, for doing the job. He succeeded in getting a flow of 450 barrels per day, and was paid $450.

In the chapter on the "hydraulic ram" I tell how he solved this baffling problem.

I do not know exactly what kind of pumps they made or how many. Mr. Powers eventually retired, turning the business over to his three sons, who turned out to be very capable business men.

MAST-FOOS and BUCKEYE PUMP

The finding of this fine old decorative "Buckeye Pump" near Scio, Oregon, led me to the history of its originators, The Mast-Foos Company of Springfield, Ohio. The Warder Public Library, of Springfield, sent me xerox copies giving the history of the company and a picture of the huge plant which was erected about 1876.[39]

The business was started in 1870 by Phinneas P. Mast and John Foos and was incorporated in 1876.

They became world famous for their "Iron Turbine Wind Engine" and the well known "Buckeye Pump." A date was not given but at one time, long ago, they had 50,000 of the one pattern in "successful operation." Of course, they made other models, too, and complete water systems.

They also made lawn mowers, for which they became famous, and many other articles made of iron.

They established branch houses in several cities around the country and had representatives in several foreign countries such as: Canada, France, Mexico, Australia and some others.

The following advertisement appeared in issue 21 of the 1908 Minnesota Farmers Institute Annual:

BUCKEYE PUMPS AND WINDMILLS

Made by Mast-Foos & Co., Springfield, Ohio, are used the world over. Are still the best on earth. Single and double acting pumps for all purposes, and in all sizes and styles.

Galvanized steel IMPERIAL and DEFENDER windmills in all sizes and in any height of tower wanted. If you want to pump water for water supply, pressure systems, irrigation, spraying, drainage or any other purpose whatever, write us and we will send full information with catalogs and quotations.

MIDLAND SUPPLY CO.
St. Paul, Minn.

According to that ad, they made a complete line of pumps and windmills.

The 100 year old Mast-Foos Co. has recently been sold to the BOISE CASCADE COMPANY who have become highly diversified. I believe the Mast-Foos Company will be operated as a subsidiary.

DEMING

This interesting old pump shown in Picture 5, Sec. III was the pride of The Deming Pump Company about 80 years ago. It served a long and useful life and ended up abused and neglected, then deserted in the middle of a hay field. It was set there to furnish water for the thirsty hay hands and field workers. The handle had been broken by misuse and the air-chamber broken by freezing. It had been welded and patched up to get a little more service out of it.

Originally, it was a very efficient high-pressure deep well pump with a windmill attachment. The air compression chamber, which is set off to one side to get it out of the way of the pump rods, indicates it as a pressure pump. A faucet screwed on in a turned up manner makes drinking easier. (It is a shame that more people do not take pride in preserving more of these fine old pumps.)

Most air compression pumps had the "chamber" set on top of the standard. However, putting it to one side was not a new idea. One of the pumps "invented by Ctesibius" over 2000 years ago is described and illustrated to be very similar to this "modern" pump.[3-21]

The Deming Company started making pumps in 1880, right when the pump business was entering an era of great expansion. Our country's population had just passed the 50 million population mark and pumps were in great demand.

They started in a small way, making one model of the very popular shallow well pitcher pump, a few "set length" pumps, and two models to use with windmills.

The "set-length" is so called because the pumping cylinder and plunger are set in a pipe about 4 feet long so it can be set in the well pipe at any necessary depth to get the "lift-bucket" within 25 feet of the water. It is used in deep wells.

The Deming business was quite successful and the company kept growing and expanding. Today, they have one of the most diversified and complete lines of pumping equipment in the world.

After 90 years in business, and now making the most modern types of pumps, they still go to the trouble to make a few of the old time hand water pumps just for old times sake, I guess.

WASHINGTON & FILLMORE AND MARSHALL-WELLS

When travelling around the country, I seldom pass up an old museum. They usually have a few old pumps. A very fine one at Jacksonville, in an early mining district of Oregon, has a lot of very interesting relics. There I found several old pumps but only one of unusual design or interest: an old "Chinese wood pump" described elsewhere. One Deming lift pump, one Marshall-Wells Hardware Company lift pump and one made by The Washington & Fillmore Foundry, Inc.

I wrote to the research librarian at the Buffalo, New York, library and they informed me that they examined more than a hundred year run of the Buffalo directory and found no mention of the Washington & Fillmore Pump Company.

I have run across that kind of situation a number of times. By consistent searching, you can usually come up with something; sometimes, however, a company seems to have disappeared completely.

As I am not compiling a history of pump companies, and I already have more "material" on old pumps than I can possibly use, I did not pursue some of them very diligently.

Marshall-Wells put out a lot of miscellaneous pumps around the country; you can still run across one occasionally. Likewise Washington & Fillmore. I have found only one of each and I know they are more plentiful in some other parts of the country.

DEMPSTER PUMP COMPANY

The Dempster Pump Company started nearly 100 years ago in the same city where they are now located, Beatrice, Nebraska.

It was back in 1878 when Chas. B. and J. H. Dempster opened a small retail farm store selling pumps and windmills. The first pumps they sold were made by The Florence Lumber Company of Florence, Alabama. They were a very old company, dating back to 1790. Later, Dempster took over the Florence Lumber Company, which accounts for their connection with the first wood pumps I have dates on.[67]

They soon became agents for the National Wood Pump of St. Louis, Mo., who was a member of The National Association of Wood Pump Manufacturers of America.

"National" became a famous name on wood pumps. (The National Pump Co. was listed in the St. Louis City directories from 1884 to 1901.)

In 1885, Dempster started manufacturing some of their own products, especially windmills.

About 1890 was the beginning of their cast iron pump production. They also must have been making Wood Pumps as they "discontinued the manufacture of wood pumps in 1910."

From then on, the company prospered and grew rapidly until the name Dempster was on thousands of pumps and windmills scattered all over the West.

Dempster started making electric pumps in 1929 and the old style pumps and windmills began to disappear. The demand for those old timers never did quite vanish and Dempster still turns out a few of the old hand pumps and windmills. Their numbers, however, are counted in the hundreds instead of the thousands, as they were 70 years ago.

Today, Dempster is one of the nation's leaders in its field of modern pumps and farm machinery.

HOWELL PUMP

The one Howell pump I found in Oregon had the address of Minneapolis, Minn., on it. A letter to the library at that city brought the following:

> "R. R. Howell and D. R. Howell came to Minneapolis about 1878 from Wisconsin and commenced the manufacture of well and pump machinery. The business rapidly expanded, and in a few years a new plant was built at Prospect Park. In 1890, the plant was completely destroyed by fire, but was immediately rebuilt."

I learned that the company was still in business, so I wrote them to see if I could get some details of the pumps they made. I was told that all of the old drawings, records and literature were destroyed in the fire and that all of the old employees who knew anything about it were not around anymore.[72] The Howell pump that I saw was not an unusual one, so I did not make a sketch of it.

THE SALEM PUMP

There were actually hundreds of small pump makers throughout the country who have been gone and forgotten for a good many years. The PRESCOTT & FURBUR COMPANY of Salem, Oregon, was one. I would not have suspected there had been one here, but for an old time photographer, M. Cronise. His family were early comers to this area and his father was a photographer before him. Mr. Cronise has a collection of many fine old pictures of early Salem. He ran across a picture of an old wooden pump and notified me. Actually, it was a new pump with the names Prescott & Furbur painted on it. By checking back we found that there had been not one, but three pump makers in Salem before the turn of the century.

The 1889 Salem Directory listed Jos. Fishburn, Mfgr. & Dealer, Pumps & Windmills, located at 258 Commercial St.

The oldest Salem pump maker listed was "B. F. Drake, Salem Foundry & Machine Shop. All kinds of Machinery and PUMPS made to order, 1870".

Being a foundry, their pumps were very likely made of iron. No other information was found on either of them.

Of the Prescott & Furber Company we had better luck. Furber was listed in the 1886 Salem Directory and in the census.

Prescott invested $3,000 for equipment. He employed seven men full time and five men part time. One year's record showed that he paid $2.50 a ten hour day for skilled labor, or $3,000 wages in one year. They worked 10 hours a day in the summer and 8 hours in the winter. The value of material on hand was $2500 and the value of the product for the year was $7500. They turned out 750 pumps which would set the value of each at ten dollars.

About that same time, in the East, IXL and several others were making wood pumps. I notice the price of Douglass's smallest one was listed at about two dollars, wholesale. I was trying to do a little quick figuring on the cost of Prescott's pump. If he made 2½ pumps a day, hired ten men at $2.50 each, his pumps would cost him about ten dollars each for labor alone, not to mention overhead. At that rate, he would have been bankrupt in a hurry. It is a good thing he did not have to compete with the wood pump makers in the East; Douglass, for instance.

And how about the old pump makers of England about that time? It took two men a week, working ten hours a day, to make and install one pump from start to finish.

Following is an article listed in the 1886 Salem Directory:

> "Mr. Prescott has been making pumps for the past 5 years, and now, from Astoria to Lewiston, and from the California line to British Columbia, pumps of his manufacture are in use, and continually increasing in popularity. They are made of yellow balm wood, which stands the weather and is less apt to crack than any other wood known. Mr. Prescott keeps 4 wagons in use delivering his pumps and wooden pipe in different parts of the state, and experienced men are at work setting them. His work is all warranted. During the past three years, his factory has turned out, and his sales have averaged 750 pumps a year."

There was no mention of Furber's part in the Company. Perhaps he merely invented and designed the pump. Further half-hearted search failed to reveal when Prescott's pump works came to an end.

It must have been quite a job rounding up enough "yellow-balm" trees to make so many pumps, along with the wood pipe to go with them. The "logs" would have to be gathered up by wagon in the summer time when the fields of mud were dried up. In winter time here in western Oregon it would still be a sticky, gooey business. Just any old cottonwood would not do, either; they had to be "selected." Not too old or large, fairly straight; very few limbs or knots, nor could they be too young. The "prime yellow balm" trees around Salem were pretty well thinned out by the time Prescott got through making wood pumps. Of course, they grew back quickly, say 30 or 40 years after the iron pump makers got the wood ones run out of business. (Yellow Balm, I have learned, is the ordinary cottonwood tree.)

DECATUR PUMP COMPANY

Decatur was a "late comer" in the hand water pump industry. I do not know how it happened, but they got their start in 1914, by receiving an order for 1000 special type hand water pumps. It was designed to "pump air along with water" when air was needed in hydro-pneumatic water storage tanks.

I have been unable to get a description or picture of it but it was supposed to be superior to other pumps at that time.

Mr. Bracelin, of the Decatur Pump Co., thinks that they made only the one style of hand water pump.

Shortly after that, they started manufacturing electric pumps, which soon led them into the "Burks Super Turbine Pumps".

Today they make a complete line of modern water systems and industrial pumps under the Burks trademark.

SECTION III

PUMPS AROUND OREGON

This section is composed principally of drawings of a few of the many old pumps I have run across in my own state of Oregon. I have seen a good many interesting ones that I have not shown.

It does not include any of the 100 pump collection of Julius Steen in Bend, Oregon. If you happen to be travelling in that part of the state and care to see some odd pumps, Mr. Steen will be glad to show them to you. He lives on Division Street near the depot.

Mr. Chester Wilson, the Mayor of Irrigon, population 300, in N. E. Oregon, sent me a picture of one of the last "town-pumps" in the country to be replaced by a "municipal water system", which had been recently installed. That was in Nov. 1969.

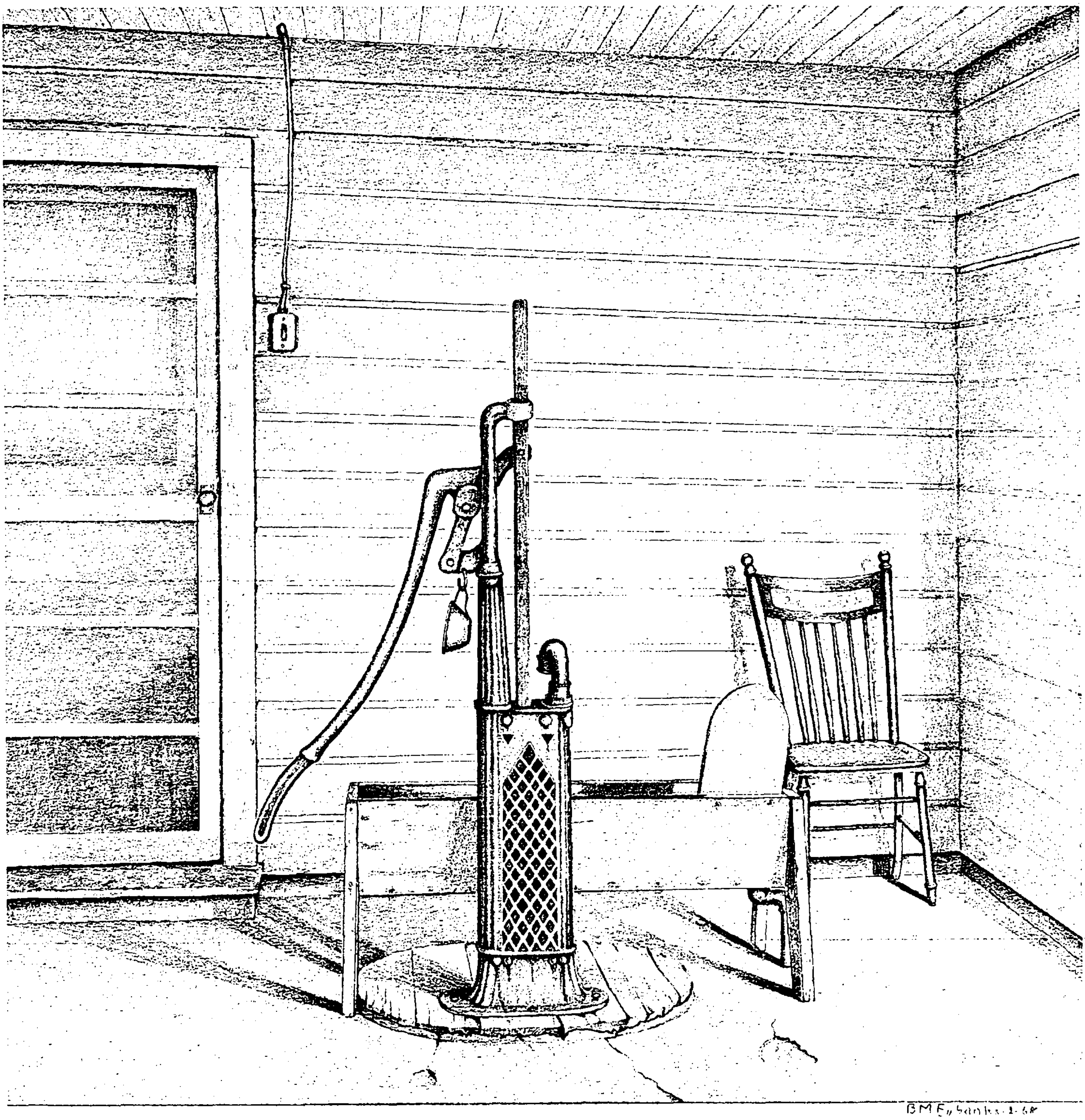
Southeast of Burns, I found an old Montgomery Ward pump in an alfalfa field. There were no traces left of the old house. The caseing over the "barrel" of the pump was oval shaped, as if it had been run over and flattened. However, it would still pump water.

Near the famous "round barn", about 40 miles south of Burns, stands an old Red Jacket pump: a few strokes of the handle and water came out of the spout. The pump and barn had been deserted for a good many years. The Historical Society is now in the process of restoring the old relics. I wrote up the history of the barn and made a drawing of it. It is not in this "pump-book".

"Come see this pump". My son hollered to me as he stood looking over an old dilapidated barn, on its last legs. Of course I "came", but said, "I don't see no pump". "You're standing on it". He replied. I looked down, and sure enough, nine tenths burried in cattle mud was a big heavy old Myers pump. Hundreds of cattle had been tramping over it for years as they came and went out of the old barn, now used as a "loafing-shed".

There were many more, but the ones I have shown should be sufficient for the purpose of this book.

I have made no effort to collect pumps, but have had a few given to me, which I intend to turn over to our Historical Society when they have a place for them.


BMEubanks 1-68

BUCKEYE PUMP

This is one of those famous "Buckeye Pumps".

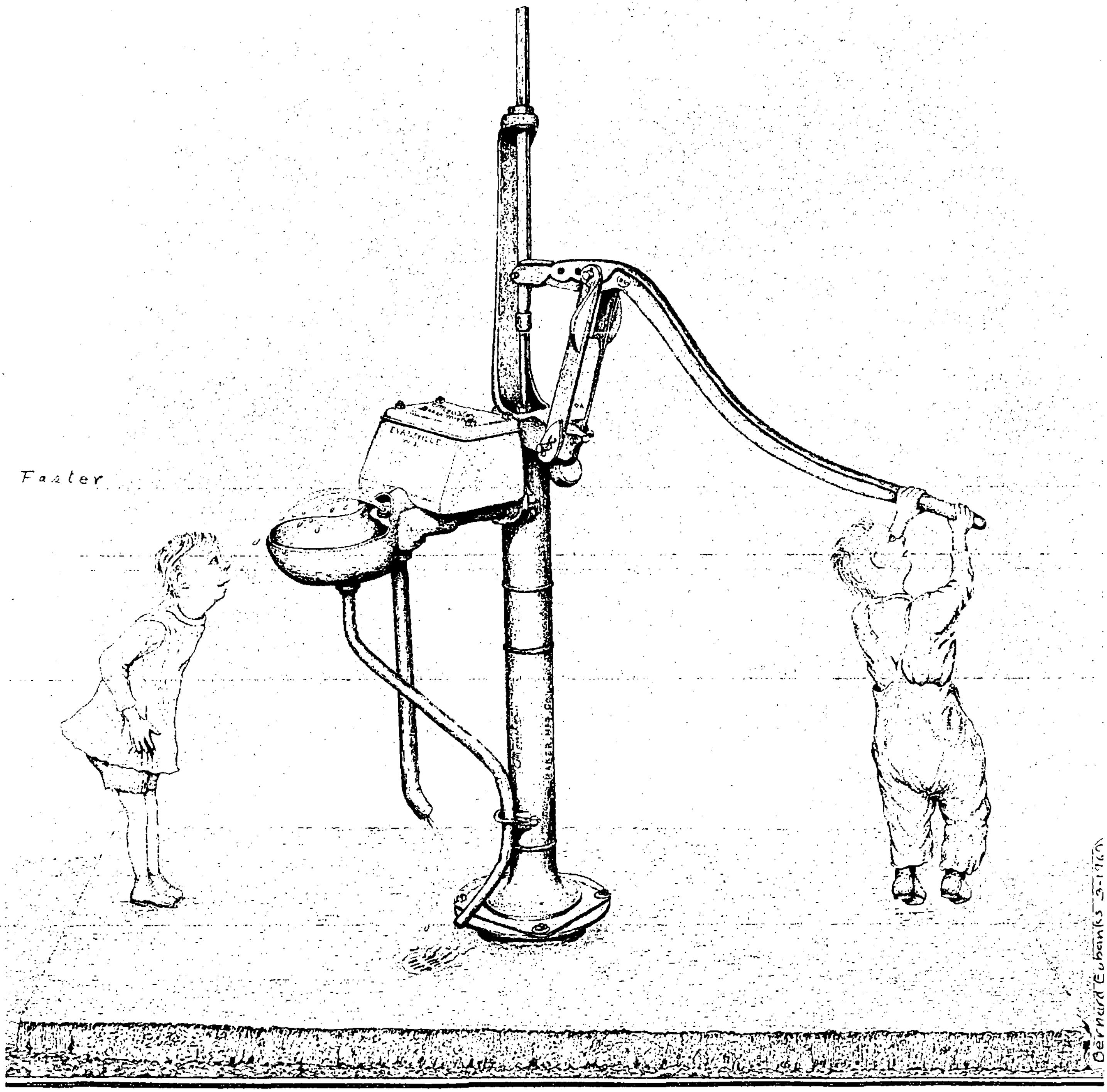
Their records claim they sold 50,000 of this one model.

I found this one on the semi-enclosed porch of the old John McKee home, near Amity, Oregon.

It was mounted over the well. An old-fashioned wood "sink" or trough, was set under the spout. Attached drain pipe carried the surplus water to a cesspool.

The following add appeared in the Minnesota Farmers Annual in 1908;

Buckeye PUMPS and WINDMILLS'
Made by the MAST-FOOS Co., of Springfield Ohio, Are Used The Wordl Over, and Still are the Best on Earth. Single and Double Acting Pumps, in all Styles and Sizes.


Faster
Bernard Eubanks

This is a **DRINKING FOUNTAIN PUMP.**

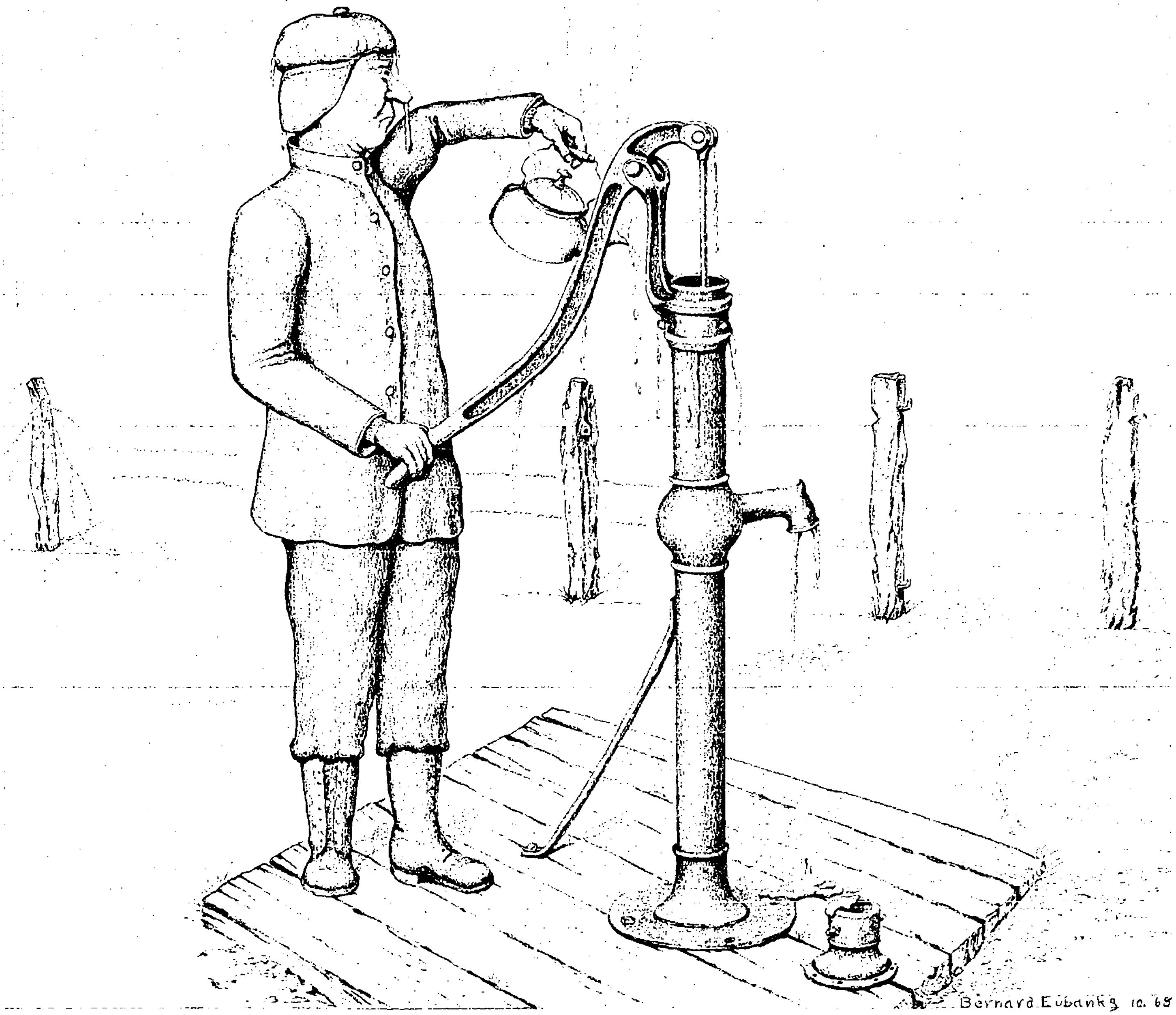
You may see and use one, if you visit certain B.L.M. parks.

It is a pressurized pump, designed to be used in deep or shallow wells.

It gives a steady flow of water. It is one of the few pump models ever made especially for drinking fountain use.

The handle has several "hinge holes" so the stroke can be adjusted, to increase leverage, for deep wells.

It was made by the Baker Pump Co., who still make a few hand pumps.


Bernard Eubanks 10.68

This is a very ordinary type of pump.

A single-acting, reciprocating lift pump.

It is not a pressure pump, as it has no air-compression chamber, and the top, where the pump rod goes thru, is open and slotted, to allow for the latteral and vertical motion of the pump rod.

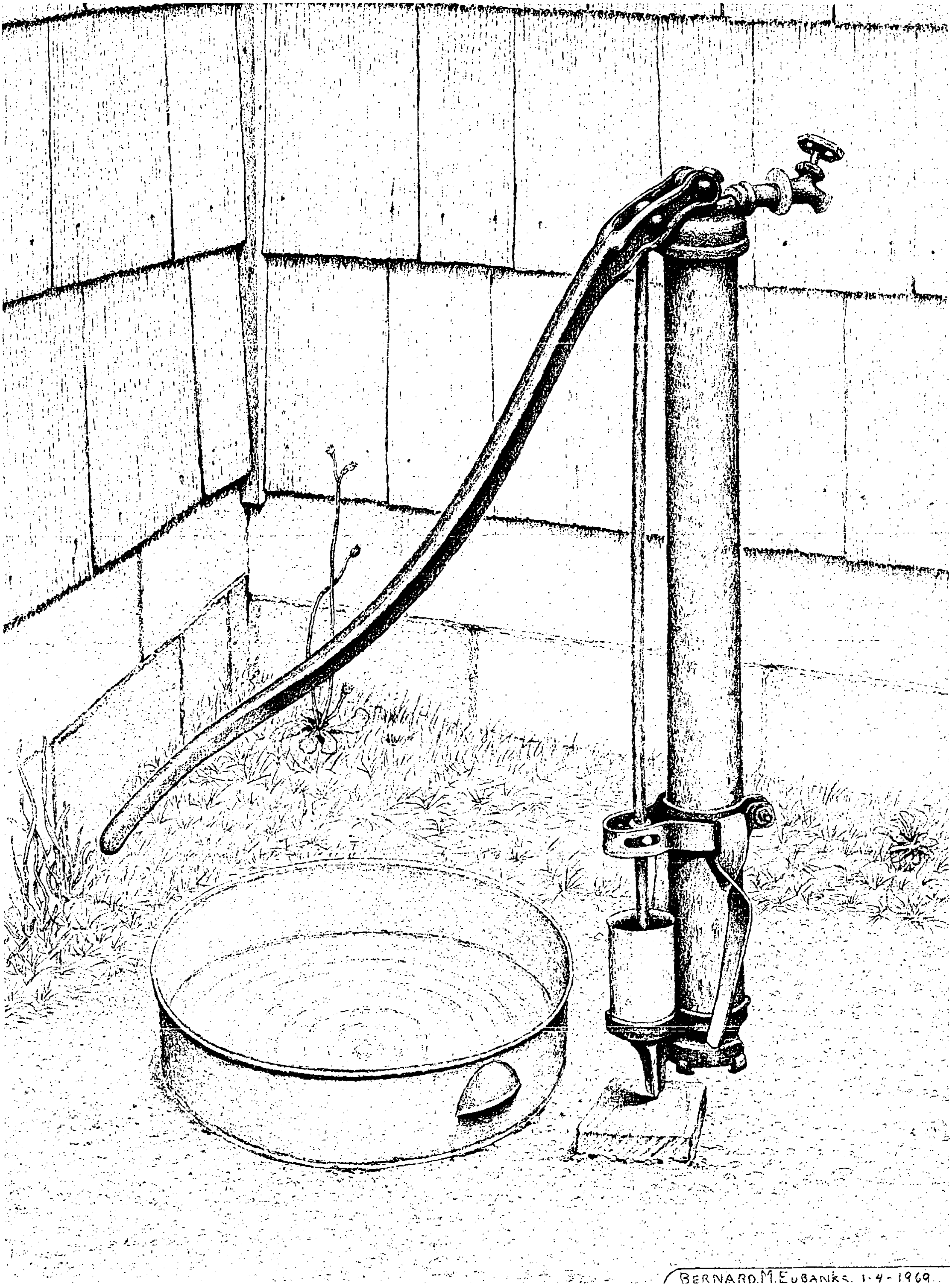
The handle support does not have a double hinge, nor does the pump rod go thru a packing nut to make it air tight.

"Freezing up" in cold weather, is a common trouble with pumps. Some pump owners were unaware that most pumps were provided with an anti-freeze drain.

Deep well pumps had a drain hole drilled in the well pipe, below the frost line and above the pumping cylinder.

Pitcher and other lift pumps, could be drained by lifting the handle "way up", which would trip the valve and let the water down.

Of course they had to be primed the next time they were used.


BERNARD M. EUBANKS 1-4-1969

WHAT KIND OF PUMP IS THIS?

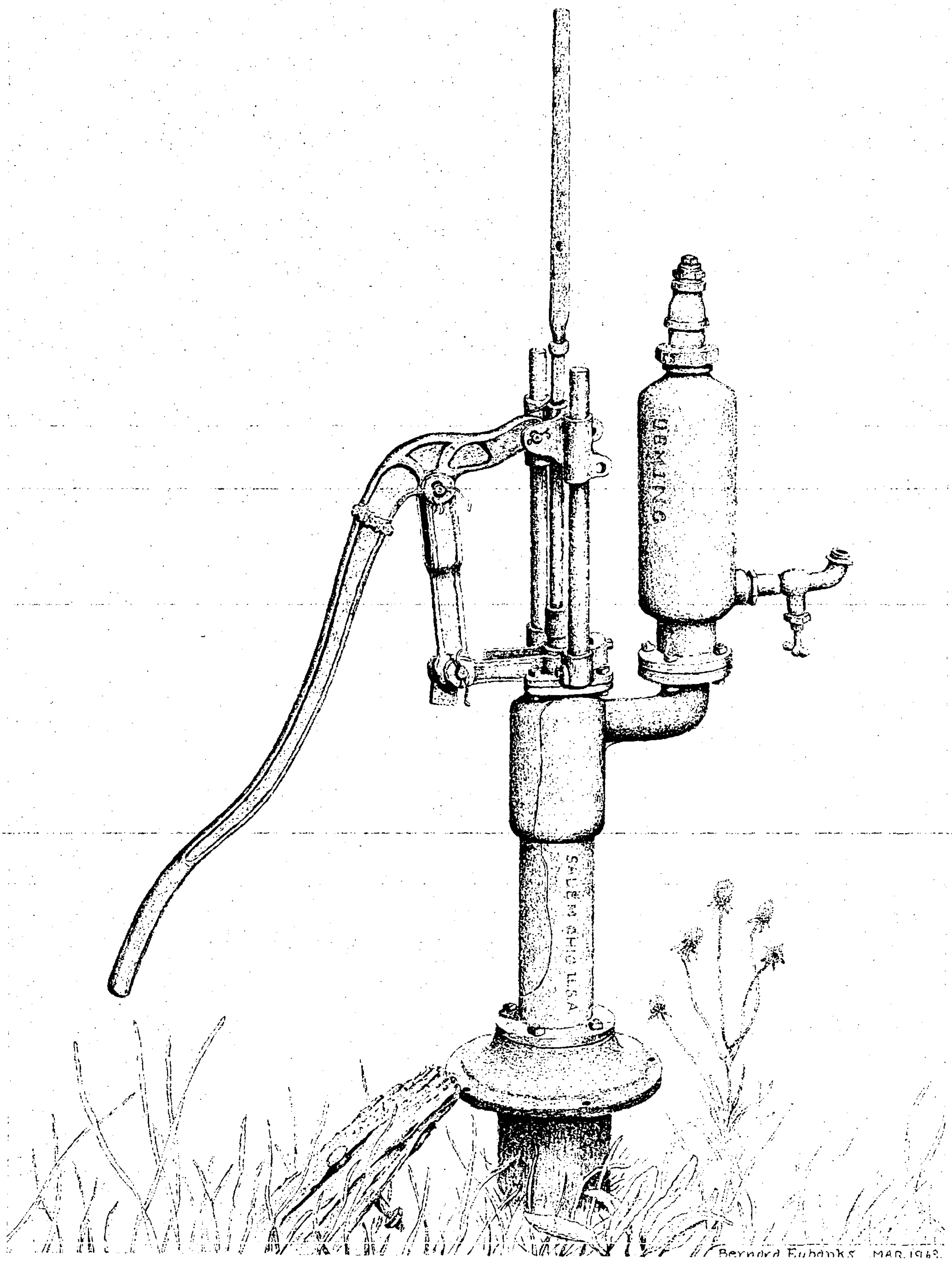
When the handle is worked, the "fins" go back and forth as if it were trying to swim.

It is a hi-pressure, force, spray pump. The long tube is an air-compression chamber.

The handle is long and the stroke is short, giving a high leverage ratio, which makes pressure pumping easy.

The short cylinder, set to one side at the bottom, is the pumping cylinder and must be set in the water.

Many a peach tree has been sprayed for leaf-curl with this kind of pump.


DEMING
SALEM OHIO U.S.A
Bernard Eubanks MAR. 1968

This old delapidated, deep well pressure pump was made by Deming.

I found it in a run-down hay field near Lebanon, Oregon.

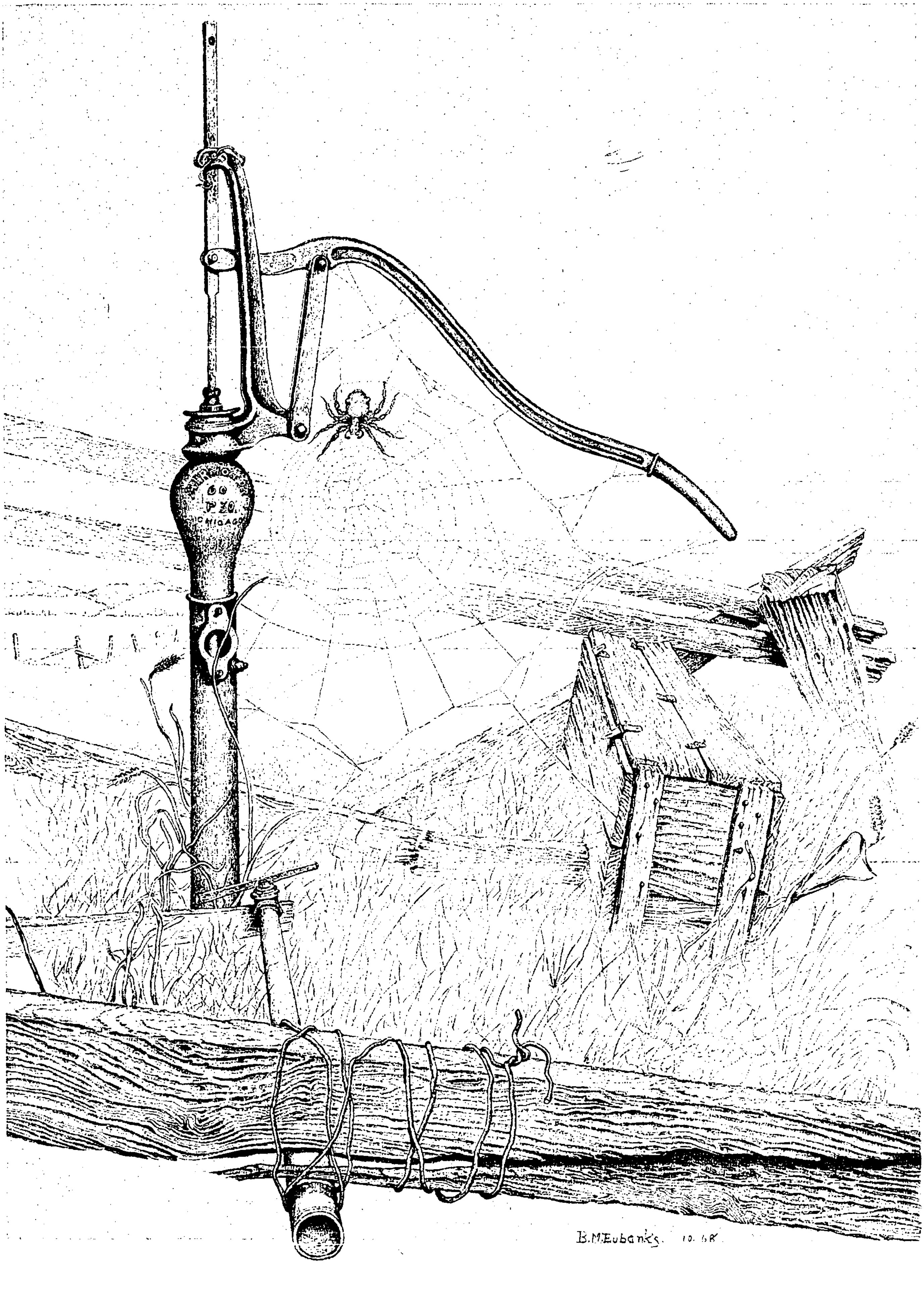
It probably was used to water the hot and thirsty hay hands at harvest time.

The old house may have been located here at one time.

The air chamber is off to one side, to allow space for the double guides of the pump rod; which must work straight up and down thru the packing nut, or stuffing box, with very little friction.

An ordinary faucet was screwed on and turned up for easy drinking.

The pump had been sadly neglected and broken by freezing.


B.M.Eubanks. 10.68

This is one of the few **AERMOTOR PUMPS** I have run across.

I found it near Honey Lake in north eastern California. It had been abandoned for many years.

It is a heavy-duty, deep-well, hi-pressure pump, designed especially to be used with one of their windmills.

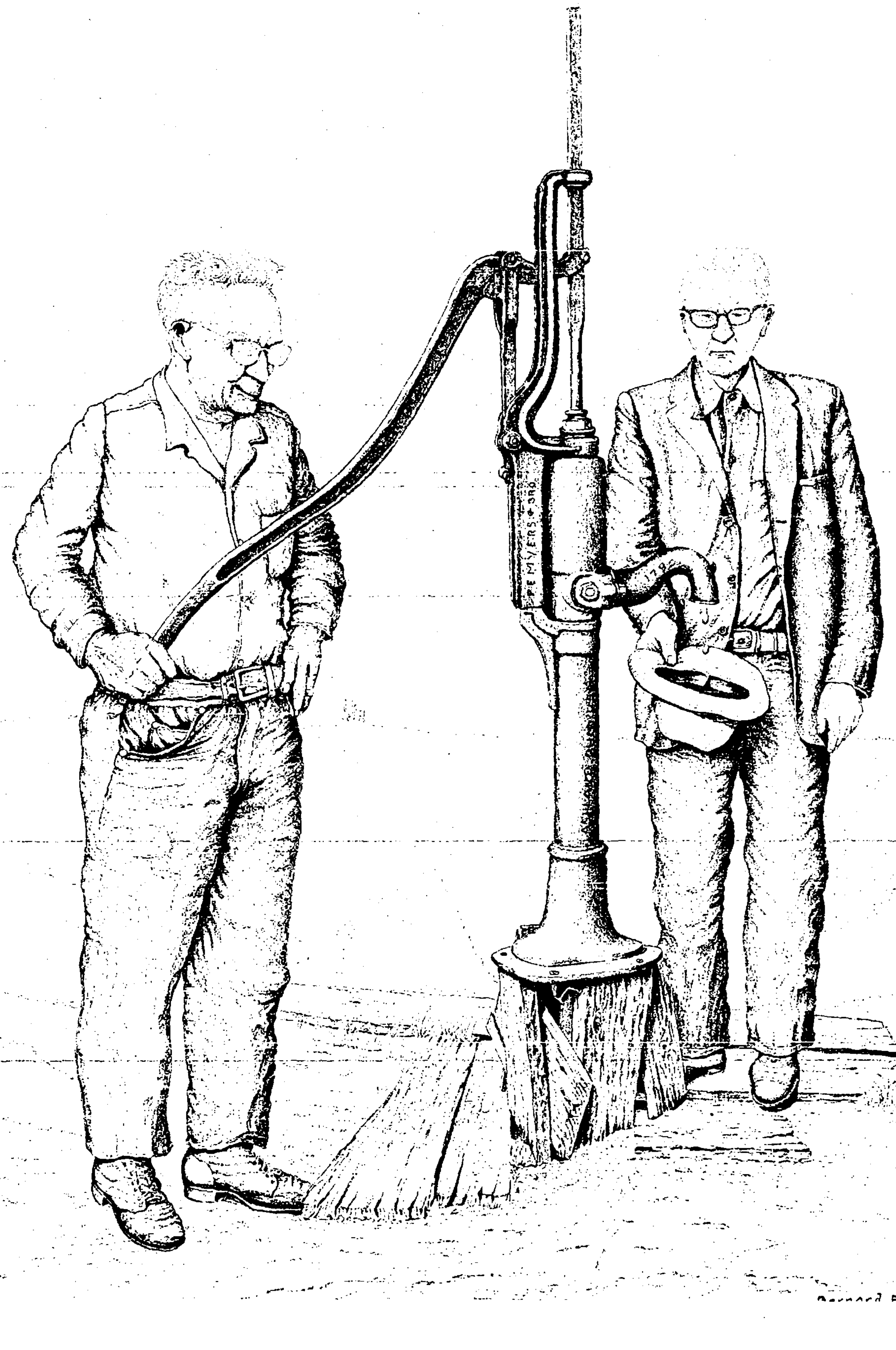
Aermotor specialized in windmills and pumps for farm use.

Remnants of the tower were scattered around, but the mill itself had been gone a long time.

I observed this "ORB-WEB" spider over a period of several weeks.

It spun a new center part to its web every night, even when it wasn't damaged much, using the same "super-structure".

SHE ate her partner after mating. (It was outside my bathroom window).



2 Bits
it wont.

Bernard Eubanks 6-68.

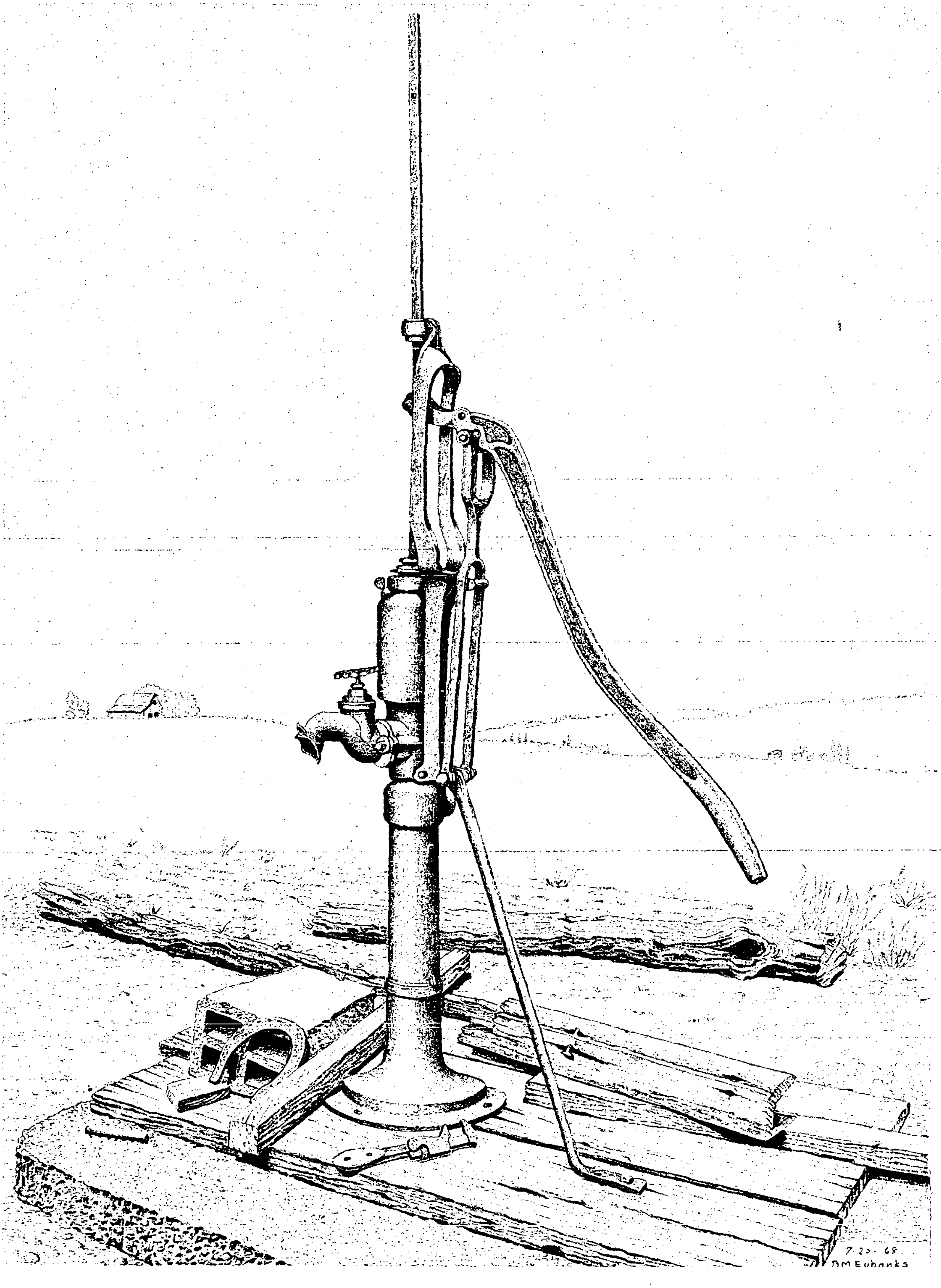
When I discovered this old **MYERS** pump in Scio, the owner seemed anxious to demonstrate it for me.

It is still in daily service.

During and after the devastating wind storm in 1962, when power was off for several days, people came from all directions to get water from this pump.

It is a heavy duty, deep well, steady flow pump with adjustable stroke and windmill rod.

The owner and a neighbor obligingly posed for a bit of humor.


7-23-68
BM Eubanks

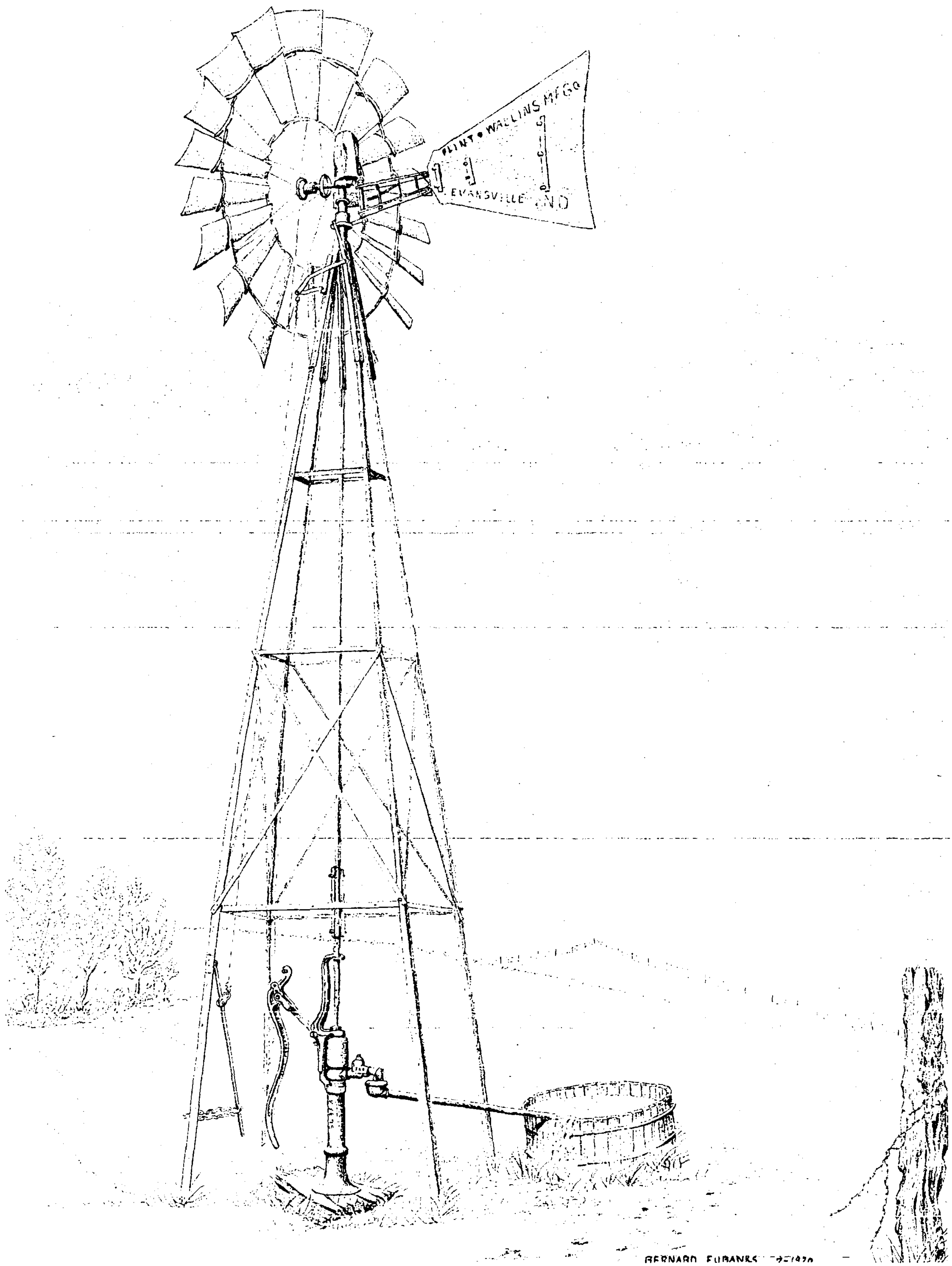
Another deep well, heavy duty compressing pump. The plunger can be set at any depth in the well pipe, just so it is within 25 feet of the water.

Can pump water as deep as 150 feet.

It is made very sturdy and heavy, with a brace, for hard work.

Has a "force spout". The valve can be closed and the water "forced" thru a hose or pipe attached to an outlet on the other side of the standard.

Notice the long "hinge and guide" arrangement of the handle, to take care of the "lateral" movement, so the pump rod can run smoothly in its vertical action thru the "stuffing box" and packing nut, on top of the air chamber.


FLINT • WALLINS MFG Co
EVANSVILLE IND
BERNARD EUBANKS

WINDMILLS and WINDMILL PUMPS

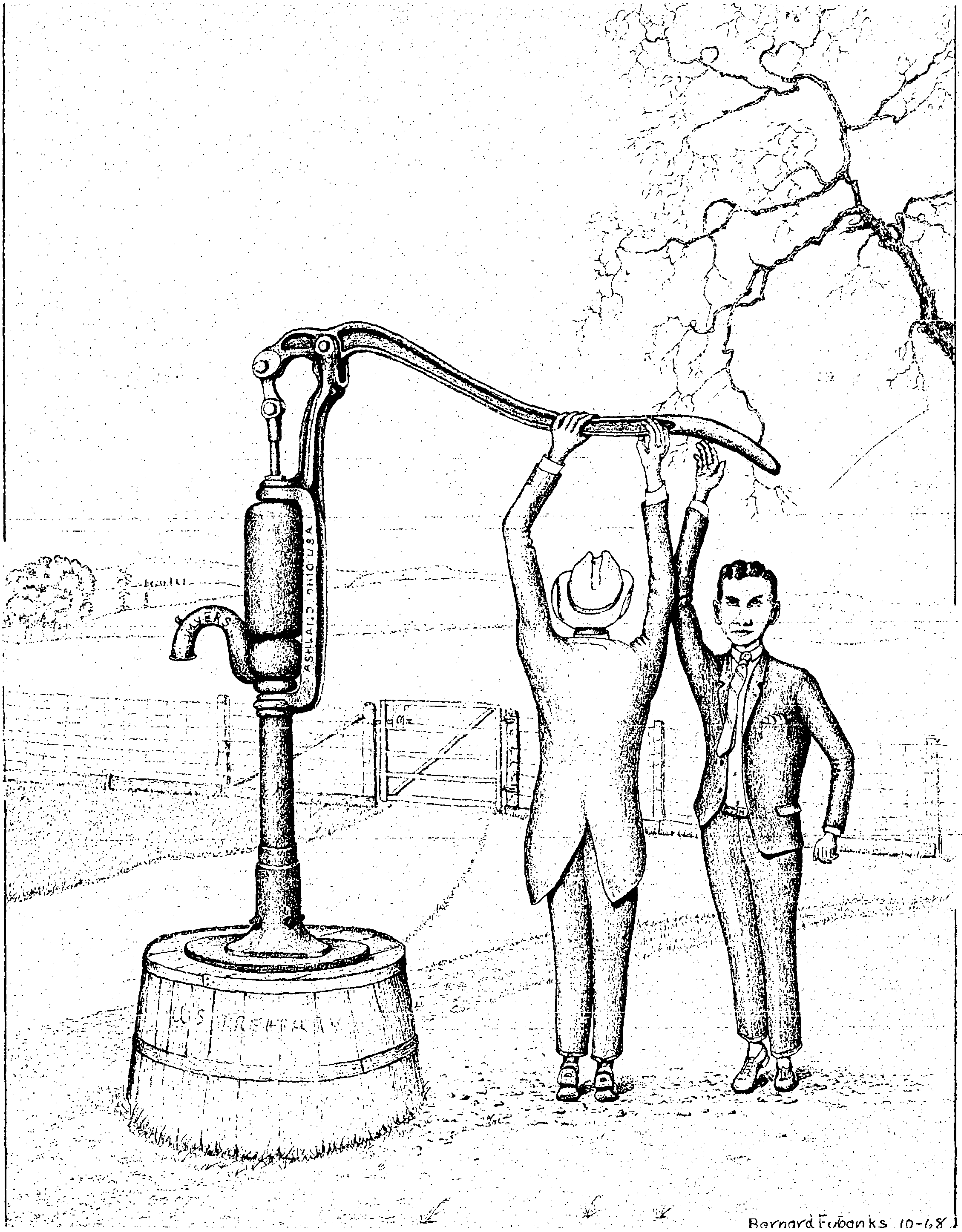
such as these, have served our people faithfully for over 100 years.

They have provided water for thousands of head of livestock that would have perished without it.

In 1860, there were so many windmills in the San Jauquin, Cal. valley, pumping water, that the city of Stockton was called "The Windmill City".

This mill and pump is near the Old Zena Church, northwest of Salem.

It is still bringing up water whenever a breeze comes along.


MYERS
ASHLAND OHIO USA
U.S. TREASURY
Bernard Eubanks 10-68

MYERS MADE THOUSANDS

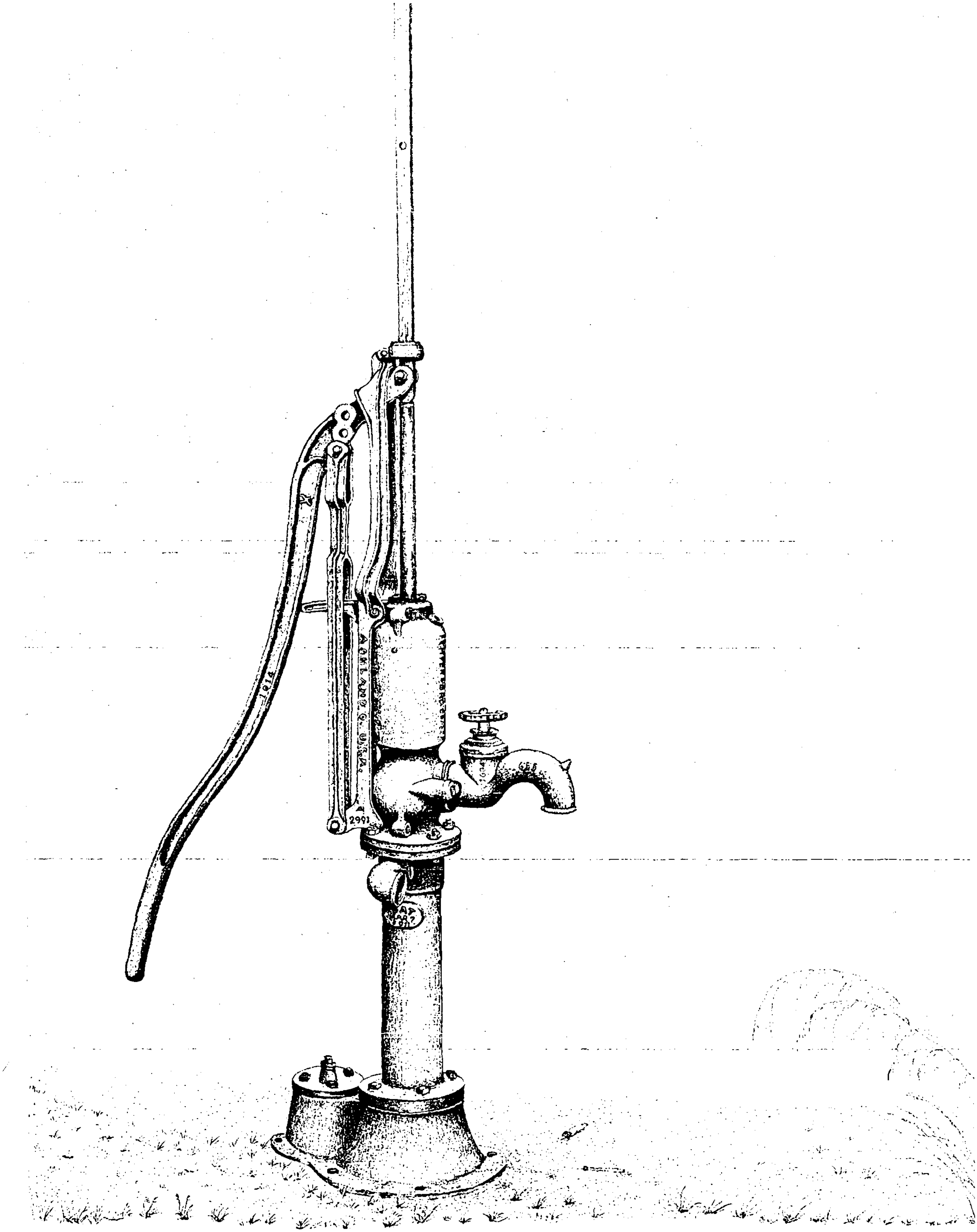
of this modest model pump.

I have run across more of them than any other Myers model.

It is a pressurized pump, as is indicated by the air-chamber, the double jointed "knuckle" or pitman on the piston rod, and the stuffing-box which it works thru.

I call this one my "Political Pump".

"Good thing it is a deep well pump, as the polititions are trying to pump the reserve dry".



Bernard M. Eubanks Jan. 1969.

There seems to be no limit to the number of different pump models made by Myers.

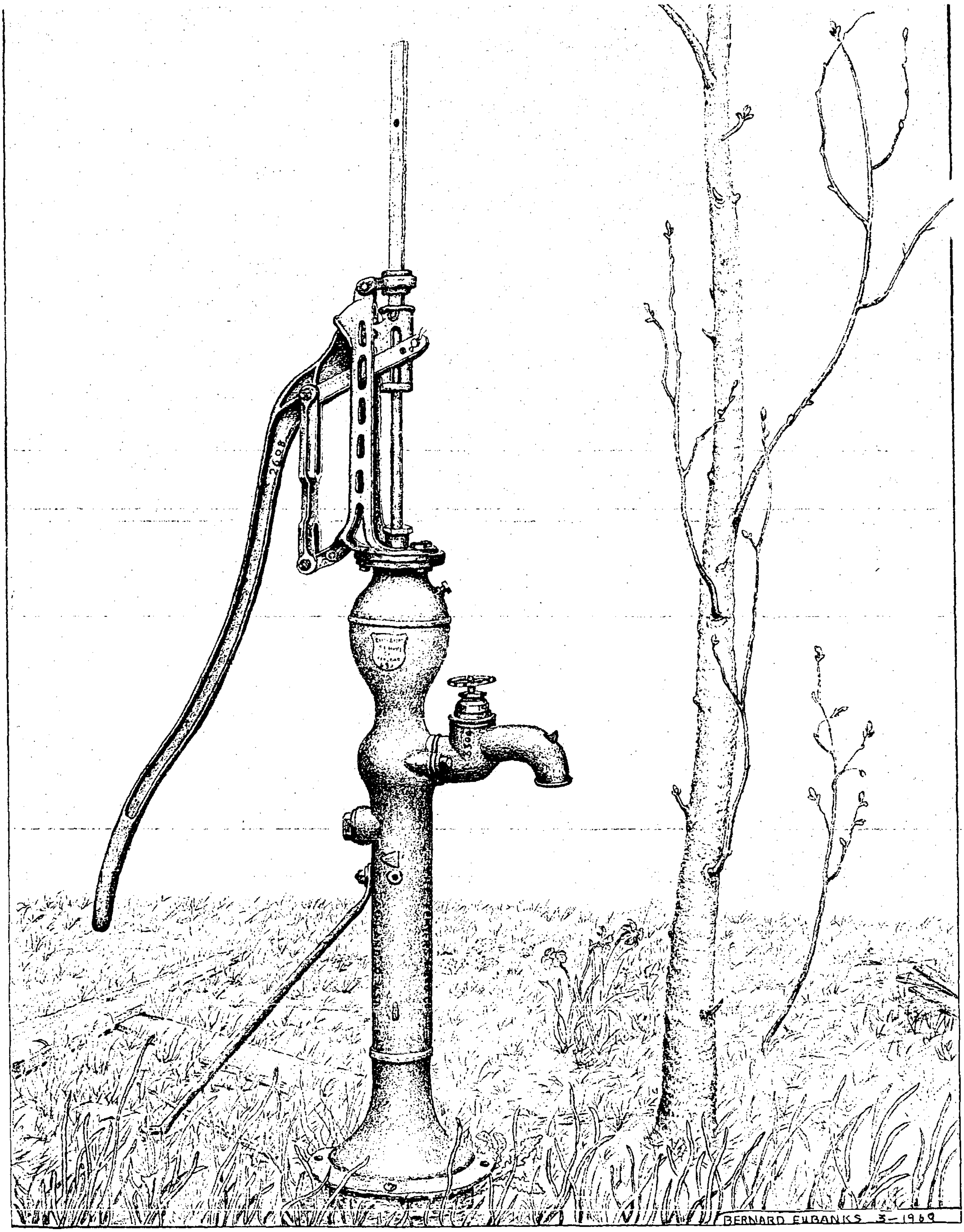
The patent date on it was March 7, 1911. I do not know what features of it were patented at that time.

It is very similiar to hundreds of pumps he made many years previous.

It seems to have about every thing that could be put on a pump. Windmill rod; elaborate adjustable handle and hinge support; air chamber; shutoff valve so water can be forced through a hose or pipe when attached to a fitting shown at top of barrel on this side.

I do not know what the extra base is for.

From Tumulo, near Bend, Oregon.


BERNARD EUBANKS 3-1969

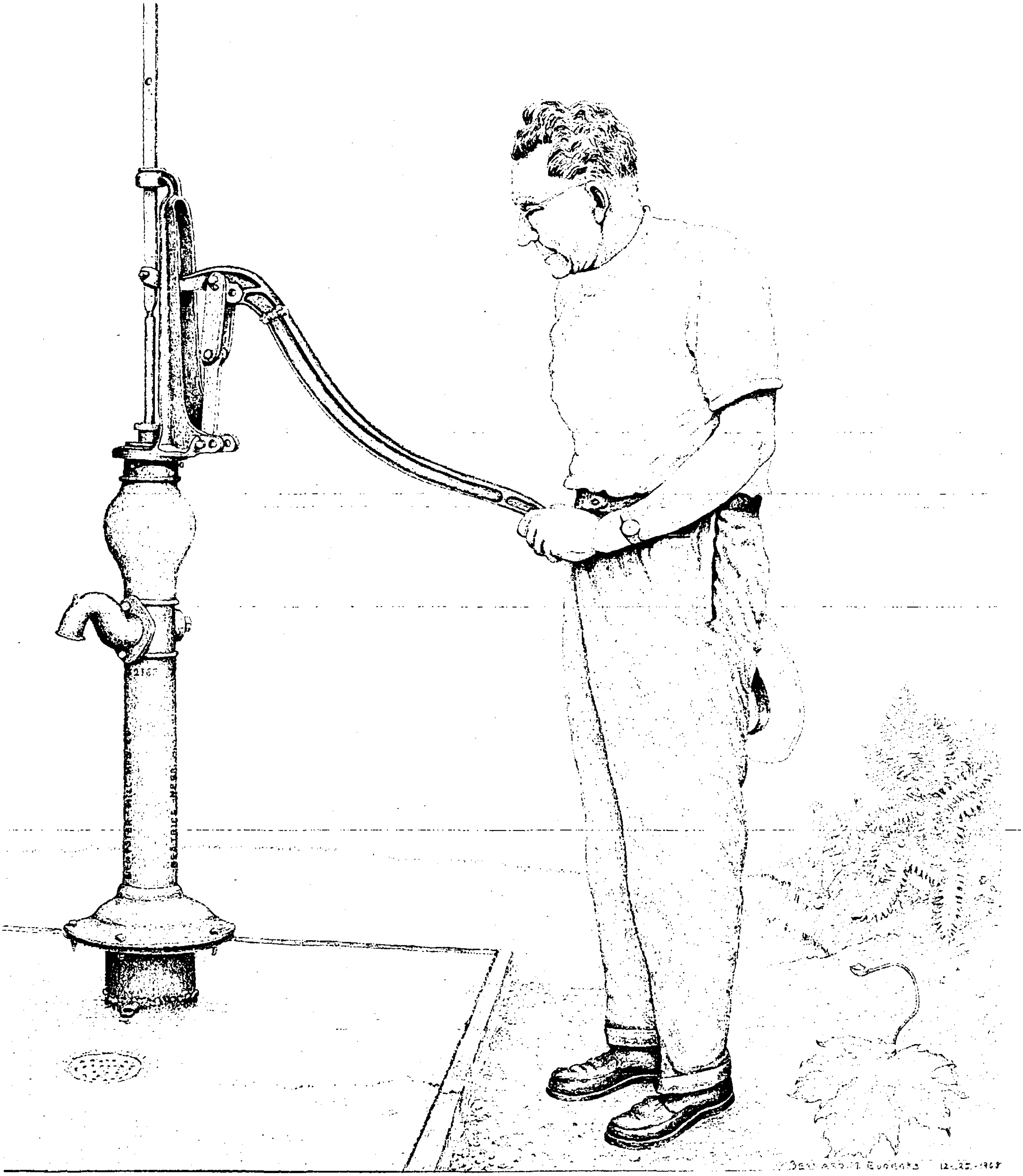
ANOTHER MYERS PUMP

I found this one in a grove of seedling cherry trees north of Silverton, Oregon. Remnants of the old farm house were still around, and parts of the barn still standing.

The standard, or barrel of the pump is cast in one piece. The "Spout" is detachable, as many are, so various types of spouts may be used.

The unique feature of this pump is a "geared handle". This one was patented June 5th 1911. The description of the patent is long, but summed up as follows;

The intermeshing, segmented gears, on handle and pump rod, travelling together, compensate for the lateral action, as the pump rod reciprocates in its vertical motion. This pump has an air chamber and windmill rod.


BEATRICE NEBR.
12-25-1968

B.L.M. parks and camp grounds use many of this model pump, made by The Dempster Company. They are a very old pump company, and still make a few of the old hand pumps.

This pump is just about the same as thousands of other pumps made by various companies.

The standard, or barrel, is cast in one piece and the spout detachable.

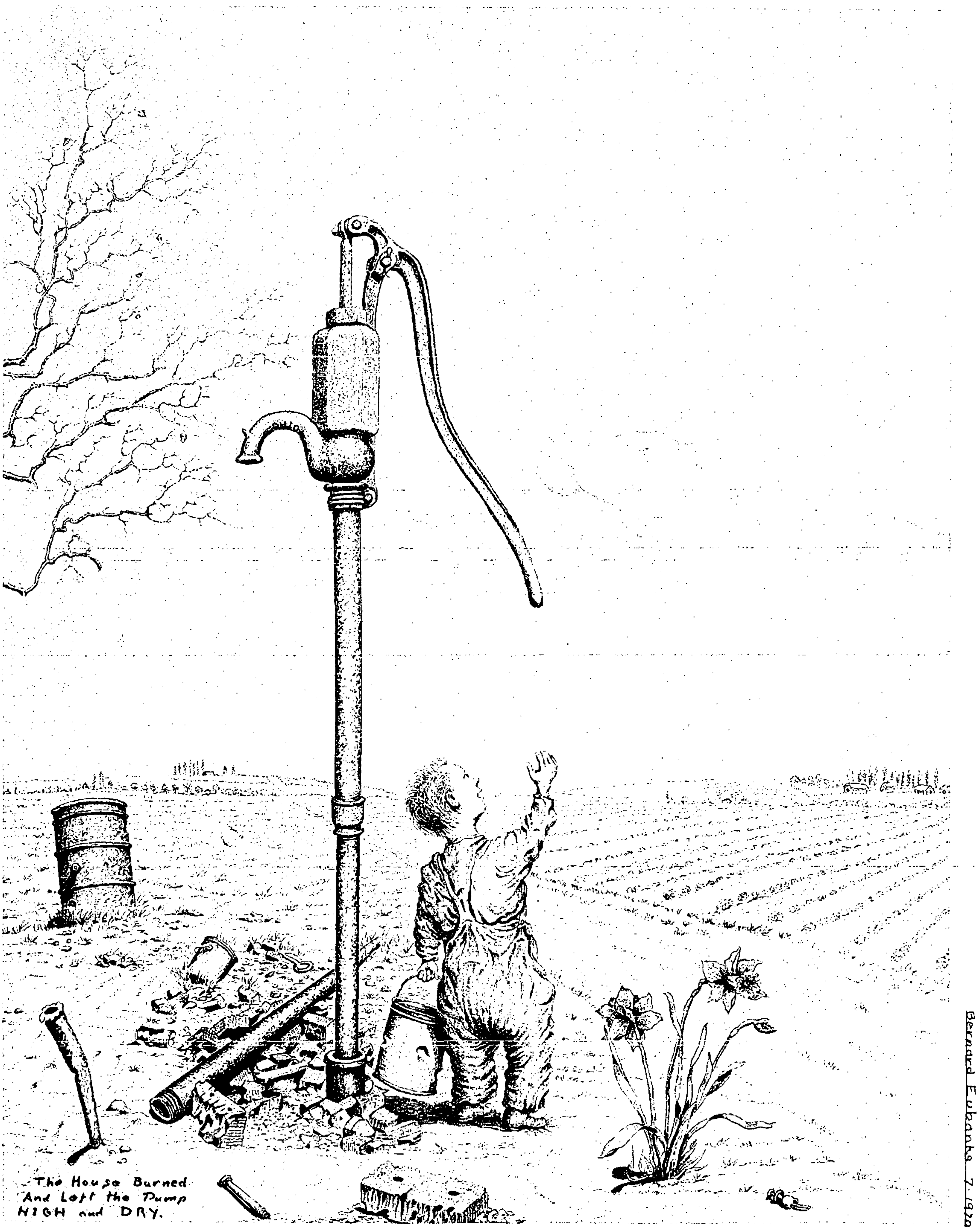
Note the double hinge system used for the handle support, also the "stroke" adjusting method.

The air chamber and water tight stuffing box make it a "steady flow" pump.

The handle has been broken and repaired by brazing.

Vandals, or irresponsible hoodlems, do lots of damage to park equipment.

Spare parts, especially handles, are kept on hand by park attendants, and are a considerable expense to park maintenance.


The House Burned
And Left the Pump
HIGH and DRY.
Bernard Eubanks 7-1970

PUMP AND BOY

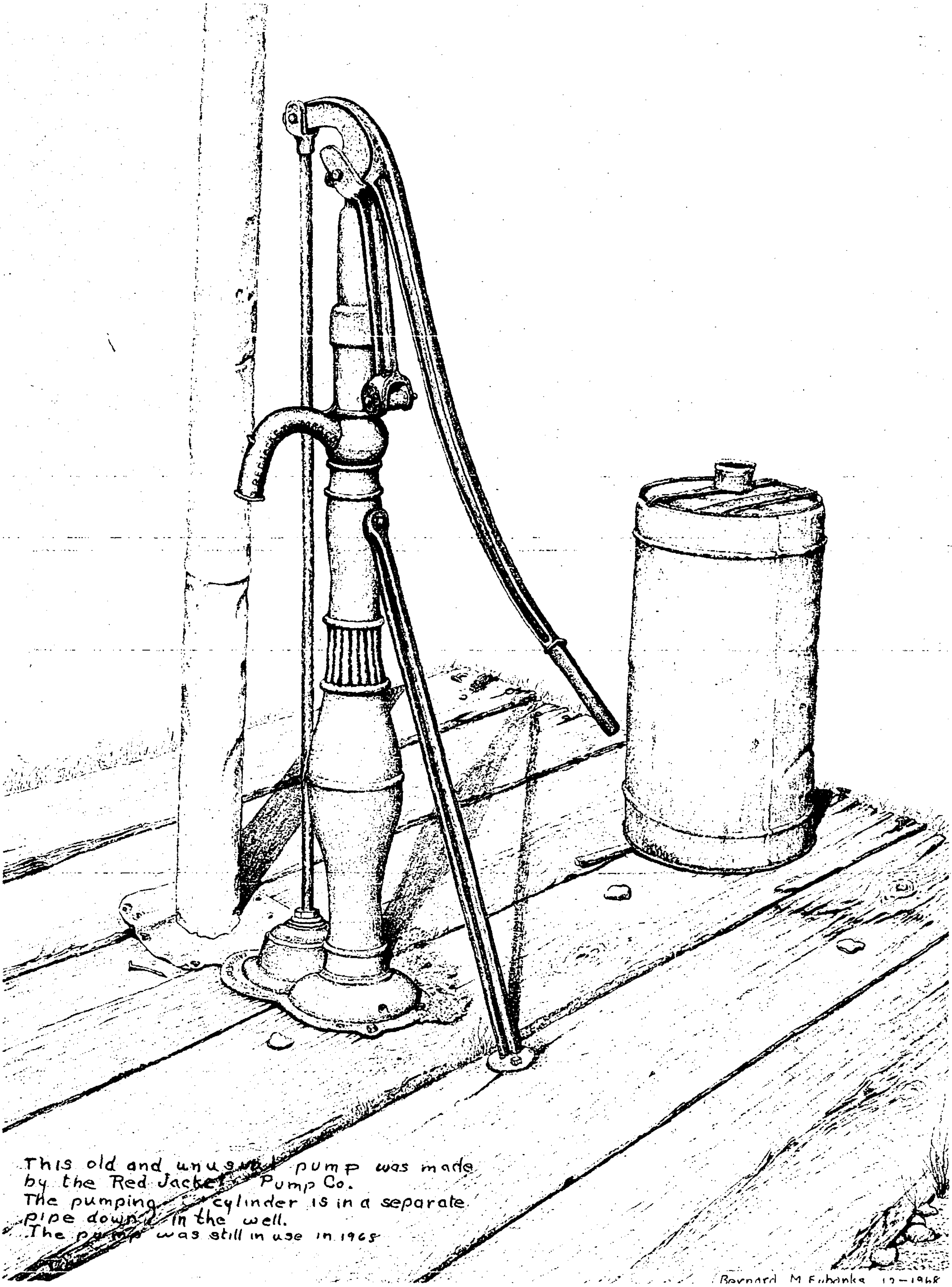
My wife and I had driven by this old farm many times without seeing anything unusual.

Then one day we were going by and noticed that the house was gone.

It had burned to the ground and left the pump "high an dry".

It had been on the back porch.

It was one of Demings most popular common lift pumps.


This old and unusual pump was made
by the Red Jacket Pump Co.
The pumping cylinder is in a separate
pipe down in the well.
The pump was still in use in 1965
Bernard M Eubanks 12-1968

A RED JACKET PUMP

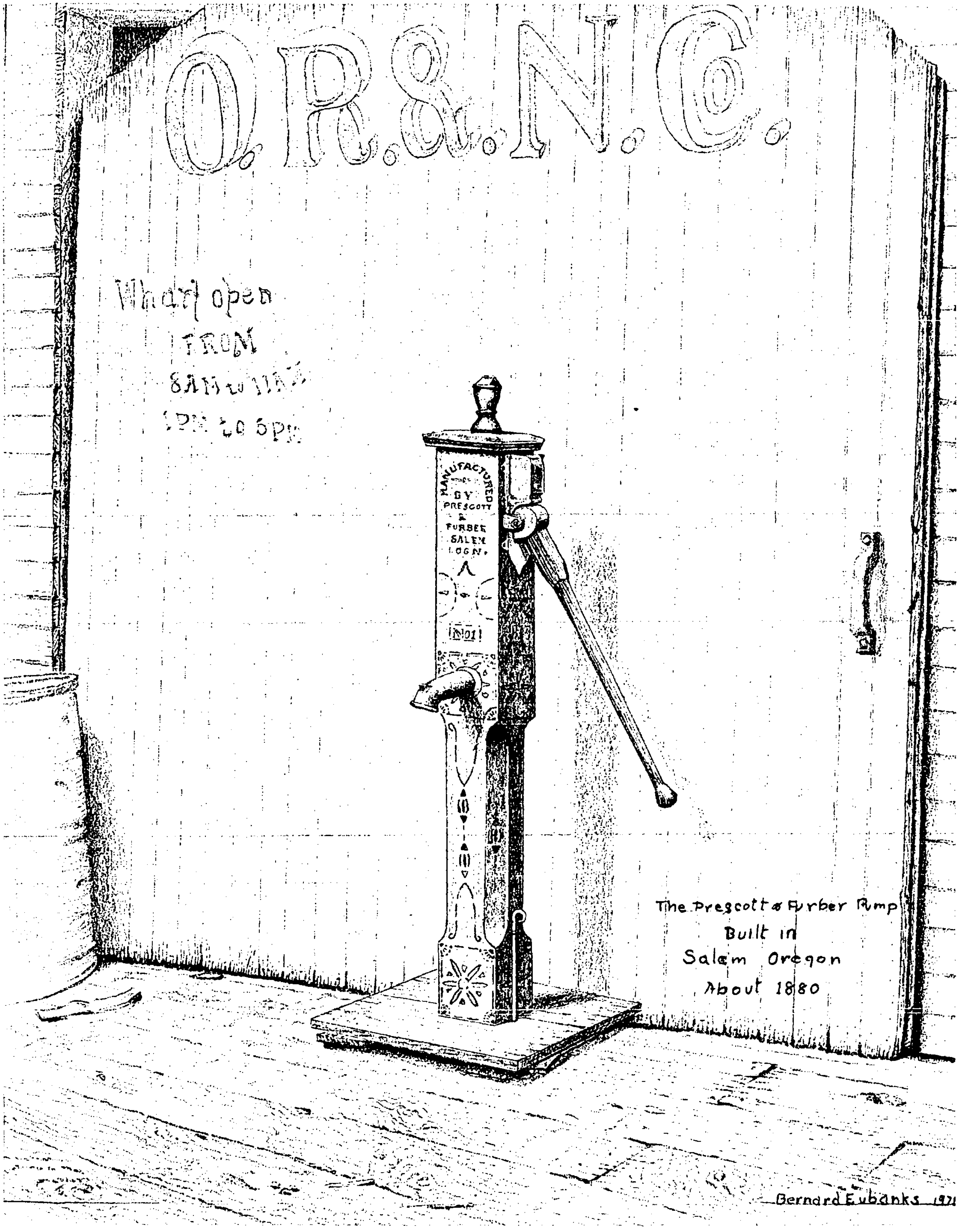
I found this fine old Red Jacket pump in Fort Jones, Cal.

Fort Jones is an old stage coach town "over the hill" from Yreka in the old Scotts river mining country.

The pump probably was installed about 80 years ago.

The large pipe to the side is to ventilate the well. The pumping cylinder is attached to the well pipe down in the well, as is indicated by the pump rod going down outside instead of inside the pump barrel.

This is a very heavy, well made pump.



O.R.&N.Co.
Wharf open
FROM
8AM to 11AM
1PM to 5PM
MANUFACTURED
BY
PRESCOTT
&
FURBER
SALEM
OGN.
No 1
The Prescott & Furber Pump
Built in
Salem Oregon
About 1880
Bernard Eubanks 1971

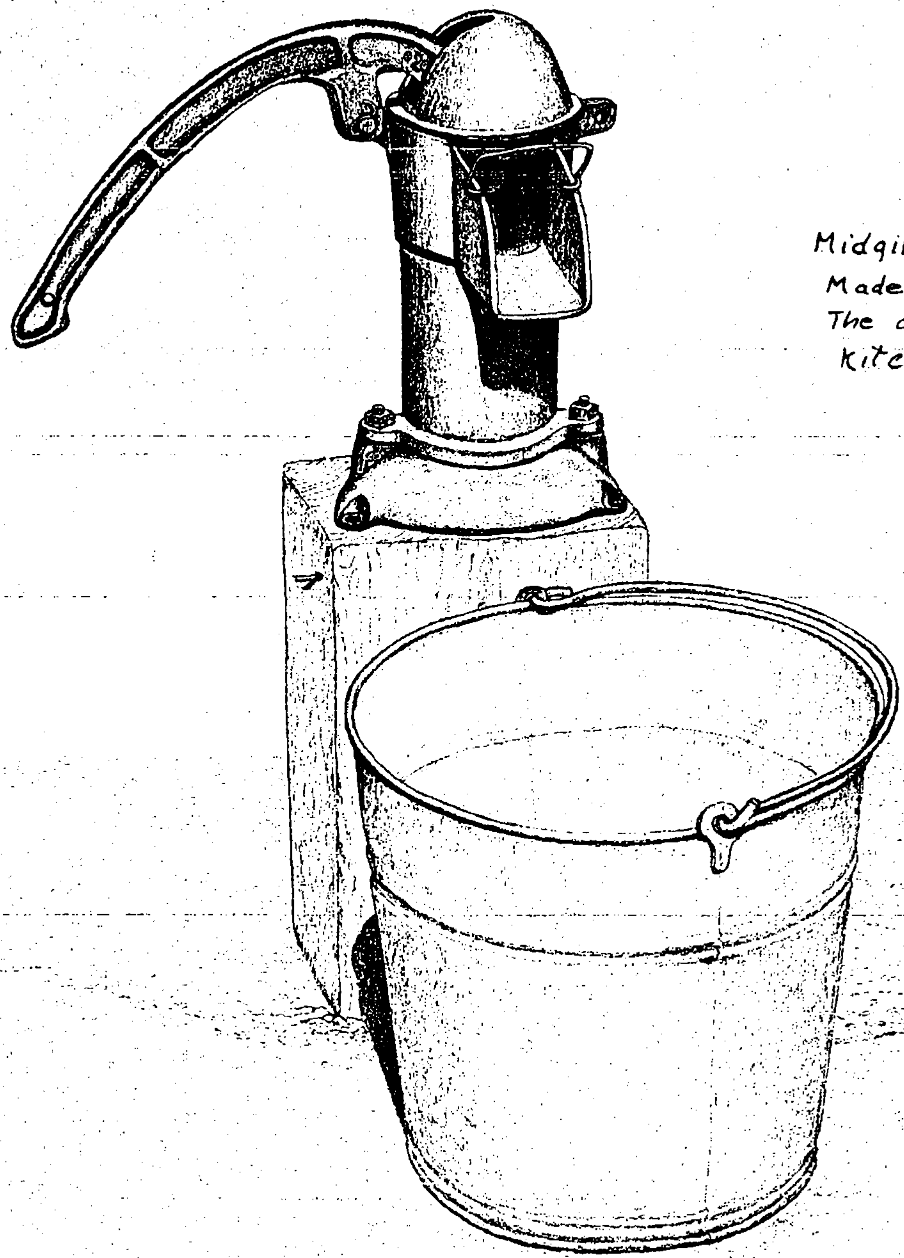
THE PRESCOTT & FURBER PUMP

It was made in Salem, Oregon during the 1880's.

This drawing was made from a photograph of a new pump as it sat on the warehouse platform of The Oregon Railway and Navigation Co.

The photograph was furnished by The Cronise Photo Studio.

There were two other pump factories in Salem about that same time. They were both makers of iron pumps.



This is a
Midgit Pitcher Pump.
Made especially to use on
The drain board in the
kitchen.

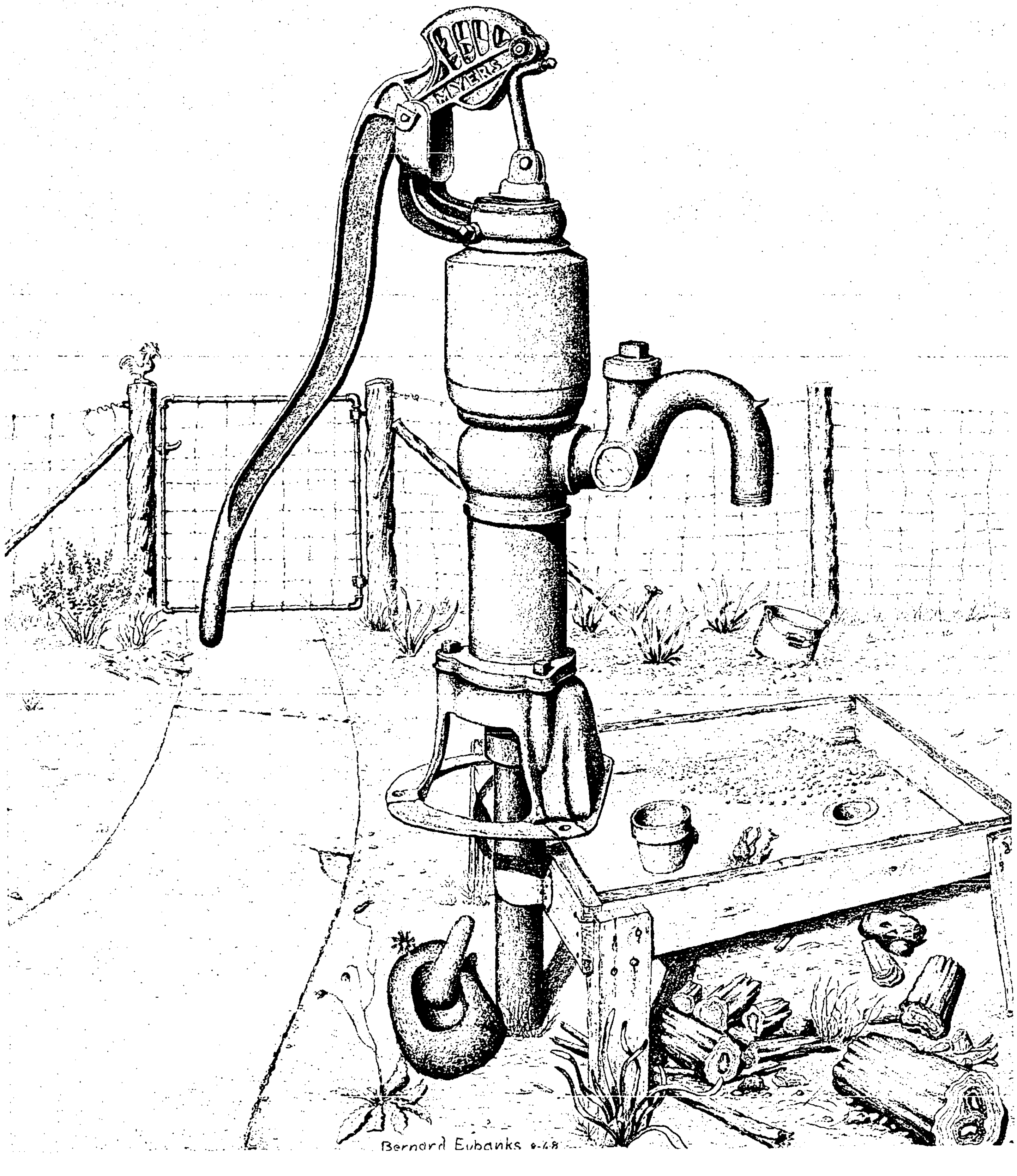
BERNARD EUBANKS 12-1968.

A MIDGET PITCHER PUMP

While the pitcher pump is the most common of all pumps, the midget is quite rare.

It was designed especially to be used on the drain board in the kitchen.

The regular pitcher pump is about twice the size of this one and most pump companies made them by the thousands.


MYERS
Bernard Eubanks 8-48

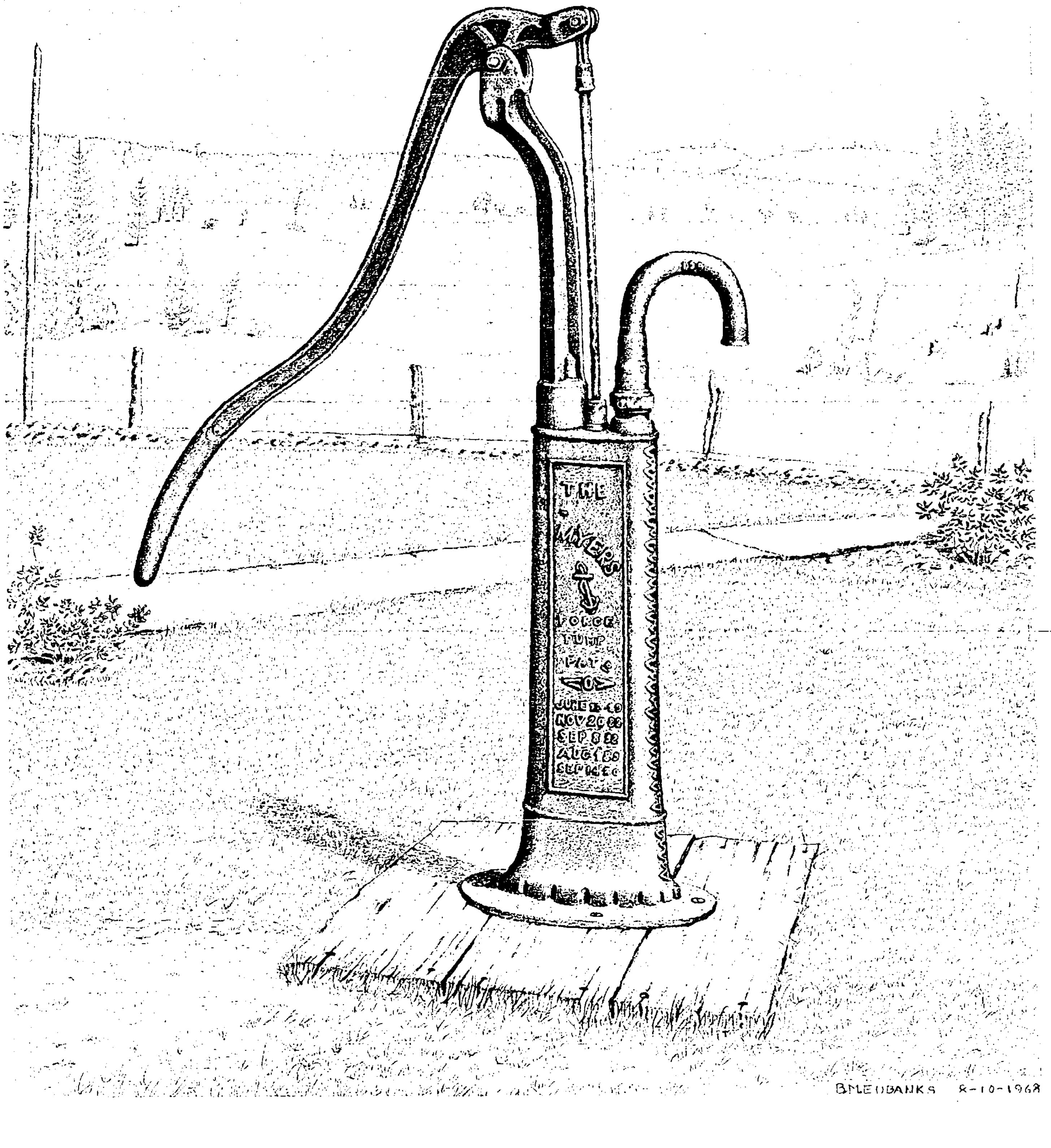
ANOTHER MYERS PUMP

This one is owned by Adolph Rosprafka near Scio, Oregon. They live on the bank of Thomas Creek, where they gather petrified wood.

It has an air-compression chamber; a cutout valve may be screwed into the spout to force the water thru another opening.

The "gears" on the end of the handle and on pump rod, is a Myers invention.

This one is somewhat dislocated.


THE
MYERS
FORCE
PUMP
BMEUBANKS 8-10-1968

MYER HOUSE PUMP

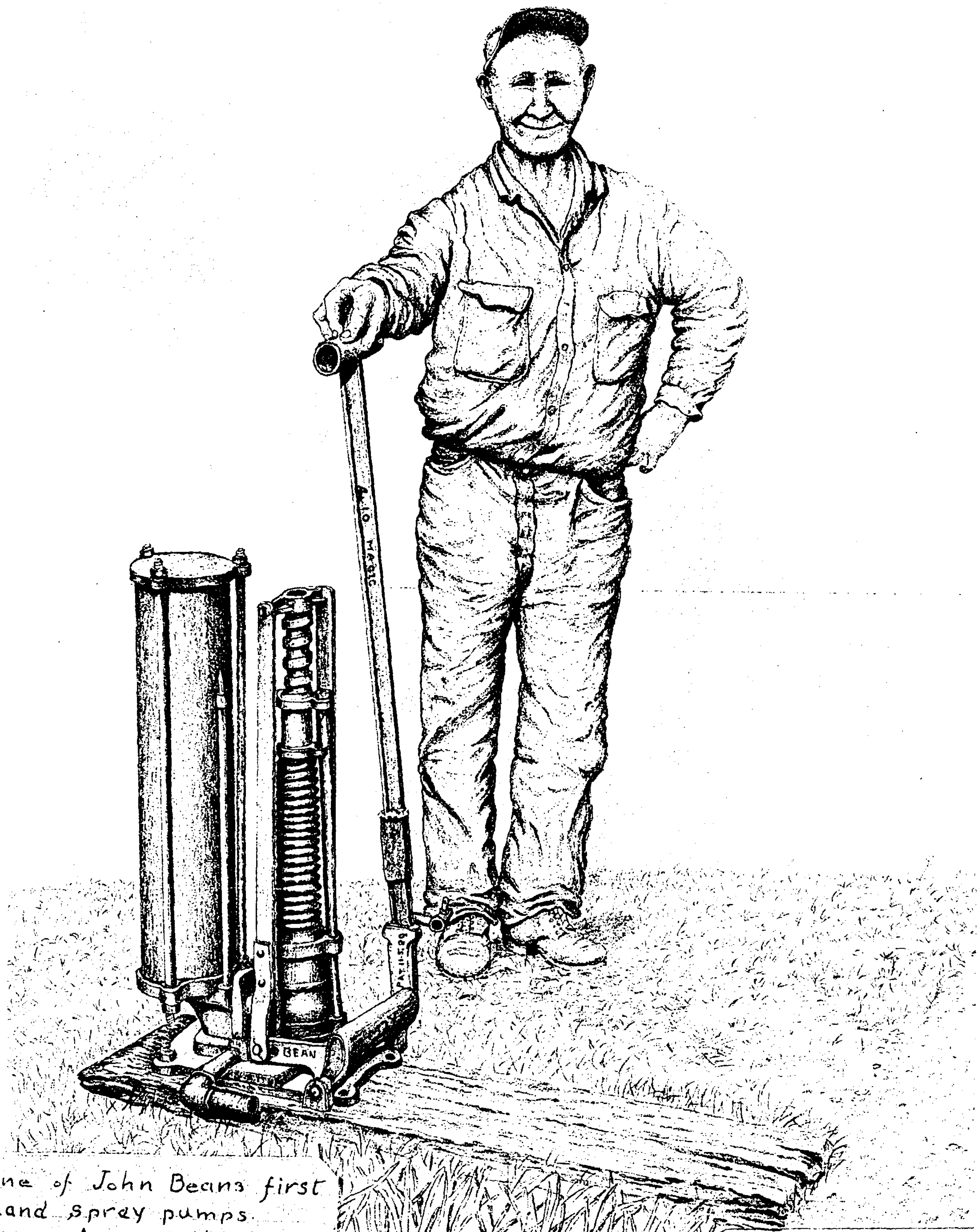
This one is made decorative especially for household use.

I ran across one of this model "stripped of its jacket". It was in a shallow open well in a field for watering stock.

The pumping cylinder was at the end of the pump rod, about ten feet down in the well.

The water discharge pipe was attached to one side of the cylinder, and came up separate.

The pump had been twisted and damaged until it was no longer usable.



One of John Beans first hand spray pumps. Magic A 10 Pat'd 1889.

A BEAN PUMP

This is one of Beans early models of hand spray pumps.

It was much too heavy to be used as a "tote-pump", so it must have been made to be carried on a wagon.

SECTION IV

FACTS ABOUT PUMPS

PUMP TERMS

It occured to me that I should give a definition of some of the most common pump terms.

Lift Pump: water runs out when it reaches the spout, has no compression chamber or stuffing box.

Pitcher Pump: so called for its open, pitcher shaped spout, it is a lift pump.

Single action pump: water is expelled once on each stroke.

Double acting pump: water discharge is continuous, usually by use of 2 cylinders, or by special arrangement of valves in one cylinder to expell water twice on each stroke. The Encyclopedia Americana says that an air compression chamber creates a double action pump. Most pumps are not called double-acting for the air-compression feature only.

Force Pump: water is 'forced' out under pressure. Must have air tight chamber with 'stuffing box'. Or, pumping cylinder is set in the water, which is forced out, but not 'sucked' in. Orchard spray pump, for example.

Suction Pump: water is drawn in, or 'sucked in' the cylinder when the plunger is pulled up and creates a vaccuum.

Shallow Well Pump: one that will draw water about 30 feet or less.

Deep Well Pump: plunger must be set down the well pipe to get it within 25 feet of the water, what ever the depth. Will draw water up to 150 feet and more.

Lift Bucket, Sucker, Plunger, Piston: the same thing; the part that works up and down in the cylinder to suck, lift, draw or force the water out of a well.

Cylinder: the tube in which the piston works.

Curb, Stand, Standard, Barrel: the main body of the pump.

Brake: the pump handle.

Check valve: a valve set at various places in the piston, cylinder or pipe to control the water.

Foot valve: a check valve set in the well pipe to keep the water from going back down after being drawn up.

Reciprocating Pump: the plunger works back and forth, or reciprocates, in the cylinder.

Siphon spout: curved, open end spout; no shut-off cock or valve.

Compression spout: has shut-off cock so water can be forced out another opening.

Air-chamber or compression chamber: an air chamber set on top or to one side of the barrel of the pump. When the water is forced up, it compresses the air, which in turn, forces the water out in a steady stream. Sometimes the standard, or main barrel of the pump is used as an air-chamber.

THE IRON PUMP AND HOW IT IS MADE

Before I go into iron pumps any further, perhaps, I should explain their function and how they are made.

Wood pumps work on the same principal as the iron, except for the air chamber and I have described their construction elsewhere.

A pump consists of the well pipe which extends down into the water and main body of the pump, called the standard or barrel, which, in shallow well pumps, contains the pumping cylinder and lift bucket. In the pitcher pump, the main barrel is also the pumping cylinder.

To the standard are attached the spout and handle support, to which the handle, or brake is hinged. In the lift, of pitcher pump, the top of the barrel is left open or slotted, so the piston rod has room for "laterals" as well as vertical movement. The handle, where hinged to the piston rod, moves in an arc.

The pressure pump has an air tight "stuffing box" and packing nut where the piston rod enters, the barrel. An air chamber is often added, which increases the pressure, causes a steady flow of water and acts as a shock absorber.

Also, in the pressure pump the piston rod must work vertical only, so multiple hinge handle systems are used. In the pump drawings you may note the various methods I have shown. In deep well pumps, the pumping cylinder and plunger are set at various distances down in the well pipe.

Some pumps use a set-length-pipe, which is a short piece of pipe containing the cylinder and lift bucket. This set-length is incorporated in the well pipe, at what ever depth is necessary to get it within 25 feet of the water. The object of the set-length is to use a larger cylinder than will fit in the well pipe. The bad feature of it is, when the lift bucket needs repairing, the entire well pipe must be "pulled." When the plunger is installed in the well pipe itself, it is small enough to be pulled up through the pipe for repairs. Many a shed roof has had a hole cut in it so a well pipe could be pulled. It happened to me once.

I used to think that casting a pump was a simple process; you just cut out a wooden pattern of a pump, put it in a sand box to make a print, pulled the pattern out and poured in the iron. Then when I really got down to thinking about it, I did not see how it could be done at all. To get the pump hollow with all the bulges and things and get the walls so thin and uniform; then to get the pattern out.

It had me puzzled so I wrote to several pump companies about it. They practically ignored my request. So I got a coulple of books on casting from the library. They were very technical, but did not explain the important things of how a pump was made. Then I visited our local foundry. Mr. Sharp, of Salem Iron Works, was very accommodating. He showed me through the plant and answered enough silly questions to give me at least a basic idea of the process. It is really quite complicated. No wonder the old timers were so slow in figuring out how to do it. I won't go into the technical terms, or "jargon of the trade" but the following is a condensed version and will give you a fairly good idea of how a cast iron pump is made. I will try to tell you in a few pages, what it took me several letters, two books and one foundry to find out. [14]

The first step in the making of an iron pump is up to the designer and draftsman. The drawing must be to scale and accurate when turned over to the pattern maker. He carves and turns on a lathe, a wooden model the exact size and shape of the main body of the finished pump. The handle and other loose parts are made separate. The main body of the pump, including the air-chamber, being hollow, is complicated and the most difficult part to make. The model is cut in half lengthwise. Dowel holes are bored so it can be set back together in perfect alignment. A second model is also made; about one half inch smaller than the first one. This one is the exact size of the 'core'.

To make the mold, a long box, with no top or bottom, called the "DRAG" is laid on a long flat plank. One half of the pump model is laid flat side down, on the plank, inside the drag. Moulding sand is put in the box around the pattern then tamped and rammed until quite firm.

The half mould is then carefully turned over and the sand scraped off level.

The other half of the pattern is set in place on dowel pins to get the two halves in perfect alignment. Parting sand is sprinkled on to keep the mold from sticking.

The cope or top half of the FLASK is then set on, clamped, filled with sand and tamped firmly. A pour-hole is made by putting a round stick through the sand to, or near the pattern. The two parts are then separated and the pattern lifted out, which leaves the mold the exact size and shape of the pump.

The core is made of clean molding sand mixed with a binder. The old timers used flour for that. the core is made by the same process as the main mold, only partly reverse. It also is made in halves then glued together to form a solid core. It is then baked to make it hard and firm so it can be easily handled.

The core is now ready to be put in the mold. But first it and also the inside of the mold box are coated with plumbago (graphite) which prevents adhesion and leaves a fairly smoothe surface on the casting. A pin or extension protruding out at each end of the core, rests in a groove, which holds it suspended in the mold. Small metal separators, like short nails with two heads, called "chaplets" are used as dividers to help keep the core in adjustment. They are absorbed in the casting.

The iron, which has been heating in the cupola is poured through the gate into the cavity of the mold. When it has cooled the mold is unclamped, opened, and the molded pump lifted out. The sand core is still intact in the pump. How do they get it out? Simple. The whole thing is put in a baking oven, heated to a certain temperatures which dissolves the binder in the core sand. The core is then poured out as sand, leaving the hollow pump barrel. The fins (where the two halves of the mold fit together) the gate and any other rough parts are ground off. The barrel is cleaned inside and sometimes bored and ground smoothe so it can be used as the pumping cylinder, as in the pitcher pump. The pump is now ready to assemble, the accessory parts having been cast by a much simpler process. We now have a pump, ready to begin its life of service to some lucky farmer who has a well but no way to get the water. The pump mold box, when once made, can be used over and over again. Likewise, the core mold box. But a new core must be made for each and every pump that is cast. Now I, as well as you, know the mystery of how a cast iron pump is made. (If you take a notion to make one, poke a few air or vent holes in the mold, or you may have some blisters or blow-holes.)

PUMP PATENTS

The United States Patent Office was established shortly after our Constitution was drawn up, and Patents were issued and recorded as far back as 1790. Pumps were among the first patents issued.

It is very difficult to find very much about them prior to 1850. The Oregon State Library has a whole series of the huge old Patent books. The 1847 ones are the earliest in their files, and they are poorly set up and difficult to search.

The patent records have had two serious set backs. The office was destroyed by fire in 1836 and again partially destroyed by another fire in 1850. In all, 7,000 models, 9,000 drawings and 230 volumes were lost. That left quite a communication gap for researchers of early patents.

Tom Ewbank, a commissioner of patents, wrote in 1841 concerning pumps; "We would predict, that in the next century, as in the present one, the cylinder pump will maintain its pre-eminence over all others and that makers of the ordinary wooden ones will then, as now, defy all attempts to supercede the object of their manufacture."[3] (At that time, rotary pumps were threatening to cut in.)

Again in 1847, the patent commissioner wrote about the pump situation: (I do not know if it was the same man.) "The subject has so long exercised the ingenuity of inventions, that little else seems possible, but to "refine upon what has already been done."

He would have been dumbfounded, if some one could have assured him that several thousand more patents would be issued on pumps by the time the electric pumps took over. He had no idea there would ever be such a thing as electric pumps. That kind of electricity was not dreamed of yet, so how could he.

I have not tried to determine the number of patents issued on electric pumps but it runs into thousands.

I have spent many hours in the library looking through patent books. The earliest pump patent I have been able to find was one issued to a man by the name of Hubbards, of Rhode Island, Conn., in 1833. (I did not find it in the patent books.) It was for a rotary pump. Following is a quote from the article: "Messers. Fales & Jenks Co. bought the rights, and now manufacture them. they improved the pump, and to supply the demand. 'the business has become of great magnitude'."

According to that, rotary pumps must have been popular at that time, and they must have had a good one. The pump was not described or pictured, so I have no idea what it was like.

I have before me, a sketch of a reciprocating hand rotary built in the late 1700's. It appears to me that its use as a well pump would be very limited.

Rotary pumps were used a great deal in the early steam engines. Watt was issued a patent for one in 1782 for use with his steam engines. In 1805, J. Trotter, London, was issued one. In 1790, a patent was issued to Bramah & Dickensen for a "rotary steam engine."

The next earliest patent I have found, is the one on the Miner wood pump, 1835. I have a picture of the pump, but the written description was destroyed in the fire.

In 1851 a patent was issued to Nelson Newman: "whereby an iron pump may be cast in one piece." That is the first I have read about one piece iron pumps. However, Douglass, Downs and a few others were making cast iron pumps before that date.

Most of the patents on pumps were to persons whose names were not connected with any known major pump company. Many of the patents, probably I should say, most of them, were for minor improvements, "gadgets" and "oddities". Some of them, of course, were very good while others were impractical and were not used much.

Following is a list of a few of the dozens I have jotted down. It gives a good idea of how they run.

Date. 2-20-1866. Harris. A double acting pump. Hollow piston rod and hollow piston. Valves arranged so the water 'goes up through the hollow piston rod'. 52-709 1866. Mayhew. Rope attached to pump lift bucket or plunger, to operate same. #52-364

1-30-1866. Vance. A means to secure a glass cylinder so it will stay in place. #52-346.

2-6-1866. Mason & Gill. A special water suction piston. #52-431

3-6-1866. Levi A. Gould, Santa Clara, Cal. (no connection with the Goulds Pump Co.) Two Pistons in one "barrel", connected to handle in such a manner, that as one ascends, the other descends and visa-versa, giving a steady flow of water "without the air-compression chamber." (Probably was too complicated to keep in working order.)

2-19-1867. J. Bean. Divided diaphragm of plunger. 62-247.

5-14-1867. Reynolds. Cylinder hung in "trunnisons." Piston hollow. Piston rod tubular & communicates with piston chamber. Water enters alternately through each end of cylinder, and enters piston to pass up through rod to exit at top. 69-250 (drawing was very complicated.)

1-11-1866. Parkhurst. To hold glass or porcelain cylinders in place, and to hold together, sections of wood pipe, by iron rods and brackets. 52-070. (another long description and complicated drawing.)

5-30-1876. S. J. Adams. Pump attachment. 177-979.

1876 Van Sant. Chain pump part. 178-208. (Van Sant was a chain pump man.)

5-3-1876 Hooper. Double acting force pump. 178-057.

1876 D. Johnston. Force pump valve release. 177-401 (To drain pump to keep from freezing.)

1876. Geo. McCrum. The case forms an air chamber around the pump cylinder. 177-403 (A major pump patent.)

6-6-1876 R. Adams. Pump gadget-to trip valve to let water back down so it won't freeze. 178-225.

J. S. Adams (same as above Adams.) Pump valve. 178-224.

John Butman. Pump with pumping cylinder to one side of main barrel 178-230. (A great many pumps were made after this patent.)

5-9-1876 Williamson. Windmill. 177-187. Many thousands of windmills had his name on them.

F. Miller. Force & lift pump. Larger cylinder outside of pumping cylinder to leave space for packing. 177-143. (Probably to prevent freezing.)

11-28-1875: A. S. Baker. Pump collar or ring, grooved around top so handle can be turned. Held in place with a set screw. 175-902.

9-5-1876 Lount. Pump for continuous discharge of water. 118-730.

The list of patents goes on and on. These are a few I picked out. I wrote down the numbers of dozens of others but there was no object in looking up the descriptions. It is interesting to look up old patents but it is tedious and time consuming. Unless one is looking for some definite patents, it does not pay. There are hundreds of them I could not connect with pump people I have researched.

How many patents have been issued on the old hand pumps? I am afraid that is another thing I cannot tell you, but I am going to make a crude and rough estimate.

I counted a few years, out of curiosity and here is how they ran.

Several years, about 200, and several over 120; many ran from 60 to 90. In 1874, there were 80, and in 1880, I counted 108.

Hand water pump patents were issued for a period of over 125 years. If the average number per year was 40, that would indicate that about 5,000 patents were issued on "Grandpa's ol' pump." How about that. Do you want to look it up?

HOW MANY PUMPS

Now that we have dipped into patents a wee bit, we might as well go a step farther and try to solve another illusive problem. How many pumps were actually made in this country up until the time the Pelton wheel "put them out of business."

Pumps were being made here 170 years before they were being recorded. That, added to some 140 years since, means that hand water pumps were manufactured for a period of over 300 years. That is, figuring to 1920 when their production got pretty low on account of the electric pumps cutting in. We could truthfully add another 50 years since there are three companies still making hand water pumps and one of them lists 59 models in their late catalog. In a recent letter from one of the large pump companies I was informed that they had run across a record indicating that between 1922 and 1960, there were approximately 16 million hand and windmill pumps made.

Over 300 or 350 years. That is ten or twelve generations of people wearing out pumps and pump makers trying to keep them supplied.

In 1875, there were about 50 million people in our country, and pumps had been made for over 250 years, then. From 1875 to 1925, was by far the most productive years in our history for hand pumps. The population had nearly doubled. Almost every family needed a water pump and it was not uncommon for a home or farm to have several. One or two were on the drain board in the kitchen and several were scattered around the farm. And they would wear out and have to be replaced.

In 1880 one company was making over 21,000 a year, and "expected to do better." That was an obscure company I had difficulty finding out about. There were quite a few larger pump makers at that time.

The question comes up; how many factories were there in the country who made pumps. I am not going to tell you that, because I do not know. I do not think there is any way to find out. In 1860, there were 133 factories listed who were making pumps and hydraulic rams. Five windmill factories, (two of them were in the Sacramento Valley area.) A few factories were turning out "bored logs for pumps and pipe." The only year I actually checked for the number of pump makers is 1860.

Now back to the number of pumps made. Taking every factor into consideration that I can think of, I am going to stick my neck out and make an estimate of the total number of hand water pumps made in this country since the Pilgrims landed in 1620.

I'll bet the number exceeds the 42,000,000 mark considerable. Just how many is 42 million pumps? Well, literally, if they were set three feet apart with their "handles up," they would reach around the earth at the equator, and join handles right where they started from. Or, if they were all packed in "hogs-heads," at 10 per barrel, like Mr. Douglass packed his for shipment, and the hogs-heads were stacked on top of one another, and you stood on top of the "stack"; you could scan the world from over 2,000 miles in the air. In fact, you might as well be on the moon, because you would not even be aware that there was a world below you. (Air pollution, you know.)

That, my friends, is not "baloney"; it is a lot of pumps.

Now, if all of those pumps weighed an average of 60 pounds each, they would out weigh Fairbanks-Morse's scales set at two and a half billion pounds.

NUMBER OF MODELS

When I first started investigating this pump business, I had the idea that there might possibly have been as many as four or five million made. Over 42 million sounds incredible. I was still more amazed when I totaled the number of pump models. When I read that Goulds, in 1860, were making 20 models in 130 different sizes, I thought surely they must be the most prolific of all pump makers. Then, I ran across Chandlers; 70 models, averaging 2 sizes each. And Columbiana, making 80 models and averaging 4 sizes per model. Then, there were two Douglasses, The Biggs, The Myers. The list is almost endless. The figures for most companies are not available, no matter how hard you look.

However, I got enough to make an estimate, that only 100 pump companies, turning out an average of 50 models (and sizes) each, the figure would mount up to 5,000. Can you imagine, over five thousand models and sizes of hand (and windmill) water pumps? I don't think I believe it myself.

Of course, many of them have slight variations, but never the less, they are cataloged as separate models.

The following is a brief run-down of Columbianas operations as shown in one of their old catalogs, which they so kindly sent me.

80 models of pumps; from 1 to 6 sizes each. (I have made drawings of several of them, which you may check for details.)

48 sizes of pump cylinders, from 2" x 10", iron, at $4 each to 4" x 20", all brass; at $31.00.

8 sizes of "water-packed cylinders," from 2" x 16" to 3½" x 20". These have no leather in the plunger or valve. The seal is achieved by close fitting and by "water-rings" cut around the piston. They are used where acids "dissolve" the leather.

39 sizes of "artesian well cylinders", complete with plunger and valves.

Sizes range from 1-7/8" x 12" at $60 each, to huge ones 5-3/4" x 65" (4½ gallons per stroke), costing $255 a piece.

(I do not know why they are called "artesian cylinders" as they were worked by a plunger rod, the same as ordinary cylinders, only they require a machine with an extra long stroke to operate them.)

They also list two styles of "drive points" in 51 sizes; up to 72" long, at $710 per dozen. And, of course, a complete line of pump accessories.

These figures on patents, numbers of pumps and models, will give you some idea of the enormous size of the old hand water pump industry which intruded quite a way into the twentieth century. As of this date, 1970, it is mostly history.

PUMP LIFT WEIGHT

In designing hand pumps with which to pump water out of deep wells, the weight of the water in the well pipe, is one of the factors to be considered.

The pressure of the air will "push" the water up the first 25 feet or so in the 'suction' pipe so the plunger, or "lift-bucket" can get hold of it. From there on up, the water is dead weight, and must be lifted the rest of the way by hand power. The leverage of the pump handle reduces the power needed considerably. An iron ball was put on the end of some pump handles to add weight and help with the "lift."

A 125 foot well is pretty deep to pump water out of by hand, but I will use it as an example. Much deeper wells have often been used.

If air pressure pushed the water up 25 feet to the piston, it would leave 100 feet to lift it by hand. The water in 100 feet of 2 inch well pipe would weigh about 137 pounds. There is also another factor involved. The weight of 125 feet of 3-4 inch pump rod, which weighs about 150 pounds, or more than the water. So you see there is about 287 pounds of weight on every stroke of the pump handle. Well, not quite; the water displaced by 125 feet of pump rod would be about 17 pounds. That still leaves about 270 pounds weight that has to be lifted to get the water to come out of the spout.

That is where the handle leverage comes in. It varies from a ratio of about 1 to 5, to perhaps 1 to 10. Let us take an average of 1 to 7 and see how that works out. That would be a handle 35 inches to the pivot, with a 5 inch fulcrum. One seventh of the 270 pounds combined weight of the water and pump rod is about 38 pounds. That is not too bad, but would soon tire a person if he had very much pumping to do.

Now if you happened to feel extra ambitious, and put down a 4 inch well pipe that same distance, you would have the following weights to contend with. Water, 548 pounds. The pump rod, the same as in the smaller pipe, 125 pounds, or a combined weight of 698 pounds; minus a few for displaced water, or 680 pounds dead weight to be lifted by the handle. Using the same handle leverage of 1 to 7, the weight is reduced to a mere 97 pounds; which of course is out of the question for the average person to operate a pump.

Some pump handles, or "brakes" as they were often called, were made so the stroke, and also the leverage were adjustable. The stroke could be set for 6, 8, or 10 inches, by setting the hinge pin, in the first, second or third hole of the handle. The leverage would thus be changed too; even to a ratio of 1 to 10.

However, most deep well pumps use 1¼" well pipe, which is much smaller, in order to make the pumping operation as easy as possible.

(The above weight of water and pump rod were taken from a table of weights and measures.)

Following is some good pump and well advice given to farmers by F. L. Marsh of the Minnesota Farmers Institute. It was in Minnesota University Annual No. 14 dated 1901.[25] It is novel and interesting, and I thought worth repeating.

WELLS AND PUMPS

by F. L. Marsh

"The one thing indispensable and oftenest used on the farm or village lot, is the water supply. This must be had, whatever else is or not.

The drive well may be driven through many feet of clay, providing a suitable "feeding ground" of sand lies below. The only hindrance is stone or a quicksand bottom. The cylinder of the pump must be within twenty feet of the water to work well. Therefore a pit must be excavated and curbed to this depth. The point (well pipe screened point) should be several feet under water, if possible, the deeper the better.

Do not curb such a well with wood, especially pine. Use cement pipe, brick or stone. Choose a location where nothing can drain into the well, and try to keep the small animals out; a hard thing to do.

The forked twig, or "water witch" is often used to locate a well. The writer was foolish enough to think there was something to it once, after repeatedly seeing it turn down, apparently in spite of the hard effort to prevent it from doing so; but now thinks it is the said effort that makes it turn down and that if it is gripped hard enough and just right, it will turn down any where. There are many places where the best skill and experience is needed to locate a well, that some greater intelligence than a forked twig is required.

There is no other machine used about the farm, unless it be the cream separator, so inconvenient to have out of order. None is so apt to get out of order or more disagreeable to repair. Some of this repairing cannot be avoided. Most of it may be if material and work were first class at the start. One would not think of buying a poor binder because it cost less; the pump is used all year and the binder only a few days.

There are several types of pumps. The cistern or pitcher pump will throw more water, and do it easier in the limited use to which it is adapted, than any other kind, unless it is the old wooden pump. It is only adapted to shallow wells, and for summer use, or indoors, because of its tendency to freeze. (The pumping cylinder is the main barrel of the pump.) In any other class the cylinder is separate from the base or standard. The cylinder is the vital part of a pump, all else being accessory, and it cannot be too good. It does not pay to buy an iron cylinder. One of brass or brass lined, is far more durable keeps bright and does not wear out the plunger leathers so fast. Again the check valve is the vital part of the cylinder. Be sure to get one having the best check valve. This is one which is warrented 10 years.

The common flap valve is always giving trouble. The pump standards made mostly of pipe are better and work easier than those of cast iron.

Next to the pitcher pump, the common lift pump is the cheapest and is good when water is to be pumped into a pail only. The surface force pump costs a little more, and allows a hose to be attached to the spout. The other force pumps are of the anti-freezing, underground, or two-way class. There are several kinds, some are better than others. Get the best you can find in the class which is adapted to your needs. By the time you wear it out, it will have saved you many times its' cost as compared to a cheap one. Life is too short to be spent in fussing with and working a poor pump. The good ones will give trouble enough." This is the end of the quote from The Minnesota Farm Journal.

SECTION V

ODDS AND ENDS

ENGLISH DRYDOCK PUMPS

(A note in English Ship building. From Lloyds Register of Shipping.)

From about 1700 to 1800, the pumping of water out of dry-docks was done by horse power. The steam engine came along about the end of that time, and someone decided to try one and relieve some horses of the chore. In 1799 a steam engine made by Saddler was installed. It rated 12 to 14 horse power, and it wasn't cheap. The engine itself cost 800 Lbs. and the pump part cost another 500 Lbs. The horses that "powered" the pumps also ran a sawmill to cut timbers for the ships. The pumping was done at night and the sawing in the daytime. So they also got a special saw outfit to go with the steam engine, costing another 600 Lbs., making the total cost of the steam outfit to replace the horses, 1950 Lbs. (The horses had also been pumping water from a well, giving them triple duty.)

They must have liked the steam engine, as they bought another one in 1800. This time they got a "Bolton & Watt" machine. No price was given for the new engine, and there was no mention of results.

SEWER PUMPS IN LONDON

By 1850 in some parts of London, it became necessary to raise sewage by pumps to a higher level to keep from dumping raw sewage in rivers where some of their water supplies came from. At the Abby-Mills pumping station on the North side of the Thames River (they had 4 pumping stations), the sewage was lifted as much as 41 feet. They used steam engines to "man the pumps". Eight engines were installed. The make was not mentioned, only that they were "double acting beam engines of 142 horse power each". They were pretty good size engines, having cylinders 4 foot 6 inches in diameter and a 9 foot stroke. That isn't just "pretty good size", it is *very* large. Of course, at that time steam engines were fairly new and bulk had to make up for efficiency.

Each engine operated two "double acting pumps with 3' 10" bore, and a 4 and one half foot stroke" which is also pretty big for a pump. It would be quite a sight to see those eight huge steam engines puffing away and working 16 large pumps. Altogether, they could raise 15,000 cubic feet of liquid every minute to a height of 40 feet. That compares quite favorably with our modern electric pumps of today.[19]

Before the advent of the steam engine to operate large pumps, there was no effort to control some of the sewage; they just let nature take its course.

THE MARLEY PUMP

THE MOST ELABORATE MACHINE EVER CONSTRUCTED for pumping water was at Marley, on the Seine River at Paris. It was put to work in 1682.[19] Its purpose was to furnish water for the Palace of Versailles and the "exquisite fountains" where Louis the 14th and his son, Louis the 15th, entertained the "Royalty of Europe".

To build this "colossal monstrosity", the entire river was dammed and divided by piling, into 14 distinct water courses. In each of the 14 courses, huge water wheels, each 40 feet across, were installed. At both ends of each axle, cranks were attached to operate pumps. More than 200 pumps were used, both "suction and force" or "push pumps".

The pumps were divided into 3 sets. The first set consisted of 64, which were set in the river and were operated by six of the water wheels. They sucked and forced the water to a cistern about 160 feet up the hill.

In this "cistern", 79 other pumps were placed which forced the water 185 feet higher to another reservoir in which 82 more pumps were installed. The latter pumped the water to the main reservoir which was over 500 feet high and three quarters of a mile distant from the river.

So far, this pumping system doesn't seem to be too complicated. But, the second set of pumps were operated by JOINTED IRON RODS, connected to the water wheels at the river level and directly to the 79 pumps. And that isn't all: the third set of pumps, numbering 82, was also hooked directly to the water wheels by their own set of jointed iron rods. The latter must have been at least one half mile long. The waste of power was enormous; the noise from the clanking and vibration was tremendous.

You will have to go over all of that again to really understand the immensity of the installation. It cost a fortune to build, it produced only about 80 horse power, but it pumped 870,000 gallons of water a day. It was given the title, "A monument of Ignorance".

When Napoleon Bonapart became Emperor of France in 1804, he replaced the water wheel power with steam engines. The water wheels had been doing the job over 100 years. In 1840 most of the old works was still there.

Most of this information on the Marley Water Works is from Ewbank, who took it from Belidor. It is also found in The History of Technology, and in Knights American Mechanical Dictionary, 1876.

It certainly was an "elaborate machine". As for a feat of construction, Joseph's Well and Agricola's 500 horse mine pumps rank pretty high.

PUMPS VENTILATE MINES

The ventilation of mine shafts was a real problem to the old time miners. One of the earliest methods they used was the "Bellows", run by man-power, horse power and a few other means. They made some very big ones.

The first "mechanical ventilator" was an air pump invented by Buddle in 1807.[19] It was an "air suction pump" using a wooden piston 5 feet square and a stroke of 8 feet. The "square cylinder" which this piston worked in was also made of wood. The valve in the piston was made so that it would close on the suction stroke and draw the air out. It was operated at 20 strokes a minute, which was pretty fast for such a large piston and long stroke. It exhausted 6,000 cubic feet of air a minute. It was extensively used in the coal mines in Belgium and in the lead mines in The Harz Mountains. Other large ventilators were soon invented and put to use in the mines. The steam engine made these huge ventilator pumps possible.

PUMP GIVES ALARM

Haskell's Alarm Pump was designed for ships: to pump water out of the hold, for dock washing and to operate a "signal whistle", which was set on top of a large air-compression chamber.

It was a three cylinder pump; the pistons were worked by a crankshaft. On one end of the shaft was a wheel with a handle for turning, and on the other end of the shaft, a large geared wheel, with handle, which meshed with a smaller gear to give power and speed when needed.

(From Knight's American Mechanical Dictionary.)

Also mentioned in Knights was a "Piston-Blower", which was a large round piston working in a cylinder to furnish air in "ancient" blast furnace smelting. What date was meant by ancient was not indicated, but I think it coincides with the old bellows, which dates back a couple of thousand years B.C. Apparently the piston and cylinder were used much longer ago than we realize.

MOLASSES and PENDULUM PUMPS

"Hello: who er you?" "Wy, I'm 'Lassis Pump. Haven't you'all ever heard of me?" "I thought ya looked kind o stuck up." "O, not really; a little, maybe. But you see, I belong to the MOlasses Pump family, an we're always stuck up, more or less. But then we'all can't help it. When they put ya on top of a barrel o that DElicious MOlasses, well, you'd get stuck up too". "Who er you?" "Wy, I'm Pendulum Pump. Mr. Pendulum Pump". "O, so that's what makes you tick; HA-HA!" "Yes, Ocourse; No! I don't know what makes me tick. My insides are a secret. Besides, I'm an orphan. Sh! – nobody knows much about me, only that I'm a wayout member O the Pump family".

"M, I thought you looked a bit, a – – – queer".

Molasses pumps don't look much different than many other pumps. The "barrels" are a little larger, and so are the suction and outlet pipes, so they can handle thicker liquids.

I have been unable to find out much about the "pendulum pump". I do not know who made it, nor have I found it on the patent records, altho it is supposed to be patented. A very poor picture of it is about my only knowledge. It is "short and squat"; looks something like a "fire hydrant" with a tail hanging down from one side. It looks like a hi-pressure pump as the bulbous air-chamber top part is sealed on top to create pressure, and the spout can be closed to force the water through a provided opening on which a hose or pipe may be attached.

THE BUMP PUMP

When I saw the heading BUMP PUMP, I thought perhaps I had run across a real 'odd-ball'. A bump pump. What on earth kind of a pump could a bump pump be, anyway? It had my curiosity aroused.

The "mystery" of this one was solved with a minimum of research, by reading a little farther. A bump-pump is nothing more nor less than – you guessed it – a "pump" made by The BUMP PUMP Co.

I think the company was founded in 1905. It developed into a large modern concern, and was connected, in a way, with The Caterpillar Tractor Co. I believe they still retain the name of The Bump Pump Co.

THE CLAM GUN

How about the "clam gun"? Sure, it's a pump, the most primitive kind, used by the "ancients", and called a syringe. I doubt if they ever used it for pumping clams, but it comes in mighty handy for that purpose. It is composed of a cylinder and a close fitting plunger; when the plunger is pushed clear down then pulled up, it creates a vacuum, and what ever gets in the way is "sucked" in, or rather is "pushed" in by that ever present "air-pressure". If it happens to be a clam, that's good.

McKINLEY a PUMP MAKER

President McKinley's Grandfather apparently was one of our country's earliest pump makers.

He wasn't really in the business; he probably was one of those "jack-of-all-trades" gentlemen like so many of our forefathers. When he needed something, he went ahead and made it.

The pump was a huge square wooden one about the height of a tall man. Wm. McKinley made the entire pump, iron handle and all.

This information was obtained by The Lisbon Historical Society. It appeared in a Lisbon newspaper in July, 1963. Following is part of the article:

> May 21st 1834 – Wm McKinley, Dtr. to making pump. I found timber 34 feet long for $10. For which he is to pay 4 or 5 dollars in iron and castings and the balance in cash (after harvest) 50 cents more for taking out trade. Total $10.50.

(If you care to see this pump, contact the Deming Pump Co.)

You never know who may be revealed as a pump maker; even Leonardo de Vinci, the artist, engineer and architect, had a try at it.

THE BEAN PUMP

"In 1884, two men sprayed one acre of orchard in a day. Today, 75 years later (1959), two men cover 10 acres in a day". (In 1959, Bean Pumps celebrated their 75th anniversary.)

In 1883, John Bean invented a one-man, portable, hand-tank pump-sprayer. By one man carrying the pump-tank and keeping it pumped up, and another man operating the spray pipe, they could spray one acre of apple trees in one ten hour day. (I'll bet those fellows really earned their pay.)

The information the Bean Pump Company sent me said very little about their hand spray pumps. However, they made thousands of them; just how many and the number of different models, I have no idea, but it must have been quite a few. I made a drawing of one of them; it is shown as drawing number 20. Mr. Nickel, a farmer, had sprayed many a tree with it and was now retiring, so he gave the pump to me.

This particular Bean Pump has the model "Magic A 10" and the patent date of 1889 stamped on it, so it must have been one of Bean's earliest models. It is a very heavy, high-pressure pump and must have taken a husky man to operate it.

In the early 1900's the Bean Co. began the manufacture of "wagon tank sprayers"; the pump was operated by that then welcome new-comer, the gas engine. The "out-fit" was pulled by horses. With that "new modern machine", a crew of three men could spray five or six acres a day.

The "adjustable" spray nozzle was invented in 1916 and was considered a very important contribution to the spray industry.

From then on, as the gas engine was improved, larger and more efficient spray machines were built; larger tanks to hold more spray liquid, and more powerful pumps. The orchard business expanded very rapidly.

During the 1920's, pipe lines were laid through orchards where the trees were too thick or the land too steep for the portable spray machines. The solution was pumped thru the pipes by a high-pressure stationary pump, to convenient outlets, sometimes a mile or more distant from the master pump.

Today, over 75 years after Bean's first hand spray pump, the John Bean Company makes orchard sprayers that cover 70 or more acres in one day; they can spray an entire orchard almost as soon as the bug pest gets out of his shell.

One odd fact of this new spray machine is the fact that the two men who originally covered one acre in a day is all the crew that is needed to handle this huge new machine. One man drives the thing, while the other just sits there and punches buttons to direct the liquid or dust spray material to where it is needed. And I'll bet that at the end of the day they aren't half as tired as the two men who sprayed only one acre back in 1884.

For quite a few years now, many of the "hydraulic" sprayers have been replaced by "air-sprayers", whereby the liquid is vaporized and carried by a large volumn of air under high pressure. But that is getting out of my field.

THE DEAN PUMP

Mr. Stevens retired his faithful old pump to a place of honor on his front lawn where he could easily see it and be reminded of the good old days on the farm. He set it up to support an old fashioned gas lamp, now electric, to illuminate his front yard at night.

The pump had the name Dean & Co. cast on the air-chamber.

The place where it was made was not given so I was unable to trace it. It is the only Dean pump I have run across in my pump hunting. It is a deep well, high-pressure, heavy duty, well made pump with a windmill rod.

Mr. Stevens salvaged the pump from the old homestead, and he told me a good yarn that goes with it. (The homestead, not the pump.)

It seems that one snowing morning, many years ago, Bill went out to do some chores and saw a bear in his apple orchard. He'd already had too many bears in his apples so he stepped back in to get the shotgun. The bear had sniffed him and was already movin' off. It was a bit far but he cut loose anyway and got a squeal.

When the bear tried to get through the woven wire fence in a hurry, it got stuck. Bill was right behind it. (The gun was a single shooter, and he hadn't brought an extra load.) He hopped the fence and tried to kick the little bear back, but it got thru anyway, and right between Bill's legs. He grabbed hold of the loose skin on the bear's neck with both hands. It twisted right around and latched onto Bill's hind leg – or Bill's leg behind. He happened to have good husky boots on and all the bear got was a mouth full of rubber.

By that time they were both down in the snow, each one afraid to let go – or couldn't. The claws on the bear's hind feet had Bill's nice red mackinaw about torn to shreds and he was ready to holler for help, only there wasn't any, 'cause the mare his wife was riding had sniffed Mr. Bruin and taken off for the far end of the ranch.

When Bill let loose with one hand to push his hat off his face, he got hold of a fist size rock instead – that probably saved his life; or at least, his pride, 'cause when he quit hitting little bear over the head with it, it was stone dead and Bill looked like heck, or worse.

What became of the bear? He made steaks of it, of course. "Wasn't no bear steaks goin' t' git away from him if he could help it". O yes, his wife was proud of the bear hide rug he made.

> (My memory isn't too good when it comes to repeating yarns people tell me and I had to shorten it a bit, but it seems to me that's about the way it happened.)

WHERE DID THE PUMP COME FROM?

The following is from page 1825 (sent to me by The Smithsonian Institute) of Knight's American Mechanical Dictionary, N.Y. 1876.

> "Pump. A device for lifting water by the motion of a piston in a cylinder. Whether or not they were invented by Danus, who dug the wells of Argus in 1485 B.C., on the coast of Peloponessus or by Ctesibius of Alexandria in 224 B.C., it is not possible to determine. In either case, the origin is Egyptian, and that is the most likely part of the statement".

According to The Encyclopedia Americana, 1904-6, under pumps and pumping machinery (the pages were not numbered):

". . . Danus dug the wells of Argus in 1485 B.C. on the coast of Meloponessus, and, according to Pliny (v11) installed the Egyptian chain-o-pots as pumps, and not THE ATMOSPHERIC or FORCE PUMP." (Note the different spelling of M-Peloponessus.)

The origin of the pump seems to be getting more illusive all the time.

IS THIS THE WAY THE PUMP WAS INVENTED?

A Nomad family on the move, having exhausted all food and game around "home":

"Say Ma, I'm thirsty; can't go much more without water."

"I know, Son, so 'm I. Pa'll find some soon er we're done fer. Been 2 days now, with nary a drop."

"Here 'e comes now, Ma. Sure hope he found some; how about it, Pa?"

"Well, yes an' no, Son; see that cliff o' rocks an' stuff, an' them green things way over thar? Well, ther's a crevice thar that's got water, but it's so deep down to it we can' never git none of it. There's yak tracks there tho, maby I kin ketch one, 'n git some grub anyhow, 'n some blood".

So they suffered on till they came to the green stuff and crevice of water. Sure enough, it was way to heck an gone down to it; 15 feet or more.

Ma said, "Sure is a heck of a note t' die o' thirst with water right under our nose. Pa, what kind o' stuff is that green stuff, anyhow"?

"O jes' some ol' bamboo an' some long vine things with some ol' dry gourds on 'em. Ain't no use t' us."

Ma said, "Son, git me some o' those sticks an' some o' that vine an' gourd stuff."

"Well, here it is, Ma; now what?"

"Jes reach that stick down in that uh-uh."

"Well, what, Ma?"

"Oh well, jes' call it a well 'n be done on it."

"O.K. Ma, but it's too short; can't reach it ––"

"Here, gimme that, 'n go git 'nother one."

"Well, here it is, Ma ––"

"I'll jes' tie these sticks together 'n I'll bet it reaches –– now try it."

"It reaches alright, Ma; now what?"

"Well, jes' pull it back up."

So up it come, with water a-dripping.

"Git somethin' quick, t' catch these drips. I got some, an' it sure tastes good; but too darn slow!"

"Say, ain't that gourd over there holler? Gimme an' I'll jes – tie it – on – an' –"

"Whoopee –, we're saved; Ma, you sure are smart."

They decided to set up housekeeping there by the well. While Pa Yak-Kow was out running down an ox for grub, Ma-Tung and Look-See got to experimenting with the hollow bamboo, vines and gourds. They came up with the world's first "chain pump" by tying some oxhide on a vine and drawing it up thru the hollow bamboo. They also invented the world's first piston pump, simply by tying the hide on a stick and working it up and down thru the bamboo; the water just seemed to follow it up like magic. That is also where the well got its name.

P.S. YAK-KOw, Ma-Tung, and Look-See, all lived happily; till the communists came.

That, my friends, is as near as I can tell you where the pump came from. Disappointed?

PUMPS GONE

O where, O where has the old pump gone?

What has become of the millions of old hand pumps?

Some are left where they stood when the old house burned, or just rotted away from age and neglect.

I have seen them standing, lonely, in a field, where they were once used to furnish cool water to the thirsty farm hands.

If you visit rural cemeteries, the old ones, you will often see one standing by to give water on a few strokes' notice. These pumps are to keep fresh the flowers that adorn the graves of their masters, whom they had served for perhaps a hundred years.

Some have been belittled by being smashed with a sledge hammer and sold to the junk man.

I have seen numerous of these old pumps at the site of old rural churches and school houses, where, at one time, not so long ago either, the happy, squealing youngsters gathered at recess and noon time to quench their thirst or help gulp down a dry peanut butter sandwich, so they could get to the serious business of hopscotch.

A few are treated with the dignity they deserve by being cleaned, neatly painted, and set in a place of honor on the front lawn, so all that pass that way may see it and pay their respects.

Others, their water giving days long past, are given a new service, such as supporting a rural mail box, or combining its graceful design with an outdoor lamp to help with evening illumination.

Now and then you can see a lonely, deserted pump stand as a faithful sentinel, and the only monument to a long abandoned, but once happy, homestead, to rust away in solitude.

Such is the History of THE PUMP.

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35 Stockton Public Library. Stockton, Cal.
36 Springfield Public Library. Springfield, Ohio.
37 St. Louis Public Library. St. Louis, Mo.
38 Waterbury Public Library. Waterbury, Conn.
39 Warder Public Library. Springfield, Oh. (Mrs. Mary Miller)
40 State Travelling Library. Des Moines, Ia.
41 California Historical Society. Sacramento, Cal.
42 Connecticut Hist. Society. Hartford, Conn.
43 Cedar Falls Hist. Society. Cedar Falls, Ia.
44 Bismark Historical Society and Library. Bismark, N. Dak.
45 Des Moines Hist. Society. Des Moines, Ia.
46 Iowa State Hist. Society. Iowa City, Iowa.
47 Pennsylvania Hist. Society. Philadelphia, Penn.
48 Peoria Hist. Society. Peoria, Ill.
49 Prairie Hist. Society. Madison, S. Dak.
50 Dept. of History & Archives. Des Moines, Ia.

MISCELLANEOUS

51 Water Well Journal. Urbana, Ill.
52 Water Systems Council. Chicago, Ill.
53 The Smithsonian Institute. Washington, D.C.
54 The Dakota Farmer. Aberdeen, S. Dak.
55 Oregon State Univ. Corvallis, Ore.
56 Dean of History. Stanford Univ., Palo Alto, Cal.
57 Superintendent of Documents, Wash. D.C.
58 Rawhide Line. 1011 E 28th St. Spokane, Wash.
59 University of The Pacific. Stockton, Cal.
60 University of Oregon. Eugene, Oreg.

PUMP COMPANIES

61 Aermotor. 800 E. Dallas. Broken Arrow, Okla. 74012.
62 Baker Mfgr. Company. Evansville, Wisc. 53536.
63 Biggs Pump & Supply Co. Box 208 LaFayette, Ind. 47902.
64 Columbiana Pump Co. Columbiana, Ohio. 44408.
65 Decatur Pump Co. Decatur, Ill. P.O. Box 431. 62525.
66 Deming Pumps. 884 So. Broadway, Salem, Ohio. 44460.
67 Dempster. Beatrice, Nebr. 68310.
68 Bean Spray Pump Co. San Jose, Cal. 1115 Coleman Ave. 95103.
69 Fairbanks-Morse. 3601 Kansas Ave., Kansas City, Kan. 66110.
70 Goulds Pumps. Seneca Falls, N.Y. 13148.
71 Myers & Bro. Co. 400 Orange St. Ashland, Ohio. 44805.
72 R. R. Howell Co., 31st Ave. & 5th St. S. E. Minneapolis, Minn.
73 McDonald Pump Co. Box 508 Dubuque, Ia. 52006.
74 Red Jacket Pump Co. P.O. Box 3888, Davenport, Ia. 52808.
75 Pierce Well Excavators Co. Catalog. 1875. Sent to me by The Pennsylvania Historical Society. Philadelphia, Penn.

I WISH TO THANK the following individuals who have been especially helpful to me.

Mr. Dave Dunniway. Oregon State Archivist.

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Mr. Wallace Eubanks, without whose help in editing, arranging and suggesting, this book would be a scrambled hodge-podge.

There were many other persons who supplied various bits of information, which I appreciate.

PERSONAL COMMENTS

The purpose of this book is, among other things, to try and preserve the memory of the old water pump, especially here in America.

The pictures, or drawings, are to show a few of the many different kinds of pumps and water lifters that were made and used thruout the country. Without the drawings one would never be able to visualize how odd and queer looking some of them were. I think I have shown a pretty good cross section of them, altho there were actually hundreds of variations of the few I have shown in the book.

What has been put in the book has been sifted and condensed from many times the information I have accumulated on the subject.

Take the Pierce Well catalog, for instance. A copy was sent to me by the Historical Society of Pennsylvania. It was put out about 1877 and has a lot of odd bits of information mixed in with the companies' business. It has about 60 pages.

The McDonalds sent 16 pages of an old catalog; on each page was a picture, description and price list of the old pumps they used to make. They also included a booklet giving the history of the company.

Columbiana sent me an old original catalog which had been much used. It contained cuts of about 80 models of pumps. Many or most of them were unusual and odd looking.

Goulds sent a copy of their 1853 catalog showing the first pumps they ever made. Some of them were quaint, to say the least.

Mr. Harlow, of the Connecticut Historical Society, sent a copy of the W. & B. Douglass catalog dated 1854, which illustrates and describes some of the first cast iron pumps ever made.

Then there were catalogs from Fairbanks-Morse, Biggs, Myers, Red Jacket, and others.

I cannot fully express my appreciation for the cooperation of these companies, Historical Societies, libraries and others for furnishing all of this information. Without it this book would have been impossible.

I hope I may be forgiven for not going into more detail on some of them. Quite a story could be written about almost any of the old companies.

In writing the story of the pump, I have tried to combine a little art with, what I hope you will consider good reading (not trash).

This story is actually only a 'nucleus' of the pump history, as I try to link the old hand pump with its ancestors.

I would like to suggest that every Historical Society, or group that has a museum, to collect a few of the old pumps. They have been a collectors' item now for several years, and outside of a few in museums and private collections, I doubt if many of the old and quaint looking ones can be found today. There are still quite a few around that date back seventy or eighty years, and even they are hard to come by.

Some people research door-knobs, some insulators, or 'bob-wire', or shaving mugs, and even sad-irons, so why not pumps?